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Forest Service

Pacific Southwest Region

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September 2005

Final Environmental Impact Statement, Volume 1

Land Management Plans

Angeles National Forest

Cleveland National Forest

Los Padres National Forest

San Bernardino National Forest

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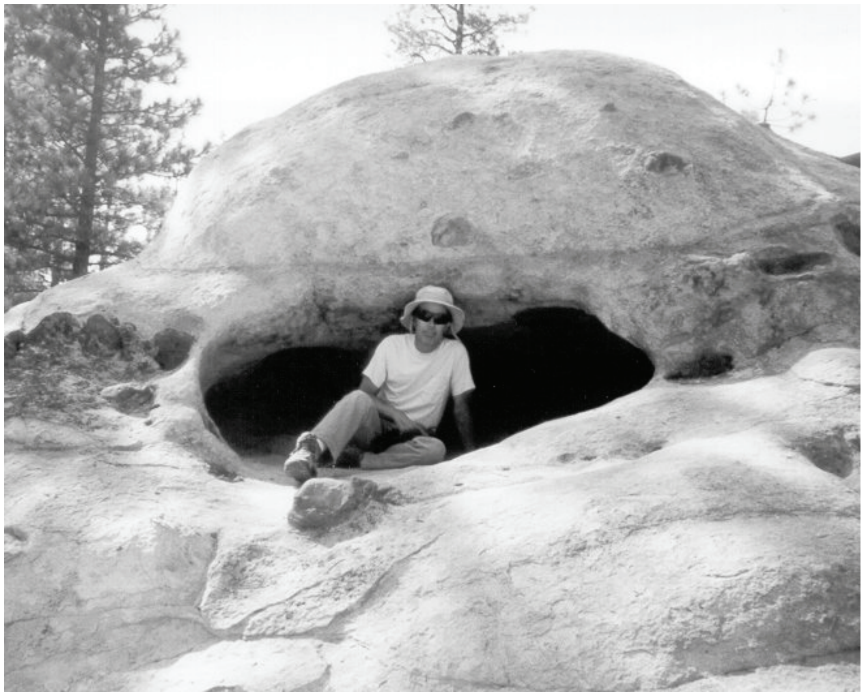

Dedicated to the Memory of Mike Foster

Forest Botanist, Los Padres National Forest
Lead, Biology Team, Southern California Forest Plans Revision
1955-2005

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Tables and Figures

Note: Tables were managed in a database environment, and were assigned unique numbers as their need was identified. During the lifetime of the analysis, over 500 tables were created for potential use. Some tables were later determined to be redundant or unnecessary. The planning team decided not to renumber the tables for publication due to the amount of work required to locate and update every reference to every table. Thus, the table numbers are not consecutive, and all table numbers were not used in the final documents.

Document Format Protocols

The following format protocols (font type, size, and strength, as well as indentation) are used throughout the Land Management Plan.

All headings are Arial bold, in varying font sizes and indentation.

Text is generally Times New Roman, 12 point regular.

Table Titles are Arial, bold, 11 point.

Table column headings are in Arial Narrow, 10 pt, with a shaded background.
Table cell contents are Times New Roman, 12 point.

Photograph captions have a top and bottom border to separate them from regular text, and are 12 point Arial font. For example, this is a clip-art butterfly.

References to Web sites (URLs) are in OCR B MT, 10 point in the printed version. In the electronic version, these are live links. The electronic version is posted at:

http://www.fs.fed.us/r5/angeles/projects/lmp

http://www.fs.fed.us/r5/cleveland/projects/lmp

http://www.fs.fed.us/r5/lospadres/projects/lmp

http://www.fs.fed.us/r5/sanbernardino/projects/lmp

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Chapter 1. Purpose and Need for Action

This final environmental impact statement (FEIS) describes the purpose and need for action, the range of management alternatives (including the selected alternative), and the analysis and disclosure of the environmental consequences of the alternatives. The FEIS documents the effects of applying alternative themes for the management of the Angeles, Cleveland, Los Padres and San Bernardino National Forests in southern California. The FEIS includes information that is the basis for determining what components of the current land management plans need change, alternative ways to accomplish the change, and the estimated effects of implementing each of the alternatives.

The companion documents to the FEIS are the final land management plans (forest plans). There will be a forest plan for each of the southern California national forests.

The national forests of southern California are using a new format for describing the strategic direction for the management of each national forest over the next 10 to 15 years. Each forest plan is actually a series of documents that are related to each other, but each stands on its own. These core documents consist of three parts:

- **Part 1 is the vision**; this part of the plan looks to the future and describes a collective vision or desired condition for the national forests of southern California over time.
- **Part 2 is the forest-specific strategies**; this part of the plan can be thought of as "the tools" that will be used to achieve the desired conditions in Part 1. This section includes descriptions of objectives, program emphasis and potential resource management strategies.
- **Part 3 includes the design criteria**. This part of the plan constitutes the "rules" that the Forest Service will follow as various strategies are implemented. The rules include design criteria that consist of pertinent environmental and public land management laws, standards that define the parameters for the activities the Forest Service anticipates, and other guidance (including management guides, manual and handbook direction or other appropriate reference material).

Each part is found in a separate document. Parts 1 and 3 of the forest plans are common to all four southern California national forests. Part 2 is "customized" to accommodate the unique management requirements of each individual national forest.

The forest plans were developed using a "selected alternative" that is based on the Regional Forester's "preferred alternatives." The preferred alternatives (one for each national forest) were identified in the draft environmental impact statement (DEIS). The preferred alternatives were identified based on public comment, legal requirements, resource needs, and the ability of the alternative to move the national forests' resources toward the realization of the desired conditions described in Part 1 of the forest plans. The selected alternative was developed by adjusting the preferred alternative for each of the national forests. The adjustments were made using the public comments made during the 90-day public comment period and from internal review of the draft documents. The forest plans are the guides for all natural resource management activities that may be proposed to move toward the achievement of desired conditions.

This FEISand the forest plans have been developed based on the comments that were gathered at public meetings during all phases of the revision process and from ongoing discussions with individuals, groups, organizations, adjacent landowners, tribal governments, communities and other government agencies.

Other Issues and Concerns

Some concerns did not meet the criteria for being considered significant but are nevertheless important. These appear in the revised forest plans and are addressed through adjustment of design criteria (standards), land use zones, or procedural adjustments. Examples include the topics of air quality, geologic resources and hazards, law enforcement, soils, and heritage resources.

A number of other interests and issues raised by the public and other agencies are not addressed by the alternatives described in this document. Some of the concerns that were raised (such as the Adventure Pass, grazing fee levels, and global warming) require a solution that is outside the scope of decisions made in a land management plan or are the responsibility of another agency.

Document Structure

The interdisciplinary planning team (IDT) for the four southern California national forests prepared this FEIS to comply with the requirements of the National Forest Management Act (NFMA) and the National Environmental Policy Act (NEPA). This FEIS discloses direct, indirect, and cumulative impacts that would result from the implementation of the seven alternatives analyzed.

The FEIS is organized within the framework of five chapters:

Chapter 1. Purpose and Need for Action. This chapter includes a description of the proposed action and a brief summary of information relevant to the proposal, including a description of the purpose and need for the plan revisions and a description of the action proposed by the Forest Service to accomplish the purpose and need. This chapter also describes the public involvement strategies that were used to inform people about the proposal and the plan revision process.

Chapter 2. Alternatives, Including the Proposed Action. This chapter includes a description of seven alternative ways (including the selected alternative) to accomplish the proposed action. The range of alternatives is based on the resolution of the issues identified by the Forest Service as a result of public involvement, consultation with other agencies and tribal governments, and internal Forest Service review. Chapter 2 concludes with a comparison of the seven alternatives and the environmental consequences or trends that are expected if the alternatives were to be implemented.

Chapter 3. Affected Environment and Environmental Consequences. Chapter 3 describes in detail the existing conditions (affected environment) and the anticipated environmental effects (environmental consequences) of implementing the alternatives. There is an important difference in the level of analysis used for this plan revision. The alternatives considered would each make the six decisions described in the Decision Framework section of this document. There are no site-specific, final agency action decisions made as part of this planning process. Trends are assessed to provide overall indications of the effects of each alternative at a scale that is appropriate for these strategic level decisions. In the future, proposed projects will each have site-specific analysis with appropriate NEPA disclosure before any specific actions are taken. The description of the analysis and subsequent environmental consequences is organized in two parts:

- **Affected Environment:** The affected environment includes a description of the existing condition of each resource area and a short list of those factors that are most likely to indicate movement either toward or away from desired resource conditions over time.
- **Environmental Consequences:** This section discusses the direct and indirect effects that can generally be expected when activities are implemented for each resource area. This section also includes a discussion of resource protection measures that Forest Service managers anticipate using to mitigate these expected effects where appropriate. The term "mitigate" is defined in Part 3 of the forest plans consistent with the CEQ definition at CFR 1508.20 (a) through (e). Because the revised forest plans are strategic documents that do not authorize site-specific activities or designations, the effects analysis is, by necessity, general in nature. What this means is that forest plan decisions are analyzed and specific projects are not analyzed. Following the discussion of the general types of effects is a comparison of future resource scenarios; these scenarios suggest trends in environmental indicators that can be expected under the management emphasis and strategic direction described for each of the alternatives. Finally, cumulative effects (including

reasonable and forseeable levels of use) are discussed, including, where appropriate, how regional trends such as land development may affect national forest resources.

Chapter 4. Consultation and Coordination. This chapter includes a list of the people (along with their qualifications) responsible for the preparation of the FEIS and a list of the agencies that were consulted during the development of the FEIS.

Chapter 5. Public Comment on the Draft Revised Forest Plan and DEIS. This chapter provides a summary of comment received from the public in response to the published Draft Revised Forest Plan and DEIS. Appendix M. Public Comments and Forest Service Response contains Forest Service response to comment. Comments are summarized and grouped according to subject. There is one response for each summary comment in this appendix. Detailed tracking of each comment letter, individual comments, and comment summaries is found in the project record.

Appendices. The appendices provide supplemental, detailed information used in the analysis of the alternatives.

Additional information (including more detailed analytical components of forest resources) is located in the project record at the Supervisor's Office of the Cleveland National Forest in San Diego, California.

Background

Between 1995 and 1999, the four southern California national forests began a large-scale analysis of the ongoing (day-to-day) activities of national forest management and the potential effects of those activities on plant and animal species and their habitats. The analysis was initiated because of numerous changes that had occurred with respect to resource demands and the condition of the national forests since the land management plans were originally approved for implementation. This analysis concluded with the publication of a comprehensive habitat conservation assessment, the *Southern California Mountains and Foothills Assessment* (SCMFA) (Stephenson and Calcarone 1999). The SCMFA provides detailed information about current conditions and trends for ecological systems and species in the region. This information can be used by land managers to develop broad land management goals and priorities and provides the context for decisions specific to smaller geographic areas. The assessment area covers 6.1 million acres, of which 56 percent are National Forest System (NFS) lands. Over eighteen million people live in the coastal basin bordering the assessment area. As compared to historic conditions, mountain and foothill ecosystems in this region have undergone dramatic changes. Forested landscapes are more susceptible to stand-replacing fires. Invasive nonnative species have become widely established, causing a decline in habitat capability for many native plants and animals. An extensive network of dams and diversions has altered aquatic systems. Some areas of high ecological integrity remain and can serve as building blocks for restoration. Biological diversity is not uniformly distributed across the landscape; rare species in particular tend to be concentrated in certain habitats. Key areas of high ecological integrity and rare species assemblages are identified in the report. The assessment provides a rich information base, including over eight mapped themes with associated models and databases, from which future decisions (including the revision of forest plans) can benefit.

In 1999, a 13-member Committee of Scientists evaluated the *1982 Planning Regulation* (36 CFR 219) that guides the development and revision of land management plans. The committee issued a report, *Sustaining the People's Lands* (Committee of Scientists 1999), with the results of their evaluation and recommendations for land management planning in the future. Based on many of the committee's recommendations, the *2000 Planning Rule* was published in the *Federal Register* in October 1999 and was adopted by the Forest Service in November 2000. At about the same time, the four southern California national forests formed the interdisciplinary planning team and started work on the revision of the forest plans according to the requirements of the *2000 Planning Rule*.

After the *2000 Planning Rule* was adopted, internal and external concern for the complexity of the rule and the agency's ability to implement it resulted in a review of the rule and a recommendation that the regulation be simplified. The Chief of the Forest Service directed that the *2000 Planning Rule* be revised, and an *Interim Planning Regulation* was published in the *Federal Register* on May 17, 2001. The interim regulation included managerial discretion to complete land management plan revisions initiated prior to May 9, 2002, using either the *1982 Planning Regulations* or the *2000 Planning Rule*. A final planning rule was published on January 5, 2005 *(2005 Planning Rule*). Under the transition provisions of the final planning rule, the southern California Forest Supervisors elected to complete the plan revisions using the *1982 Planning Rule*. This FEIS is compliant with the requirements of the *1982 Planning Regulations*.

Purpose and Need for Action

The purpose of this proposed action is to produce revised forest plans that describe the strategic direction for the management of the four southern California national forests. Specifically, the purpose of this proposed action is to develop revised forest plans that:

- Meet the objectives of federal laws, regulations and policies;
- Address changed conditions and direction that have occurred since the original plans were adopted; and
- Guide all natural resource management activities on the national forests.

In 1982, instructions to revise land management plans and the basis for revision were described in the Code of Federal Regulations (CFR) at 36 CFR 219.10(g):

"A forest plan shall ordinarily be revised on a 10-year cycle or at least every 15 years. It also may be revised whenever the Forest Supervisor determines that conditions or demands in the area covered by the plan have changed significantly or when changes in Resource Policy Act policies, goals or objectives would have a significant effect on forest level programs."

Not only have conditions and expectations changed on the national forests, but all of the current land management plans are at least 15 years old. Current plans for the four southern California national forests were approved between 1986 and 1989.

Since the plans were approved in the mid-1980s, there has been a dramatic shift in people's perception of national forest management. Specifically, the need for revision is driven by several key factors:

- the National Forest Management Act (NFMA) requirement to revise forest plans every 10-15 years;
- the results of analysis initiated because of numerous changes that have occurred relative to forest health (including biological and ecological systems), fire (including community protection, fuels treatment, and suppression), and the anticipated demand for human use of the national forests (including recreation opportunities, access and resource development) since the original forest plans were approved for implementation;
- a need to respond to new information from recent assessments:

An interdisciplinary planning team (made up of resource specialists from the four southern California national forests and the Pacific Southwest Research Station) used the *Southern California Mountains and Foothills Assessment* (SCMFA; Stephenson and Calcarone 1999) and other national forest documents to review the land management plans and the ability of the plans to deal with current conditions, including 60 federally listed threatened and endangered species. The team's analysis was published in the *Province Forest Plan Monitoring and Evaluation Report* (M&E Report) (USDA Forest Service February 2000). The M&E Report identified a number of areas where the land management plans do not include adequate management direction for riparian areas, ongoing activities, and habitat conservation. Specifically, the report concluded that the data compiled and documented in the SCMFA, the *Interim Management Guidelines for Riparian Ecosystems*, and the review of on-going projects constituted new information that indicated a need for land management plan revision on the four southern California national forests. The key question that needs to be clearly addressed in all levels of land management plan direction (Goals, Objectives, Desired Conditions, Management Area Prescriptions, and Monitoring Questions) is that of sustainability. Sustainability as defined by the Committee of Scientists is "meeting the needs of the present generation without compromising the ability of future generations to meet their needs." Based on all of this, the M&E Report concluded with a recommendation that the four southern California national forests' land management plans be revised. The objectives of the revisions are to describe up-to-date strategic direction and to have more consistent management direction across the four southern California national forests.

- to address the issues identified through public involvement with a series of seven possible alternatives for resolution:
- A series of concerns came to light through the course of the national forests' public involvement process indicating that public perception of forest management has changed. The range of alternatives considered in the analysis for the FEIS is based on the resolution of concerns that came from people during the public involvement process.
- For instance, there has been considerable concern expressed over the amount and type of timber harvest done on national forests nationwide. Locally, this issue is centered more around the treatment of forest vegetation to address mortality and disease. The subject of biological diversity (plant and animal species) has become increasingly important. The number of listed threatened and endangered species has increased. People are concerned that listing should be stabilized or reduced. Newer concerns have emerged including habitat connectivity, forest health, the role of fire, and community protection.
- Older, familiar issues are still present, but the issues have many new facets to them. For instance, the disposition of the undeveloped areas of the national forests used to revolve around whether or not to recommend them for wilderness designation. The issue has expanded and includes a variety of concerns including protection from development, habitat protection, human access, community protection and fuel management for fire, recreation use, the opportunity for solitude and the renewal of the human spirit, and more.

Human needs are equally important. Many people are concerned about the level of development on the national forests in light of the rapid urbanization that is occurring around them. Others are concerned about how changes in national forest management may affect resource uses, including infrastructure for community support, transportation of water, transportation corridors, communication sites, mineral development, grazing, or day-to-day recreation activities of all kinds. There is concern for public education and how people use the national forests in light of the expected growth in the population of southern California. Others see the number of people as an advantage and as an important resource that can be tapped for community education, collaborative planning and more.

The revisions are based on the concept of identifying the need for change in the various components of the plan, including utilizing a format that clearly describes management intent, is easier to understand, and easier to use. In effect, the new format reorganized or changed the entire forest plan for each of the national forests.

Proposed Action

The fundamental purpose of this proposed action is to revise the land management plans (forest plans) for the Angeles, Cleveland, Los Padres and San Bernardino National Forests and ensure that management is in conformance with federal law, regulations, and policy. The current forest plans have been in effect since the mid-1980s. A revision of the forest plans is needed to satisfy regulatory requirements and address new information about the national forests and the use of them. The strategic direction included in the revised forest plans will be used to guide all natural resource management activities on the four southern California national forests. The forest plans have been designed to meet the objectives of federal law, regulation, policy, and the Forest Service mission.

The Final Environmental Impact Statement (FEIS) describes the analysis of seven alternatives for revising the Angeles, Cleveland, Los Padres, and San Bernardino National Forests' land management plans and discloses the environmental effects of these alternatives.

The forest plans include the provisions of the National Forest Management Act (NFMA), the implementing regulations, and other guiding documents. The multiple-use desired conditions and objectives, land use zoning, design criteria (standards), and monitoring all work together to define management direction for the four southern California national forests. However, successful implementation of the direction and the rate of accomplishment of desired conditions is dependent on the congressional budget process and other factors.

The revised forest plans will provide forest-wide strategic direction that is designed to achieve the desired conditions described for each of the southern California national forests. The strategic direction in the forest plans addresses the Resource Planning Act (RPA) requirements through the incorporation of Government Performance and Results Act (GPRA) objectives at the national level. At the local level, the forest plans address the needs of people by addressing issues relative to fire, plants and animals, and people. The revised forest plans clearly portray management intent:

- for the implementation of the National Fire Plan and the emphasis on community protection,
- by managing for motorized access to the national forests on 'designated' National Forest System roads and trails, and by carefully managing the expansion of facilities,
- and the levels of development on all of the national forests in order to retain the natural or near-natural character of each of them.

The revised forest plans emphasize the protection of threatened and endangered species in all zones and clearly describe the design criteria and other guidance that will be used as activities are implemented. The revised forest plans include management strategies that are designed to accomplish vegetation treatment for forest health and to contain or reduce the spread of invasive plant species consistent with national direction.

Decision Framework

The adoption of a land management plan includes six decisions for the long-term management of a national forest. These decisions are:

1. The establishment of forest-wide multiple-use objectives, including a description of the desired condition of the southern California national forests as required by 36 CFR 219.11(b). The desired conditions are described in Part 1 of the forest plans. Objectives are described in Part 2 of the forest plans.
2. The identification of forest-wide standards to fulfill the requirements of 36 CFR 219.11(c) and 36 CFR 219.13 through 219.27. Forest-wide standards are described in the design criteria section in Part 3 of the forest plans along with the other guidance that will be referenced during project implementation.
3. The identification of the suitable uses for each land use zone in order to fulfill the requirements of 36 CFR 219.11(c). Suitable uses are shown in the land use zone tables and the accompanying maps and appendices in Part 2 of the forest plans.

4. The establishment of the monitoring and evaluation requirements for implementation of the forest plans as required by 36 CFR 219.11(d). Monitoring and evaluation questions are listed under each desired condition in Part 1 of the forest plans and in a separate monitoring section in Parts 2 and 3.
5. Recommendations to Congress of areas eligible for wilderness designation as required by 36 CFR 219.17(a) and rivers recommended for inclusion in the Wild and Scenic River System as described by 16 USC 1271-1287 and 36 CFR 297. Recommendations to Congress for establishing wilderness and other special designations will be made in the record of decision (ROD) for the FEIS for the forest plans.
6. Determination of suitability and potential capability of lands for resource production (timber, grazing, and oil and gas leasing), as required by 36 CFR 219.14 through 36 CFR 219.26.

The forest plans describe the strategic direction for the management of the national forests over the next 10 to 15 years. The forest plans do not make any decisions regarding site-specific project proposals for implementing the land management plans nor do they compel managers to implement any specific activity. Project-level environmental analysis in accordance with NEPA requirements would still need to be completed and a project must be consistent with the direction (desired conditions) described in each of the forest plans.

The Regional Forester is the Responsible Official for the southern California Forest Plan Revisions. The decisions made in a forest plan according to the 1982 Planning Regulation are described above. Each national forest has an individual Record of Decision signed by the Regional Forester. The Record of Decision describes the strategic direction and management intent for each national forest over the next 10 to 15 years. The Record of Decision describes the decisions made, as well as the rationale for them. It is important to understand that the revised forest plans are strategic and do not include site-specific decisions.

When site-specific projects are proposed that move the national forest toward the desired conditions, environmental analysis will be conducted including the incorporation of the appropriate information drawn from the other design criteria listed in Part 3 of the forest plans. The procedure is consistent with the "staged decision making" process that the agency has been using for decades.

Public Involvement

The Forest Service conducted public participation activities for the revision of the land management plans during several phases in the planning process and in accordance with 36 CFR 219.6. The forest planning process is also subject to the requirements of the Federal Advisory Committee Act. The Act requires that the public, across the board, be given equal opportunity to comment on the plan and the process. The purpose of the public participation activities was to introduce members of the public to the planning process and encourage their involvement, explain the planning materials, answer questions, and describe opportunities for providing input.

The southern California planning team and leadership have sought out, listened to, and responded to all points of view and a wealth of good ideas. The issues that drive the development of the alternatives used for analysis were identified and refined using public involvement and comment throughout the plan revision process. The Forest Service retains the responsibility for the analysis of the alternatives, and the decision for the identification of the selected alternative.

Communication is a challenge because:

- The four southern California national forests cover approximately 3.5 million acres in 10 counties in southern/central California;

- Approximately 31 million people live near, visit or influence the Angeles, Cleveland, Los Padres, or San Bernardino National Forests, and most of them are within a one-hour driving time from the national forests (Struglia and others 2003, U.S. Census 2000);
- The ethnic and racial diversity of the southern California region is unique within the National Forest System; and
- There is national and international interest in the management of the southern California national forests.

The Notice of Intent (NOI) to prepare this environmental impact statement (EIS) was published in the *Federal Register* on September 24, 2001. The NOI asked for public comment on the proposal from September 24, 2001 through December 31, 2001. Opportunities for public comment have been available throughout the process, particularly at the public meetings and workshops. Informal comments from the public were solicited and accepted during each round of public meetings.

To date, five rounds of public meetings and open houses were held in various locations across southern California. These included:

<u>January through March 2001</u>: people were asked to develop a list of values and visions for the national forests. Public comments were accepted and retained for the planning record.

<u>March through May 2001</u>: the Forest Service presented the preliminary significant issues and a range of background data and information. Public comments were accepted and retained for the planning record.

<u>October through December 2001</u>: people were asked for comments on the proposed action.

<u>February through March 2003</u>: the preliminary range of alternatives being considered to address the issues were presented; people were asked if their concerns were addressed by at least one of the alternatives and if the range of alternatives was adequate. Informal public comments were solicited and accepted, and modifications to the alternatives were made based on those comments.

<u>May through August 2004</u>: the range of alternatives and the organization of the environmental documents, including the forest plans, were described in order to facilitate more effective public comment during the official 90-day public comment period. Additional meetings were scheduled during this timeframe at the request of organizations in communities with minority populations.

In addition, throughout the process, newsletters were mailed periodically to all parties who had expressed interest, and information was posted on the land management planning Web site `www.fs.fed.us/r5/scfpr` in order to keep people informed and involved in the opportunities for participation afforded them during the planning process. The Web site shared the newsletter and other planning information in English and Spanish.

On May 14, 2004, the Notice of Availability of the Proposed Revised Forest Plans and accompanying DEIS was issued in the *Federal Register*. This initiated a 90-day comment period which began on May 14, 2004, and concluded on August 11, 2004.

The opportunity to order print or CD versions of any or all of the draft documents (DEIS, DEIS executive summary, one or more of the forest plans, and map packet) was announced on the national forest and planning Web sites and in a newsletter (Forest Plan Revision Update) that was mailed to approximately 8,500 individuals and groups in June 2003, and was also available at Forest Service offices. A follow-up postcard was mailed in July 2003. Print and CD copies were mailed well in advance of the comment period to all persons who ordered them. Print copies were available to the public at libraries across southern California and at Forest Service offices. In addition, print and CD copies of the draft documents were available at public open houses and at the Forest Supervisor's offices.

Several weeks in advance of the 90-day comment period, the Forest Service announced the approximate dates of the comment period on the agency's Web site, as well as in a mailer sent to approximately 8,500 individuals and organizations. The national forests also issued news releases announcing the comment period and open houses to their local and regional newspapers, radio and television stations. Many media outlets did stories about the open houses that included information on how to submit comments on the forest plan. Flyers with open house dates and other public participation information were posted widely at national forest facilities and elsewhere. The information was also included in the quarterly Schedule of Proposed Actions newsletters issued.

During the draft plan review phase in spring/summer 2004, twenty-nine open houses were hosted in communities in and surrounding the national forests, drawing attendance of at least 1,511 persons. (This figure is derived from the sign-in sheets. Many other people attended but chose not to sign in.) Forest Service open houses were designed to facilitate understanding of the documents so that individuals and organizations could more effectively develop their comments. Most open houses had bilingual employee(s) available to meet with the public. All meetings had materials in Spanish and English. Open houses in the cities of Los Angeles, Fontana, and Riverside included bilingual presentations.

In addition to hosting open houses throughout southern California, the national forests used a variety of activities to communicate with the public about the draft environmental impact statement and forest plans including: making presentations to organizations and community groups; distributing English and Spanish versions of posters, flyers and other materials, as well as posting English and Spanish versions of newsletters and other information on the Forest Service's Web site; hosting displays and making presentations at a variety of venues (e.g., shopping mall, environmental fair, county fair, Burn Run Expo); and mailing materials inviting participation to organizations, community groups, chambers of commerce and news media. The open houses and other outreach efforts were targeted to include underserved populations and communities.

Planning and national forest staff have coordinated with other federal agencies (the Bureau of Land Management, US Fish and Wildlife, and NOAA Fisheries), various state and community governments and tribal governments.

After the publication of the draft forest plans and draft environmental impact statement, there was a 90-day public comment period. Chapter 5. Response to Public Comment of this FEIS provides a summary of the volume and content of the letters, emails, faxes and web responses received. Planning and national forest staff read and responded to each of these comments, and numerous changes have been made based on them and incorporated into the final environmental impact statement and revised forest plans. The Forest Service responses to public comment are in Appendix R - Public Comments and Forest Service Response.

Public involvement is ongoing. National Forest leaders intend to continue open and responsive public involvement during plan implementation, including forest plan monitoring and evaluation.

Issues

The "issues" are generally regarded as subjects for which resource conditions, technical knowledge, or public perception of resource management have created a "need for change." The issues by themselves would generally result in a significant amendment of the forest plans, because the resolution of the issue could change the overall management direction for large areas of the national forests.

The interdisciplinary planning team identified issues and grouped them into five categories after a review of the comments that were received in response to the public meetings and the notice of intent. The five issue categories are:

1. Public Values and Uses
2. Ecosystem Elements and Function
3. Commodity Values and Uses

4. Urban Development and Forest Habitat Linkages
5. Special Area Designations

The comments that helped refine the issues touched on just about every aspect of national forest management. Initially, the issues were separated into two groups: significant and non-significant.

Significant issues are defined as:

- Those directly or indirectly caused by implementing the proposed action. A significant issue is one that suggests different actions among the alternatives. These different ways of addressing an issue are reflected in the range of alternatives.

Non-significant issues are characterized as those:

- That require a solution that is outside the scope of decisions made in a land management plan or is the responsibility of another agency;
- Already decided by law, regulation, or other higher level decision;
- Not relevant to the decision to be made; or
- Conjectural and not supported by scientific or factual evidence.

The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec.1501.17: "... identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review... (Sec. 1506.3)."

The issues can be thought of as 'umbrellas' for several important aspects of concerns related to the same issue. For instance, Ecosystem Elements and Function covers concerns including riparian areas, habitat connectivity, threatened and endangered species, and so on. The significant issues identified by the Forest Service are discussed in the following sections.

Issue 1 - Public Values and Uses

Public use and enjoyment of the national forests is affected by intense competition among an increasing number of people for a finite amount of resources.

This issue is focused on the ability of the four southern California national forests to continue to offer a sustainable variety of opportunities, experiences, uses and national forest access to an expanding and increasingly diverse population, while continuing to conserve national forest resources.

The rugged, wildland landscapes of southern California are valued for the visual contrast they provide in this rapidly urbanizing region. As the population continues to increase, so too, does the desire to conserve these remaining vestiges of regional open space and scenic heritage in a natural or near-natural appearing condition.

The public expects management of national forest heritage resources to be in a manner that will protect and enhance those resources. The public also has an interest in increased cooperation between the national forests and Native Americans in the resolution of management issues of mutual concern. These issues include the use of the national forests for traditional, ceremonial or cultural concerns, as well as the availability of and access to resources for Native Americans and other cultural groups to use in traditional ways.

The transportation system is the fundamental tool for providing national forest access, delivering goods and services, affording wildland fire protection, and providing access to recreation opportunities. National Forest road managers recognize that additions to the National Forest System roads will be needed to increase the system's effectiveness, that other segments may require relocation or improvement to resolve resource concerns, and that the urbanization (development) of land along the national forest boundaries has closed off traditional points of access to the national forests.

Another aspect of the issue is that the condition of existing recreation and administrative facilities has continued to decline because of budget reduction, which causes the facility maintenance backlog to grow. At the same time, improvements to facilities are needed to help accommodate increased visitor demand.

Travel management and access will continue to be one of the most contentious components of national forest management in southern California. Public education is needed to call attention to the importance of using designated National Forest System roads and trails. User created routes are illegal and are not designed to offset environmental effects. The management of non-system routes will be addressed incrementally over time.

Issue 2 - Ecosystem Elements and Function

The trend of increased listing of threatened, endangered and sensitive species and the consequences of management actions on these species must be addressed.

This issue focuses on the restoration and maintenance of habitats for all native species, particularly the habitats needed for the conservation and recovery of threatened and endangered plant and animal species. Habitats for the species considered sensitive must also be protected, so that these species are not elevated to the threatened or endangered categories. The four southern California national forests include high vegetation diversity, unique ecological communities found nowhere else, and many endemic species. Approximately 3,400 species of plants and animals are known to occur on or adjacent to the four southern California national forests. Of these, more than 470 species are identified as either threatened, endangered, sensitive, or as species of concern. When the last of the four land management plans was approved in 1989, 18 federally listed endangered or threatened species (under the Endangered Species Act) were known or had the potential to occur on the four southern California national forests. Since then, an additional 50 plants and animals with known presence or potential to occur on or near the southern California national forests have been listed or are candidates for listing. Some of the factors influencing this trend include historical and ongoing activities on the national forests; rapid urbanization and habitat loss outside the national forests' boundaries; and increased attention to the issue due to higher public interest in biodiversity.

The present fire regime is out of balance, and the threat of wildland fire and risks to humans are increasing.

Wildland fire is a critical issue on the four southern California national forests. The Forest Service agrees with the public that community protection needs should be a priority. The wildfires of October 2003 demonstrated that the risk of wildfire has increased dramatically because of the bark beetle epidemic occurring on portions of the San Bernardino, Cleveland and Angeles National Forests and other drought-related factors. More than 100 years of fire suppression have resulted in dense stands of trees. Four years of unprecedented drought in these dense stands stressed the trees, which then became very susceptible to bark beetle attack. More than 80,000 acres have beetle-killed trees, and many more acres are still at risk to bark beetle attack. In addition, over 400,000 acres of chaparral suffered extensive top-killed, resulting in massive dead fuel loads.

Fuel reduction treatments are needed to protect human communities and to minimize or prevent wildland fire effects on listed species and their habitats. Fire suppression has modified the structure and composition of some vegetation types and in some cases has changed the vegetation from one type to another. Frequent burning is also causing negative effects, especially along urban interface areas in coastal sage scrub and chaparral habitats. Chapter 2 of this document provides a detailed discussion of each alternative and the role of fire, which is treated equally in all alternatives.

A balance needs to be defined between the quantity of water extracted from national forest lands for human uses and the amount retained for ecosystem sustainability.

The four southern California national forests include watersheds that are critical to providing the quality and quantity of water needed for the support of plants and wildlife, as well as for drinking water and other human uses. The relationship between groundwater extraction, water diversions, and instream flow requirements to support aquatic species and riparian habitat is important to the proper functioning of sustainable forest ecosystems and the recovery of listed species. The challenge is to balance the needs of water users with resource needs for the maintenance or improvement of riparian and wetland habitat.

Invasive nonnative animal and plant species are threatening ecosystems.

The infestation and spread of invasive nonnative animal and plant species threatens the health of many forest ecosystems, particularly riparian habitats, reduces biological diversity, and affects threatened, endangered and sensitive species on the national forests.

Issue 3 - Commodity Values and Uses

The increased demand for uses and products such as water extraction, oil and gas development, and special forest products has intensified human pressure on the national forests.

This issue focuses on traditional, current, and future commodity values, uses, and levels of outputs from the national forests. These products or uses include livestock forage; gathering forest products for personal, traditional, or commercial uses; collecting fuelwood; hunting and fishing; mineral exploration and development; oil and gas production; extraction of groundwater; and surface water diversion. The challenge for the national forests is to meet local and national demand while protecting other national forest resources. A common theme in public comment throughout the revision process has been concern for the level of development on the national forests and for the retention of a natural or near-natural forest character.

Issue 4 - Urban Development and Forest Habitat Linkages

Growing populations and expanding urban development are increasing pressure on national forest resources.

This issue is focused on the effects of urbanization on the national forests. Maintaining open space and the natural setting of the national forests while accommodating the continuous need for additional urban infrastructure is a challenge. More than 20 million people live in southern California, and this number is expected to increase over the life of the revised forest plans. The national forests routinely receive requests to locate special-use sites, communication facilities, and urban infrastructure (including highway corridors, communication sites and utility routes [including hydro-electric facilities]) on National Forest System lands. The trend toward development of private land within the national forest boundaries also creates a need for increased infrastructure across the national forests.

Private land development both within and outside the national forest boundaries is steadily reducing the habitat linkages that wildlife species need to connect large blocks of national forest land with other public and private natural spaces and habitat reserves. In the past decade, the national forests acquired about 30,000 acres of land. The acquisitions of private land within national forest boundaries will continue to be beneficial, especially given the effect that development of private land has on the surrounding national forest land. In addition, some people would like the national forests to pursue the acquisition of land outside national forest boundaries that is important for species habitat linkages.

There is a need for increased coordination with adjacent communities, county, state and tribal governments, and other federal agencies to help ensure coordinated land management.

Issue 5 - Special Area Designations

The designation of 'special areas' offers protection of resources but can result in the reduction of current opportunities, experiences or uses.

Some areas of the national forests may be given formal recognition as special areas based on their unique or outstanding physical features, environmental values or social significance. The designations impart long-term protection to these special resources. The special areas include formal recommendations to Congress for wilderness and wild and scenic rivers. Special areas also include administrative designations, such as research natural areas and special interest areas. Compatible uses are retained to the maximum extent possible; however, the designations can result in the reduction of some level of opportunity, experience or use that may have been occurring in the area.

Other Issues and Concerns

Some concerns did not meet the criteria for being considered significant but are nevertheless important. These appear in the revised forest plans and are addressed through adjustment of design criteria (standards), land use zones, or procedural adjustments. Examples include the topics of air quality, geologic resources and hazards, law enforcement, soils, and heritage resources.

A number of other interests and issues raised by the public and other agencies are not addressed by the alternatives described in this document. Some of the concerns that were raised (such as the Adventure Pass, grazing fee levels, and global warming) require a solution that is outside the scope of decisions made in a land management plan or are the responsibility of another agency.

Other Related Efforts

Additional public environmental assessments and environmental impact statements which are being or will be prepared that are related to but are not part of the scope of this FEIS include:

- The Oil and Gas EIS on the Los Padres National Forest;
- The joint Bureau of Land Management and Forest Service Santa Rosa and San Jacinto Mountains National Monument Management Plan EIS;
- The Bureau of Land Management Off-Shore Monument EIS; and
- The National Oceanic and Atmospheric Agency Monterey Bay Marine Sanctuary EIS.

Chapter 2. Alternatives, Including the Proposed Action

Development of Alternatives

This plan revision process started with the determination that there is a need to change current forest plans, which were approved in the 1980s. Four revised forest plans were formulated. Potential changes to the forest plans are identified in the significant issues described in Chapter 1.

As required by National Environmental Policy Act (NEPA) regulations, the Forest Service used an interdisciplinary process to develop alternatives. Public comments received during the scoping phase of the process were combined with the significant issues and used as the basis for the development of six different alternatives. Each alternative was designed to respond to comments and significant issues in a different way, thus providing a range of possible management approaches from which to choose.

To encourage participation by local and national audiences, four primary communication techniques were used:

- Periodic newsletters sent to those who expressed an interest;
- Numerous open houses and meetings held in various communities in southern California;
- A Web site, developed and maintained to disseminate information and provide further opportunities for participation; and
- One-on-one meetings requested by individuals and specific groups.

Using these communication techniques, local communities and people from across the country participated in the alternative development process.

The Role of Science in Alternative Development and Environmental Consequences

The integration of science has been a critical component in developing alternatives and in analyzing the expected effects of implementing the alternatives. The benefits of this integration result in: (1) an improved set of options for decisions; (2) a clear display of the uncertainty and risk associated with proposed courses of action; (3) increased clarity with which scientific evidence and rationales are expressed; and (4) enhanced insights into choices that are made, thereby strengthening possibilities for more effective adaptive management.

Existing data and knowledge were augmented by several major scientific assessments, including:

- *Southern California Mountains and Foothills Assessment* (Stephenson and Calcarone 1999);
- *Atlas of Social and Economic Conditions and Change in Southern California* (Raettig and others 2001);
- *Southern California Socioeconomic Assessment: Sociodemographic Conditions, Projections, and Quality of Life* (Struglia and others 2003);
- *Managing Outdoor Recreation in California: Visitor Contact Studies, 1989-1998* (Chavez 2001);
- *Missing Linkages: Restoring Connectivity to the California Landscape, Conference Proceedings* (Penrod and others 2001);
- *An Exploration of Recreation and Management Preferences Related to Threatened and Endangered Species: Final Report for the Angeles, Cleveland, Los Padres and San Bernardino National Forests* (Winter and Knap 2001); and

- *Social Trust and the Management of Threatened and Endangered Species: An Investigation of Communities of Interest and Place* (Cvetkovich and Winter 2001).

Scientists and researchers have contributed to the land management plan revision process by helping to:

- Gather, synthesize, and validate information;
- Identify and quantify risk without recommending what level of risk is appropriate; and
- Assure the quality of information by following scientific protocols, including peer review.

The Regional Forester requested a formal Science Consistency Review of the draft forest plans and draft Environmental Impact Statement (DEIS) by the Forest Service Pacific Southwest Research Station. The Science Consistency Review team, composed of both federal and non-federal scientists, used established evaluation criteria to assess key elements of the revised forest plans, the DEIS, and supporting documents. The results of the Science Consistency Review, and the Forest Service response to the review report, are summarized in Appendix Q. Science Consistency Review.

Elements Common to All Alternatives

Forest plans do not create, authorize or execute any site-specific ground-disturbing activities.

All alternatives adhere to the concepts of multiple-use and ecosystem management, strive to protect national forest resources, and comply with applicable laws, regulations and manuals.

Safety is the number one priority in every management situation.

All alternatives emphasize implementation of the National Fire Plan (NFP) in Wildland/Urban Interface (WUI) areas. Each alternative implements key aspects of the National Fire Plan, and while there are variations in the implementation and the effects of these alternatives, these differences are not significant. Key elements of the wildland fire management program that are common to all alternatives are:

- Current fire suppression practices will be continued, except there would be a much greater emphasis on community protection; also, confine and contain suppression strategies will be used in the more remote portions of the national forests to reduce costs of suppression and to restore forest health, where and when appropriate. All wildfires will be suppressed as either direct or future threats to communities, because the Angeles, Cleveland, San Bernardino and the southern half of the Los Padres National Forests are considered part of a Wildland/Urban Interface environment. Vegetation treatments would be designed to improve forest health, protect communities, and limit wildfire patch size, with community protection as the primary emphasis of each alternative.
- While the alternatives that feature increased public recreation and commodity production would be expected to increase fire occurrence, most of the increase in acres burned would be due to the existing tree and shrub mortality that has occurred on more than 500,000 acres of National Forest System land. Even with full fire prevention and suppression mitigations in place, substantial increases in acres burned from wildfires would be likely on the San Bernardino and Cleveland National Forests and on portions of the Angeles National Forest. The national forest with the least mortality (Los Padres National Forest) already accounts for over 60 percent of the annual acres burned.
- Each alternative provides for 75 to 90 percent of the hazardous fuels reduction program to occur near foothill and mountain communities. The Forest Service has considerable work to accomplish in the mortality removal area, but success hinges on other landowners treating the lands that structures actually occupy as well. Only with the recent tree mortality crisis has the concept of managing for a pre-suppression vegetation condition gained acceptance in mountain communities. In severe mortality areas, reforestation may be needed as a first step, while

thinning and the reintroduction of fire are planned as the final steps in restoring conifer forests to a pre-suppression fire regime in healthier portions of the national forests.

- Most fires would be aggressively suppressed because the predominant vegetation is chaparral, and there are over 500,000 acres with at least partial tree and shrub mortality on the one national forest that contains substantial acreage of coniferous forest (San Bernardino National Forest). Suppression of chaparral fires will be necessary to maintain fire frequencies within the range of natural variability: there is more concern for fire frequency than fire exclusion in chaparral (Haidinger and Keeley 1993, Keeley 1995, Keeley 2002, Zedler and others 1983). The effects of fire exclusion would be addressed on the smaller portion of the national forests that consists of mixed conifer and other high-elevation forest types. The undesirable consequences of fire suppression in montane conifer forests are the basis for forest health thinning, a substantial program to mitigate tree and brush mortality, and allowing fire managers to use less aggressive suppression strategies when in remote areas.
- Most of the opportunities for confine/contain type suppression strategies are at the highest elevations and in some large wilderness areas. The lower and middle elevations of these urbanized national forests are primarily chaparral, with human communities on private land inside the national forests and along the national forest boundaries. Several national forests surround substantial mountain communities as well, so there are few areas on the national forests that are truly remote. The Cleveland National Forest does not contain a large wilderness area within which to confine a wildland fire; the arrangement of communities interspersed with the national forest creates instant community protection concerns. Confine/contain strategies here would hinge on favorable weather and suppression savings and would be very short-duration events. These suppression strategies would most likely be implemented within large wilderness areas on the other three national forests.

Rangeland type conversion, where increased forage is the primary objective, is not suitable on the southern California national forests. The low productivity of chaparral soils makes this practice impractical.

Lands with a timber management objective are not suitable on southern California national forests. These national forests need to be actively managed for a variety of other purposes, including wildlife habitat and recreation opportunities.

Mountain bike use is restricted to designated roads and trails. Cross-country travel creates an unmanaged trail system with unacceptably high rates of erosion.

Motorized use off National Forest System roads is suitable only in designated open areas and on designated motorized trails. Cross-country travel creates an unmanaged trail system with unacceptably high rates of erosion and impacts on other resources.

Current designated wilderness, national scenic and recreational trails, monuments, scenic byways, and wild and scenic rivers will not be reduced or eliminated.

The revised land management plans assume all existing authorizations issued for non-recreation special uses would continue. The plans would also continue existing communication sites, utility corridors, and transportation corridors designated in the current plans. The revised forest plans do not designate new corridors or sites in any alternative. Future issuance of non-recreation special use authorizations or designation of utility corridors, transportation corridors, and communication sites would require site-specific analysis and environmental review.

The level of land (real estate) adjustment actions to reduce complexity of national forest land ownership and improve manageability of the national forests is expected to be about the same for each alternative. As land ownership complexity is reduced through adjustment, opportunities to combine land use zones commensurate with the character of the surrounding land would be expected.

Land Management Decisions

The proposed action being analyzed in this environmental impact statement is to establish four revised land management plans (forest plans), one for each of the southern California national forests (Angeles, Cleveland, Los Padres and San Bernardino).

The purpose of the revised forest plans is to articulate the long-term vision and strategic management direction for each southern California national forest and to facilitate the development of management activities that will contribute toward the realization of the national forests' desired conditions. The forest plan defines the parameters (limits) for management, but offers the flexibility to adapt decisions to accommodate rapidly changing resource conditions.

A forest plan makes six fundamental decisions, including:

- The establishment of forest-wide multiple-use goals and objectives. This requirement is met through a combination of the desired conditions described in Part 1 and the more traditional objectives described in Part 2.
- Determine the suitability and capability of national forest land for resource production. This requirement is met through the use of appropriate scientific analytical processes described in the project record, land use zoning, and the identification of land uses appropriate for the zones that are included in tables 2.1.1 through 2.4.4 in Part 2 of the forest plans.
- The identification of and recommendation to Congress for areas as wilderness and wild and scenic rivers. This requirement is met based on the wilderness evaluations for inventoried roadless areas, the suitability studies done for eight rivers, and the eligibility inventory (no decision) for an inclusive list of rivers and creeks on all four southern California national forests.
- The establishment of forest-wide and forest-specific standards. This requirement is met through the simplified list of mandatory design criteria and the associated manual and handbook requirements (other guidance) described in Appendix A of Part 3.
- The identification of management area prescriptions. This requirement is met through the use of land use zones that are identified on the national forest zoning map and described in Part 2 of the forest plans.
- The establishment of monitoring and evaluation requirements for plan implementation. This requirement is met through the monitoring requirements identified and described in all three parts of the forest plans. All monitoring requirements are detailed in Appendix C of Part 3.

It is important to emphasize that the forest plans are completely strategic. They do not make project level decisions, nor do they compel managers to implement specific actions or activities. Current uses are carried forward. Any changes made to existing uses or new proposals will be determined at the project level according to the requirements of the National Environmental Policy Act. This concept is consistent with the requirements of the National Forest Management Act (NFMA), and with the agency policy of two decision levels: 1) strategic; and 2) project (site specific). These strategic plans DO NOT:

- create, authorize, or execute any ground-disturbing activity;
- grant, withhold, or modify any permit or other legal instrument;
- subject anyone to civil or criminal liability; nor
- create legal rights.

Each of these six decisions are reflected in the revised land management plan for each national forest representing implementation of the selected alternative. These forest plans present a new format based on a model that is referenced in FSM 1921.1 and further described in FSH 1909.12, Chapter 10, section 12.2 Plan Components. The format consists of three interrelated parts that work together to facilitate the use of adaptive management and the development of management activities that will collectively move the national forests toward their desired outcome. Part 1 paints the picture of the vision and conditions desired in the long-term. Parts 2 and 3 contain, respectively, the strategic management direction and the guidance for designing actions and activities in order to make progress toward the vision and desired conditions described in Part 1. The contents of the forest plan are organized as follows:

Part 1 is the vision for the southern California national forests. It describes the national forests' uniqueness on a national and regional level. It describes the Forest Service's national goals, the roles and contributions that the national forests make (their niche), the desired conditions (36 CFR 219.11(b)) for the various landscapes within the national forests, and finally, the evaluation/monitoring indicators (36 CFR 219.11 (d)) that will be used to assess the progress made toward accomplishing the desired conditions. The Code of Federal Regulations (CFR) are the implementing regulations for laws. Part 1 includes:

- **Niche:** Distinctive roles and contribution of the national forests. The vision document begins with a description of the national forest, including its distinctive roles and contributions to the local area, state, region, and nation. Through the course of public involvement, the niche for national forest lands has been identified.
- **Government Performance and Results Act (GPRA) goals (36 CFR 219.12(f)(6)):** In 1993, Congress passed the GPRA to increase the accountability of federal agencies by measuring progress toward achieving agency goals and objectives. This legislation requires preparing periodic strategic plans. In 2003, the Forest Service issued an updated draft version of the 2000 Strategic Plan for the agency (USDA Forest Service 2003). These long-term goals and objectives help guide the Forest Service's current actions and future plans.
- **Desired Conditions:** The desired conditions describe the ecological, economic and social attributes that characterize or exemplify the outcome of land management. In short, this means how the national forests are expected to look and function in the future when the forest plans direction has been successfully implemented. Desired conditions can be measured now and over time through monitoring. Each national forest desired condition contributes to the achievement of GPRA goals. Desired conditions are not commitments and may be achievable only over the long term.
- **Evaluation/Monitoring Questions:** Each of the desired conditions is linked to evaluation/monitoring questions. These questions are designed to evaluate the indicators of progress over time towards the desired conditions (outcomes). These, along with annual accomplishment indicators and implementation monitoring of design criteria constitute the monitoring requirement for the land management plan.

Part 2 is the strategy. The strategy describes the objectives (36 CFR 219.11(b)) that the Forest Service intends to implement in order to move the national forests toward the vision described in Part 1. Part 2 identifies suitable uses through land use zones (36 CFR 219.11(c)) that show allowable uses and opportunities by zone, including existing and recommended wilderness and other special area designations (36 CFR 219.17). Part 2 also presents a prospectus that describes past program performance, program priorities and objectives, and a discussion of performance risks, recent trends, and expectations regarding the levels of experiences, goods, and services supplied by the national forests. The national forests have been subdivided into geographic areas called "Places." The theme and desired condition and the multiple-use management focus for each Place is described in Part 2 (Management Area Prescriptions).

Part 3 is the design criteria. The design criteria include the laws, the standards (36 CFR 219.11(c), 219.13 through 219.27), and a reference to other applicable guidance that the Forest Service uses during project planning and implementation. Standards are mandatory requirements that come into play as site-specific activities are planned for implementation, and they are designed to be consistent with achieving the objectives and desired conditions. The standards act as thresholds or constraints for management activities or practices to ensure the protection of resources.

Land Use Zones

Each alternative is described in terms of the forest plan decisions that vary to reflect the alternative theme. Land use zones and special designations are key decisions made at the forest plan level. Unless noted otherwise in the alternative description, the land use zone definitions do not change. The primary difference between alternatives is the amount of land area assigned to each zone or to the special designation overlays that modify the suitable uses in the zones. Eight land use zones have been identified, including a combined zone representing development interface areas and a subdivision of the Back Country zones where public motorized access is restricted. These zones (including special designation overlays) are applicable only to National Forest System (NFS) lands and in no way modify the zoning applied to other ownerships by local government agencies. The land use zone descriptions in this section help to paint a picture of the anticipated level or intensity of public use or administrative activities. The existing character of each zone is included, along with the characteristic Recreation Opportunity Spectrum (ROS) objective. The zones, in order of decreasing land use intensity, are:

- Developed Area Interface (DAI) - Combines zones mapped as Urban/Rural Interface and Developed Area Intermix for Alternatives 1 through 6
- Back Country (BC)
- Back Country Motorized Use Restricted (BCMUR - in Alternative 4a only)
- Back Country Non-Motorized (BCNM)
- Critical Biological (CB)
- Recommended Wilderness (RW)
- Existing Wilderness (EW)
- Experimental Forest (EF)

Developed Area Interface (also describes Urban/Rural Interface and Developed Area Intermix): These zones include areas adjacent to communities or concentrated use areas and developed sites within the national forests with more scattered or isolated community infrastructure. The level of human use and infrastructure is typically higher than in other zones.

The characteristic ROS objectives are Rural and Roaded Natural. A number of highly popular developed recreation facilities, recreation and non-recreation special-uses facilities, and national forest administrative facilities are included in this zone. The level of development within this zone varies between areas that are highly developed to areas where no development has occurred.

The DAI zone is managed for motorized public access. The National Forest System roads are generally managed and maintained to a high standard, facilitating public access to developed recreation opportunities and authorized infrastructure. A designated off-highway vehicle (OHV) system may be included in some locations, often including trailheads or staging areas leading to Back Country areas.

Most direct community protection Wildland/Urban Interface (WUI) Defense zones (see Appendix K in Part 3 of the forest plans) and some Threat zones are anticipated to be located within the DAI zone.

Although this zone may have a range of higher intensity uses, the management intent is to limit development to a slow increase of carefully designed facilities to help direct use into the most suitable areas and to concentrate on improving facilities before developing new ones. National forest staff expects that there will be some road construction in this zone.

Back Country: This zone includes areas of the national forests that are generally undeveloped with few roads. The characteristic ROS objectives are Semi-Primitive Motorized with limited areas of Roaded

Natural. Most of the national forests' remote recreation and administrative facilities are found in this zone. The level of human use and infrastructure is generally low to moderate.

This zone is managed for motorized public access on designated National Forest System roads and motorized trails. The majority of National Forest System roads and other road systems that interconnect areas of concentrated development are found in this zone. A network of low standard National Forest System roads provide access for a wide variety of dispersed recreation opportunities in remote areas, such as camping, and access to trailhead facilities for hiking or mountain biking. Some new trails may be constructed to improve opportunities between trails on the existing system. The majority of the designated OHV system is found here including limited areas that are designated for OHV use (Angeles and Cleveland National Forests).

Wildland/Urban Interface Threat zones (see Appendix K in Part 3 of the forest plan) are characteristic in this zone. Managers anticipate locating community protection vegetation treatments that require permanent roaded access (such as fuelbreaks) within the Back Country zone.

Although this zone generally allows a range of compatible uses, the management intent is to retain the natural character inherent in this zone and limit the level and type of development. The zone will be managed for no or very low level of increases in National Forest System roads. Other development will be limited to a slow increase of carefully designed facilities to help direct use into the most suitable areas, and temporary facilities will be removed when they are no longer needed.

Back Country (Motorized Use Restricted): This zone includes areas of the national forests that are generally undeveloped with few roads. Few facilities are found in this zone, but some may occur in remote locations. The characteristic ROS objectives are Semi-Primitive Motorized and Semi-Primitive Non-Motorized. The level of human use and infrastructure is low to moderate.

This zone will be managed for non-motorized (mechanized, equestrian, and pedestrian) public access. Motorized use is restricted to administrative purposes only, which includes Forest Service, other agency, or tribal government needs, as well as access needed to private land or authorized special-uses. Administrative access is intermittent and generally limited to existing National Forest System roads or to temporary roads needed for resource management purposes. When management activities occur, the objective is to use temporary roads or gated permanent roads and then gate the permanent roads or remove the temporary routes when done.

A network of low standard National Forest System roads provide access to this zone for a wide variety of non-motorized dispersed recreation opportunities, including camping, hiking, mountain biking, hunting and fishing. Designated routes for OHV use are not suitable in this zone.

Wildland/Urban Interface Threat zones (see Appendix K in Part 3 of the forest plan) are characteristic in this zone. Managers anticipate locating community protection vegetation treatments that require permanent roaded access (such as fuelbreaks) within the Back Country Motorized Use Restricted zone.

Although this zone allows a range of low intensity land uses, the management intent is to retain the natural character of the zone and limit the level and type of development. Some National Forest System roads will be constructed and maintained, but the intent is to manage the zone for no or a very low level of increase in system development. Management will consider expanding the ability of existing facilities to meet demand before proposing new facilities and removing temporary facilities when they are no longer needed.

Back Country Non-Motorized: This zone generally includes areas of the national forest that are undeveloped with few, if any roads. The characteristic ROS objective is Semi-Primitive Non-Motorized. Developed facilities supporting dispersed recreation activities are minimal and generally limited to trails and signage. The level of human use and infrastructure is low.

This zone is managed for a range of non-motorized uses that include mechanized, equestrian and pedestrian public access. Administrative access (usually for community protection) is allowed by exception for emergency situations and for short duration management purposes (such as fuel treatment). The intent is to use temporary routes while management is occurring and then close and remove the route. Access to authorized facilities and to private land is not anticipated but may occur by exception when there are existing rights to such access.

A network of low standard National Forest System trails provide public access for a wide variety of non-motorized dispersed recreation opportunities, including remote area camping, hiking, mountain biking, horseback riding, hunting and fishing. Designated OHV use is not suitable in this zone.

Wildland/Urban Interface Threat Zones (see Appendix K in Part 3 of the forest plan) may occur in this zone. Managers anticipate locating community protection vegetation treatments that require only temporary roaded access (such as mechanical thinning of trees or prescribed burning) within the Back Country Non-Motorized zones.

While a range of non-motorized public uses are generally allowed, the management intent is to typically retain the undeveloped character and natural appearance (fuelbreaks that contrast with the natural character may be present) of this zone and to limit the level of development to a low level of increase. Facility construction (except trails) is generally not allowed, but may occur in remote locations where roaded access is not needed for maintenance. Management will remove temporary facilities when they are no longer needed.

Critical Biological: This zone includes the most important areas on the national forest to manage for the protection of species-at-risk. Facilities are minimal to discourage human use. The level of human use and infrastructure is low to moderate.

Wildland/Urban Interface Threat Zones (see Appendix K in Part 3 of the forest plan) may occur in this zone. Community protection vegetation treatments within the Critical Biological zones may occur by exception. In these cases, managers will consider species and habitat needs.

The management intent is to retain the natural character and habitat characteristics in this zone and limit the level of human development to manage for protection of species-at-risk. Activities and modification to existing infrastructure are allowed if they are beneficial or neutral to the species for which the zone was primarily designated. Human uses are more restricted in this zone than in Back Country Non-Motorized zones in order to protect species needs, but are not excluded. Low impact uses (such as hiking and hunting) are generally allowed. Motorized use of existing National Forest System roads is allowed. Road density will not be increased and may be decreased as a result of species protection requirements.

Existing Wilderness: This zone includes Congressionally designated wildernesses. Only uses consistent with all applicable wilderness legislation and with the primitive character are allowed in existing and recommended wildernesses. Road access is limited to uses identified in the specific legislation designating the wilderness (see Wilderness in the Forest-Specific Design Criteria in Part 2 of the forest plans). The characteristic Recreation Opportunity Spectrum objective is Primitive with limited areas of Semi-Primitive Non-Motorized.

Wildland/Urban Interface Threat Zones (see Appendix K in Part 3 of the forest plan) may occur in this zone. Community protection vegetation treatments within the existing wilderness zone may occur by exception. In these cases, managers will consider wilderness needs.

The management intent is to administer this zone so that natural processes that preserve its wilderness character and condition are dominant and human use is intermittent.

Recommended Wilderness: This zone includes land that the Forest Service is recommending to Congress for wilderness designation. The zone will be managed in the same manner as existing wilderness, so that the wilderness attributes of the area are retained until Congress passes legislation or the area is released from consideration. If Congress elects to not designate an area, the area would be zoned as Back Country Non-Motorized until modified by a subsequent plan amendment; no inventoried roads are found in this zone.

Wildland/Urban Interface Threat Zones (see Appendix K in Part 3 of the forest plan) may occur in this zone. Community protection vegetation treatments within the recommended wilderness land use zone may occur by exception. In these cases, managers will consider wilderness needs.

The management intent is to administer this zone so that natural processes that preserve wilderness character and condition are dominant and human use is intermittent.

Experimental Forest: This zone serves as a research and demonstration area and is generally closed to the public except by permit. This zone occurs only on the San Dimas Experimental Forest, which is managed by the Pacific Southwest Research Station.

Alternatives Considered in Detail

Alternative 1

Alternative 1 (the no-action alternative) reflects current forest-wide management direction and emphasis. It meets the NEPA requirement (36 CFR 219.12(f)(7)) specifying that a no-action alternative be considered. "No Action" means that current management allocations, activities and management direction found in the existing land management plans would continue, as amended, with certain exceptions as discussed in the 2001 programmatic biological opinion from the U.S. Fish and Wildlife Service (USFWS). In addition, terms and conditions of programmatic and other "high priority" consultations done with the USFWS would continue.

The theme of this alternative is to provide a mix of recreation opportunities and commodities while maintaining biological diversity and ecological integrity. The current mix of motorized/non-motorized land use zones is maintained. Compared to other alternatives, there is a higher level of investment in:

- Intensive control strategies at a few key locations, including closure and/or removal of sites and the reconstruction of others to protect sensitive resources. Existing facilities would continue to operate. Current levels of conservation education programs and partnerships would continue.
- Actions needed to avoid and minimize effects on species-at-risk. Current conservation efforts would continue.

In the existing land management plans, a variety of methods were used to display management area direction or emphasis. For comparison with other alternatives, management areas in the 1980s plans have been translated to the land use zones being used now; they are described by the same terms, outcomes and outputs (see the land use zone maps of Alternative 1 in the Atlas). The acreage and percentages in each zone are displayed by national forest (Angeles, Cleveland, Los Padres and San Bernardino National Forests) in the Alternative Comparison tables on page 26. (The zones in the Alternative Comparison table include Developed Area Interface, Back Country, Back Country Non-Motorized, Critical Biological, Experimental Forest, and Existing Wilderness for Alternative 1).

Issue 1: Public Values and Uses (Public Use and Enjoyment, Facility Operation and Maintenance)

Off-highway vehicle expansion has been considered and zoned for on every national forest. Improvements to the existing system that focus on opportunities for long distance routes are expected, but the level of construction can be characterized as low. Any findings and/or improvements will be approved through the normal process, which includes following NEPA procedures including site-specific environmental analysis and public collaboration.

Modest improvements to the non-motorized trail systems are also expected. This includes improvements to trails that are open to mountain bike use. What this means is that there will be a small increase in National Forest System trails over time rather than maintaining the status quo.

Road management is focused on the maintenance and improvement of the national forests' existing transportation systems, with safety being the primary emphasis and concern. The Roads Analysis Process will be used in order to manage the existing National Forest System roads, utilizing the following available options:

- maintenance
- improvements towards higher road management objectives (higher road management objectives means that the Forest Service would improve the road to accommodate different types and levels of motorized use)
- re-routing existing roads

- closure (permanent and temporary)
- adopting new routes

Management is not making a commitment to solve the non-system route problem (the proliferation on non-system, user-created routes) all at once; however, management is committed to resolving the problem, with the goal of eliminating user-created routes or adding them to the system over time. Management's intent is to resolve the problem through the normal program of work incrementally over time. The strategies to accomplish this objective are expected to vary depending on the site-specific analysis. All decisions made will be the result of the normal NEPA processes, site-specific analysis, and public collaboration.

The focus of trail management (for both motorized and non-motorized trail systems) is primarily on maintenance and improvement of existing systems. Managers anticipate that there will be modest growth as improvements occur. Management is based on the concept of limited expansion over time.

Administrative access will be permitted in all land use zones used in this alternative; however, in wilderness areas administrative access is generally limited to emergency situations. In Back Country Non-Motorized zones, administrative access is "by exception" using temporary routes. The routes in this zone will be closed after management occurs. Helicopter landing sites can be accommodated. Motorized uses in Critical Biological zones may be allowed on designated routes if they can be maintained without any effect on the listed species. The Back Country, Urban/Rural Interface, and Developed Area Interface zones are managed for public motorized access.

Note: Tables 333 and 334 are shown here, side by side, in their entirety. The sub-tables relevant to each alternative are repeated within that alternative discussion.

Table 333. Comparison of Alternative Acres by Land Use Zone

Alternative 1

	ANF	CNF	LPNF	SBNF	Grand Total
BC	270,255	203,839	720,079	328,029	1,522,201
BCNM	119,947	84,048	161,298	140,655	505,948
CBZ	2,481	1,210	0	0	3,691
EF	15,429	0	0	0	15,429
EW	81,924	75,523	860,678	130,362	1,148,487
DAI	172,947	56,258	39,325	66,706	335,236
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Table 334. Percent of Each Land Use Zone by Alternative

Alternative 1

	ANF	CNF	LPNF	SBNF	Grand Total
BC	40.8%	48.4%	40.4%	49.3%	43.1%
BCNM	18.1%	20.0%	9.1%	21.1%	14.3%
CBZ	0.4%	0.3%	0.0%	0.0%	0.1%
EF	2.3%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
DAI	26.1%	13.4%	2.2%	10.0%	9.5%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

Developed Area Interface (**DAI**)
Back Country (**BC**)
Back Country Motorized Use Restricted (**BCMUR**)
Back Country Non-Motorized (**BCNM**)

Critical Biological (**CB**)
Recommended Wilderness (**RW**)
Existing Wilderness (**EW**)
Experimental Forest (**EF**)

Alternative 2 (Table 333)

	ANF	CNF	LPNF	SBNF	Grand Total
BC	308,914	191,066	723,119	313,580	1,536,680
BCNM	80,009	88,466	91,484	138,303	398,261
CBZ	3,534	6,001	0	1,967	11,502
EF	14,145	0	0	0	14,145
EW	81,924	75,523	860,678	130,362	1,148,487
RW	80,904	16,415	62,363	18,923	178,605
DAI	93,553	43,407	43,736	62,619	243,314
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Alternative 2 (Table 334)

	ANF	CNF	LPNF	SBNF	Grand Total
BC	46.6%	45.4%	40.6%	47.1%	43.5%
BCNM	12.1%	21.0%	5.1%	20.8%	11.3%
CBZ	0.5%	1.4%	0.0%	0.3%	0.3%
EF	2.1%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	12.2%	3.9%	3.5%	2.8%	5.1%
DAI	14.1%	10.3%	2.5%	9.4%	6.9%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

Table 333. Comparison of Alternative Acres by Land Use Zone

Alternative 3

	ANF	CNF	LPNF	SBNF	Grand Total
BC	181,047	119,903	301,139	213,978	816,066
BCNM	180,392	94,871	428,064	120,169	823,497
CBZ	5,247	4,922	798	1,848	12,816
EF	14,145	0	0	0	14,145
EW	81,924	75,523	860,678	130,362	1,148,487
RW	107,632	81,840	143,809	135,339	468,620
DAI	92,596	43,818	46,891	64,056	247,362
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Table 334. Percent of Each Land Use Zone by Alternative

Alternative 3

	ANF	CNF	LPNF	SBNF	Grand Total
BC	27.3%	28.5%	16.9%	32.1%	23.1%
BCNM	27.2%	22.5%	24.0%	18.1%	23.3%
CBZ	0.8%	1.2%	0.0%	0.3%	0.4%
EF	2.1%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	16.2%	19.4%	8.1%	20.3%	13.3%
DAI	14.0%	10.4%	2.6%	9.6%	7.0%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

Table 333. Comparison of Alternative Acres by Land Use Zone

Alternative 4

	ANF	CNF	LPNF	SBNF	Grand Total
BC	321,671	192,307	733,086	346,604	1,593,668
BCNM	133,715	102,775	97,858	102,820	437,169
CBZ	3,793	6,001	0	1,834	11,629
EF	15,429	0	0	0	15,429
EW	81,924	75,523	860,678	130,362	1,148,487
RW	12,321	485	46,192	21,514	80,511
DAI	94,129	43,786	43,566	62,619	244,099
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Alternative 4a

	ANF	CNF	LPNF	SBNF	Grand Total
BC	161,392	77,064	332,050	169,786	740,292
BCMUR	52,791	50,356	319,884	37,553	460,584
BCNM	248,399	161,320	171,035	239,936	820,690
CBZ	3,920	2,131	1,762	2,281	10,094
DAI	85,828	43,107	60,150	59,408	248,493
EF	15,498	0	0	0	15,498
EW	81,924	75,523	860,678	130,362	1,148,487
RW	13,231	11,377	35,821	26,428	86,857
Grand Total	662,983	420,878	1,781,380	665,754	3,530,995

Table 334. Percent of Each Land Use Zone by Alternative

Alternative 4

	ANF	CNF	LPNF	SBNF	Grand Total
BC	48.5%	45.7%	41.2%	52.1%	45.1%
BCNM	20.2%	24.4%	5.5%	15.4%	12.4%
CBZ	0.6%	1.4%	0.0%	0.3%	0.3%
EF	2.3%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	1.9%	0.1%	2.6%	3.2%	2.3%
DAI	14.2%	10.4%	2.4%	9.4%	6.9%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

Alternative 4a

	ANF	CNF	LPNF	SBNF	Grand Total
BC	24.3%	18.3%	18.6%	25.5%	21.0%
BCMUR	8.0%	12.0%	18.0%	5.6%	13.0%
BCNM	37.5%	38.3%	9.6%	36.0%	23.2%
CBZ	0.6%	0.5%	0.1%	0.3%	0.3%
DAI	12.9%	10.2%	3.4%	8.9%	7.0%
EF	2.3%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	2.0%	2.7%	2.0%	4.0%	2.5%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

Table 333. Comparison of Alternative Acres by Land Use Zone

Alternative 5

	ANF	CNF	LPNF	SBNF	Grand Total
BC	469,459	301,481	881,722	472,471	2,125,133
CBZ	1,440	0	0	0	1,440
EF	15,429	0	0	0	15,429
EW	81,924	75,523	860,678	130,362	1,148,487
DAI	94,730	43,873	38,980	62,919	240,503
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Alternative 6

	ANF	CNF	LPNF	SBNF	Grand Total
BC	123,063	57,578	138,153	135,445	454,240
BCNM	198,268	168,887	426,295	274,133	1,067,583
CBZ	4,729	6,715	852	2,426	14,721
EF	15,429	0	0	0	15,429
EW	81,924	75,523	860,678	130,362	1,148,487
RW	144,861	67,958	310,955	57,883	581,656
DAI	94,709	44,216	44,447	65,504	248,876
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Table 334. Percent of Each Land Use Zone by Alternative

Alternative 5

	ANF	CNF	LPNF	SBNF	Grand Total
BC	70.8%	71.6%	49.5%	71.0%	60.2%
CBZ	0.2%	0.0%	0.0%	0.0%	0.0%
EF	2.3%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
DAI	14.3%	10.4%	2.2%	9.5%	6.8%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

Alternative 6

	ANF	CNF	LPNF	SBNF	Grand Total
BC	18.6%	13.7%	7.8%	20.3%	12.9%
BCNM	29.9%	40.1%	23.9%	41.2%	30.2%
CBZ	0.7%	1.6%	0.0%	0.4%	0.4%
EF	2.3%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	21.8%	16.1%	17.5%	8.7%	16.5%
DAI	14.3%	10.5%	2.5%	9.8%	7.0%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

Issue 2: Ecosystem Elements and Functions

The management of threatened and endangered species is emphasized in all zones, which means activities will be planned that are neutral or beneficial to the species. In order to resolve current problems, such as community protection, management may result in short-term effects that may not be beneficial. However, the long-term consequences of management actions are expected to be beneficial to the species. There are specific standards and other management direction included in the 2001 programmatic biological opinion from the U.S. Fish and Wildlife Service.

The community protection and vegetation management program emphasis and focus are on the implementation of the National Fire Plan in Wildland/Urban Interface (WUI) areas. These WUI areas are being refined as Community Wildfire Protection Plans are developed. The mechanical treatment of fuels is used in combination with prescribed fire to reduce fire hazard in the Developed Area Interface zones. All wildland fires will be suppressed due to either a direct or future threat to communities.

The Vegetation Management Program includes mortality (dead tree) removal, creating defensible space, the maintenance of fuelbreaks, the construction of new fuelbreaks, tree thinning, and prescribed fire. Mortality removal is planned on National Forest System lands within one mile of threatened communities, along evacuation routes, within one-third of a mile of administrative or permitted facilities, and in or around developed recreation sites. Dense stands of mixed conifer forests will be thinned and fire will be reintroduced. Prescribed burns in chaparral are designed to treat areas up to 5,000 acres in size, both in high hazard areas and as a strategic tool to limit wildfire spread under all but the most severe conditions in other areas of the national forests.

Wildland/Urban Interface areas are managed as a flexible Geographic Information System (GIS) layer of information that can be adjusted to accommodate Community Wildfire Protection Plans. The focus is community protection and fuels management.

For the initial three to five years, mechanical treatments will be used for vegetation management, and the use of herbicides for management or fuelbreak maintenance is not anticipated. If herbicide use is planned, the effects will be described and disclosed according to NEPA requirements prior to any application.

The alternative is focused on forest health and the management for sustainable resource use in all zones. In addition, vegetation treatment for forest health purposes can occur in all zones.

The Invasive Species Program emphasis places the highest priority on surveying for early detection in order to contain and control invasive species in riparian areas, in threatened, endangered, and sensitive species habitat, and in areas with the known potential to be affected by invasive species. Management flexibility is retained in order to prioritize locations where treatment is needed. This flexibility also allows for joint collaboration and funding opportunities when jurisdictional boundaries are involved.

The Watershed Management Program focuses on the maintenance of water quality and quantity and the protection and/or the restoration of watershed health. Restoration activities are anticipated at prioritized recreation use areas using a combination of strategies such as environmental education and interpretative programs; construction techniques including boardwalks, fencing and signing; Forest Service presence; and other strategies.

Issue 3: Commodity Values and Uses (Commercial Uses, Facility Operation and Maintenance)

The administration of special uses (authorized occupancy and use of National Forest System land) is emphasized as activities are planned and implemented. Existing permitted uses will continue, including authorized access to specific sites or areas.

All active and vacant grazing areas are retained. Resource constraints for threatened and endangered species and other resource areas are implemented site by site.

Minerals and energy exploration and development may occur except where specific areas have been withdrawn from mineral entry. The administration of existing operations and the processing of new requests emphasizes compliance with permit requirements. Oil and gas development on the Los Padres National Forest is subject to specific terms and conditions depending on the land use zone where the development may occur. When mining carbonate rock on the San Bernardino National Forest, the Carbonate Habitat Management Strategy will be utilized.

Issue 4: Urban Development and Forest Habitat Linkages (Resource Management, Commercial Uses, Fire)

Existing designated communication and utility (utility, water, and transportation) corridors continue to be used. Management emphasis is to expand within existing facilities before developing new facilities where possible. If new development is needed, the land use zoning on all national forests includes the opportunity for expansion based on site-specific analysis and environmental review.

Landownership adjustment is focused primarily on the consolidation of land within national forest boundaries; however, the national forests may participate in partnerships or other collaborative efforts to acquire land outside of national forest boundaries for habitat linkages. Land adjustment primarily occurs through publicly initiated cases, the acceptance of donations, small acquisitions with recurring funds, and legislated actions. Most rights-of-way to improve access are acquired as a result of land adjustment. Landownership complexity is decreased the most in Wildland/Urban Interface areas, wildlife corridors, sensitive biological habitats, and riparian areas.

Issue 5: Special Area Designations (Public Use and Enjoyment, Resource Management)

No new special designations are included in Alternative 1.

Inventoried Roadless Areas that were evaluated, but not recommended, for wilderness are zoned primarily in the Back Country (57 percent), and Back Country Non-Motorized (36 percent) in areas that currently prohibit motorized use, and Back Country where motorized use is currently allowed.

Alternative 2

Alternative 2 was originally developed as the "Proposed Action" for the land management plan revisions and was available for public comment in 2001. Alternative 2 has been modified from earlier versions to provide additional protection for federally listed and sensitive species through species management strategies and land management plan standards (see the land use zone maps of Alternative 2 in the Atlas). The acreage and percentage in each zone are displayed by national forest (Angeles, Cleveland, Los Padres and San Bernardino National Forests) in the Alternative Comparison tables shown on page 26 for all alternatives, and for alternative 2 alone below.

Table 333. Comparison of Alternative Acres by Land Use Zone

Alternative 2	ANF	CNF	LPNF	SBNF	Grand Total
BC	308,914	191,066	723,119	313,580	1,536,680
BCNM	80,009	88,466	91,484	138,303	398,261
CBZ	3,534	6,001	0	1,967	11,502
EF	14,145	0	0	0	14,145
EW	81,924	75,523	860,678	130,362	1,148,487
RW	80,904	16,415	62,363	18,923	178,605
DAI	93,553	43,407	43,736	62,619	243,314
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Table 334. Percent of Each Land Use Zone by Alternative

Alternative 2	ANF	CNF	LPNF	SBNF	Grand Total
BC	46.6%	45.4%	40.6%	47.1%	43.5%
BCNM	12.1%	21.0%	5.1%	20.8%	11.3%
CBZ	0.5%	1.4%	0.0%	0.3%	0.3%
EF	2.1%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	12.2%	3.9%	3.5%	2.8%	5.1%
DAI	14.1%	10.3%	2.5%	9.4%	6.9%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

(The zones in the Alternative Comparison tables include Developed Area Interface, Back Country, Back Country Non-Motorized, Critical Biological, Experimental Forest, Existing Wilderness, and Recommended Wilderness).

The Back Country zone includes areas of the national forest where development has been minimal; however, most of the National Forest System roads are found here. Management for motorized public access on designated roads and trails is emphasized. This zone includes roads, administrative facilities, and trails that are designated for motorized uses.

The Back Country Non-Motorized zone is managed for pedestrian, equestrian, and mechanized public access. National Forest administrative access is provided on maintenance level 1 roads for short-term emergency use only. These are areas of the national forests that have not been developed and where few, if any, roads exist. The management intent is to keep it that way. The zone includes the opportunity for a range of recreation opportunities.

The primary theme of this alternative is to maintain biological diversity and ecological integrity while accommodating a gradual increase in recreation opportunities. Land use zones are similar to those in

Alternative 1, with the addition of some special area designations. Compared to other alternatives, there is a higher level of investment in:

- The reconstruction of existing degraded facilities and the construction of new facilities to accommodate a partial amount of the projected recreation demand in an environmentally sustainable way. More intensive user controls are designed to minimize conflicts between users and sensitive environmental resources. Investments in mitigation increase so that use levels can continue. Conservation education and partnerships are used effectively; national forest staff would enlist the support of local communities, partners and volunteers to promote a stewardship ethic and enhance visitor services.
- Avoidance or minimization of effects on species by use of an adaptive management approach to meet conservation objectives in species-at-risk habitat**.** The conservation strategy provides limited focus on the restoration of habitats.

Issue 1: Public Values and Uses (Public Use and Enjoyment, Facility Operation and Maintenance)

Off-highway vehicle expansion has been considered and zoned for on every national forest. Improvements to the existing system that focus on opportunities for long distance routes are expected, but the level of construction can be characterized as low. Any findings and/or improvements will be approved through the normal process, which includes following NEPA procedures including site-specific environmental analysis and public collaboration.

Modest improvements to the non-motorized trail systems are also expected. This includes improvements to trails that are open to mountain bike use. What this means is that there will be a small increase in National Forest System trails overall rather than maintaining the status quo.

Road management is focused on the maintenance and improvement of the national forests' existing transportation system, with safety being the primary emphasis and concern. The Roads Analysis Process will be used in order to manage the existing National Forest System roads, utilizing the following available options:

- maintenance
- improvements towards higher road management objectives (higher road management objectives means that management would improve the road to accommodate different types and levels of motorized use)
- re-routing existing roads
- closure (permanent and temporary)
- adopting new routes

Management is not making a commitment to solve the non-system route problem (the proliferation on non-system user-created routes) all at once; however, management is committed to the goal of eliminating user-created routes over time. Management's intent is to resolve the problem through their normal program of work incrementally over time. The strategies to accomplish this objective are expected to vary depending on the site-specific analysis. All decisions made will be the result of the normal NEPA processes, site-specific analysis, and public collaboration.

The focus of trail management (for both motorized and non-motorized trail systems) is primarily on maintenance and improvement of existing systems. Managers anticipate that there will be modest growth as improvements occur. Management is based on the concept of limited expansion over time.

Administrative access will be permitted in all land use zones used in this alternative; however, in wilderness areas, administrative access is generally limited to emergency situations. In Back Country Non-Motorized areas, administrative access is "by exception" using temporary routes. The routes in this zone will be closed after management occurs. Helicopter landing sites can be accommodated. Motorized uses in Critical Biological zones may be allowed on designated routes if they can be maintained without any effect on the listed species. The Back Country and Developed Area Interface zones are managed for public motorized access.

Issue 2: Ecosystem Elements and Functions

The community protection and vegetation management program emphasis and focus are on the implementation of the National Fire Plan in Wildland/Urban Interface (WUI) areas. These WUI areas are being refined as Community Wildfire Protection Plans are developed. The mechanical treatment of fuels is used in combination with prescribed fire to reduce fire hazard in the Developed Area Interface zones. All wildfires will be suppressed due to either a direct or future threat to communities.

The Vegetation Management Program includes mortality (dead tree) removal, creating defensible space, the maintenance of fuelbreaks, the construction of new fuelbreaks, tree thinning, and prescribed fire. Mortality removal is planned on National Forest System lands within one mile of threatened communities, along evacuation routes, within one-third of a mile of administrative or permitted facilities, and in or around developed recreation sites. Dense stands of mixed conifer forests will be thinned, and fire will be reintroduced. Prescribed burns in chaparral are designed to treat areas up to 5,000 acres in size, both in high hazard areas and as a strategic tool to limit wildfire spread under all but the most severe conditions in other areas of the national forests.

Wildland/Urban Interface areas are managed as a flexible Geographic Information System layer of information that can be adjusted to accommodate Community Wildfire Protection Plans. The focus is community protection and fuels management.

For the initial three to five years, mechanical treatments will be used for vegetation management, and the use of herbicides for management or fuelbreak maintenance is not anticipated. If herbicide use is planned, the effects will be described and disclosed according to NEPA requirements prior to any application.

The alternative is focused on forest health and the management for sustainable resource use in all zones. In addition, vegetation treatment for forest health purposes can occur in all zones.

A moderate level of emphasis is provided for implementing an integrated species conservation strategy. This strategy consists of the following main components: education and interpretation; project surveys and general inventory; monitoring and evaluation; and habitat protection through project impact analysis and development of project-specific standards to mitigate direct and indirect impacts.

Protection of threatened and endangered species is emphasized in all zones, which means activities will be planned that are neutral or beneficial to the species. In order to resolve current problems, such as community protection, management may result in short-term effects that may not be beneficial. However, the long-term consequences of management actions are expected to be beneficial to the species.

There are specific standards included in the design criteria for threatened and endangered species, as well as management direction to reference other guidance such as the Forest Service Manual and Forest Service Handbook direction, current state and federal listings for plants and animals, species guidance documents (documents that include specific guidance for the management of the individual species or habitats), scientific literature, or other sources. In other words, management is committed to the use of the "best available science" during project level analysis.

The Invasive Species Program emphasis places the highest priority on surveying for early detection in order to contain and control invasive species in riparian areas; in threatened, endangered, and sensitive species habitat; and in areas with the known potential to be affected by invasive species. Management flexibility is retained in order to prioritize locations where treatment is needed. This flexibility also allows for joint collaboration and funding opportunities when jurisdictional boundaries are involved.

The Watershed Management Program focuses on the maintenance of water quality and quantity and the protection and/or the restoration of watershed health. Restoration activities are anticipated at prioritized recreation use areas, which involve using a combination of strategies such as environmental education and interpretative programs; construction techniques including boardwalks, fencing and signing; Forest Service presence; and other strategies.

Issue 3: Commodity Values and Uses (Commercial Uses, Facility Operation and Maintenance)

The administration of special uses (authorized occupancy and use of National Forest System land) is emphasized as activities are planned and implemented. Existing permitted uses will continue, including authorized access to specific sites or areas.

All active grazing areas are retained. The number of vacant grazing areas and other areas that may be suitable for grazing are expected to decrease where there are resource constraints for threatened and endangered species and other resources. Six new grazing areas are analyzed on the Los Padres National Forest.

Minerals and energy exploration and development may occur except where specific areas have been withdrawn from mineral entry. The administration of existing operations and the processing of new requests emphasizes compliance with permit requirements. Oil and gas development on the Los Padres National Forest is subject to specific terms and conditions depending on the land use zone where the development may occur. When mining carbonate rock on the San Bernardino National Forest, the Carbonate Habitat Management Strategy will be utilized.

Issue 4: Urban Development and Forest Habitat Linkages (Resource Management, Commercial Uses, Fire)

Existing designated communication and utility (utility, water, and transportation) corridors continue to be used. Management emphasis is to expand within existing facilities before developing new facilities where possible. If new development is needed, the land use zoning on all national forests includes the opportunity for expansion based on site-specific analysis and environmental review.

Existing land adjustment strategies continue, with a focus on the protection of listed species habitat and the preservation of wildlife corridors for species migration. Acquisition is focused primarily toward the consolidation of land within national forest boundaries; however, the national forests may participate in partnerships or other collaborative efforts to acquire land outside of national forest boundaries for habitat linkages.

Issue 5: Special Area Designations (Public Use and Enjoyment, Resource Management)

There are recommendations for additional wilderness on all four southern California national forests, as well as recommendations for three rivers on the Los Padres National Forest to be designated as wild and scenic rivers.

Sixteen percent of the inventoried roadless areas are recommended for wilderness. Inventoried Roadless Areas that were evaluated, but not recommended, for wilderness are zoned primarily in the Back Country Non-Motorized (52 percent) where current direction restricts road construction, and Back Country (25 percent) where road construction may be considered.

Under this alternative, 101.9 miles of river on the Los Padres National Forest are recommended to Congress for inclusion to the National Wild and Scenic River System.

Alternative 3

Alternative 3 is focused on natural resource protection through a high level of special area designations, while maintaining both public and administrative access to existing National Forest System roads and trails.

Alternative 3 is focused on the maintenance of healthy forests, community protection, managed recreation uses, and the management of threatened and endangered species. Managed sustainable use of the national forests is compatible with the maintenance of long-term biological diversity and ecological integrity. The focus on community protection is complimentary to the National Fire Management Policy.

The acreage and percentages in each zone are displayed by national forest (Angeles, Cleveland, Los Padres and San Bernardino National Forests) in the Alternative Comparison tables shown on page 26 for all alternatives, and for alternative 3 alone below.

Table 333. Comparison of Alternative Acres by Land Use Zone

Alternative 3	ANF	CNF	LPNF	SBNF	Grand Total
BC	181,047	119,903	301,139	213,978	816,066
BCNM	180,392	94,871	428,064	120,169	823,497
CBZ	5,247	4,922	798	1,848	12,816
EF	14,145	0	0	0	14,145
EW	81,924	75,523	860,678	130,362	1,148,487
RW	107,632	81,840	143,809	135,339	468,620
DAI	92,596	43,818	46,891	64,056	247,362
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Table 334. Percent of Each Land Use Zone by Alternative

Alternative 3	ANF	CNF	LPNF	SBNF	Grand Total
BC	27.3%	28.5%	16.9%	32.1%	23.1%
BCNM	27.2%	22.5%	24.0%	18.1%	23.3%
CBZ	0.8%	1.2%	0.0%	0.3%	0.4%
EF	2.1%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	16.2%	19.4%	8.1%	20.3%	13.3%
DAI	14.0%	10.4%	2.6%	9.6%	7.0%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

(The zones in the Alternative Comparison tables include Developed Area Interface, Back Country, Back Country Non-Motorized, Critical Biological, Experimental Forest, Existing Wilderness, and Recommended Wilderness).

The back country zones are areas of the national forest where development has been minimal. Of these zones, the most developed zone is Back Country, where management for motorized public access on designated roads and trails is emphasized. This zone includes some roads, administrative facilities, and trails that are designated for motorized uses.

The Back Country Non-Motorized zone is managed for pedestrian, equestrian, and mechanized public access. These are areas of the national forests that have not been developed and where few, if any, National Forest System roads exist, although there are unclassified roads in some areas. The management intent is to manage for non-motorized use. The zone includes the opportunity for a range of recreation opportunities, the maintenance of important habitat or linkages (migration routes) to other undeveloped areas with important habitat, and the maintenance of undeveloped natural space.

The theme of Alternative 3 is to maintain and protect biological diversity and ecological integrity and to maximize special area designations. Developed recreation and other uses of the national forests are continued but at a lower level, with increased controls (see land use zone maps of Alternative 3 in the Atlas). More area is added in the Recommended Wilderness and Back Country Non-Motorized zones than any alternative except for Alternative 6. Compared to other alternatives, there is a higher level of investment in:

- Modification of existing facilities to better protect sensitive resources, including an emphasis on decommissioning recreation facilities and individual sites that are affecting threatened and endangered species. Maximum visitor capacity controls and proactive environmental designs are implemented to minimize effects. Alternative 3 maximizes the use of conservation education and partnerships, and national forest staff members promote a stewardship ethic focused on biodiversity. No new recreation facilities are planned to replace those decommissioned.
- Proactive habitat improvement and surveys. A stronger focus is on habitat restoration compared to the avoidance of habitat degradation. There is greater emphasis on the protection of biodiversity.

Issue 1: Public Values and Uses (Public Use and Enjoyment, Facility Operation and Maintenance)

Public Education Programs have a "visible focus" that includes collaborative involvement with local communities, public education, partnerships, cooperative programs, media publication, and more. A visible focus means that there are funds and staff available for these types of programs, which in turn ensures participation and presence by the agency.

Another focus of the Public Education Programs is outreach to cultural communities within the "zone of influence" for each national forest. By including and emphasizing outreach to cultural communities, each national forest will have a better concept and understanding of how to manage and incorporate cultural heritage and traditions in their forest management planning.

Off-highway vehicle route retention has been considered and zoned for on every national forest. Improvements to the existing national forest motorized trail system that focus on opportunities for long distance routes are not expected. The level of construction can be characterized as low. Any findings and/or improvements will be approved through the normal process, which includes following NEPA procedures including site-specific environmental analysis and public collaboration.

Modest improvements to the non-motorized trail system are also expected. This includes improvements to trails that are open to mountain bike use. What this means is that there will be a small increase in National Forest System trails over time rather than maintaining the status quo.

Road management is focused on the maintenance and improvement of the national forests' existing transportation systems, with safety being the primary emphasis and concern. The Roads Analysis Process will be used in order to manage the existing National Forest System roads, utilizing the following available options:

- maintenance
- improvements towards higher road management objectives (higher road management objectives means that management would improve the road to accommodate different types and levels of motorized use)
- re-routing existing roads

- closure (permanent and temporary)
- adopting new routes

Management is not making a commitment to solve the non-system route problem (the proliferation on non-system user-created routes) all at once; however, management is committed to the goal of eliminating user-created routes over time. Management's intent is to resolve the problem through their normal program of work incrementally over time. The strategies to accomplish this objective are expected to vary depending on the site-specific analysis. All decisions made will be the result of the normal NEPA processes, site-specific analysis, and public collaboration.

The focus of trail management (for both motorized and non-motorized trail systems) is primarily on maintenance and improvement of existing systems. Management is based on the concept of limited expansion over time.

Administrative access will be permitted in all land use zones used in this alternative; however, in wilderness areas administrative access is generally limited to emergency situations. In Back Country Non-Motorized zones, administrative access is "by exception" using temporary routes. The routes in this zone will be closed after management occurs. Helicopter landing sites can be accommodated. Motorized uses in Critical Biological zones may be allowed on designated routes if they can be maintained without any effect on the listed species. The Back Country and Developed Area Interface zones are managed for public motorized access.

Issue 2: Ecosystem Elements and Functions

A high level of emphasis is provided for implementing an integrated species conservation strategy. This strategy consists of the following main components: education and interpretation; project surveys and general inventory; monitoring and evaluation; and habitat protection through project impact analysis and development of project-specific standards to mitigate direct and indirect impacts.

The protection of threatened and endangered species is emphasized in all zones, which means activities will be planned that are neutral or beneficial to the species. In order to resolve current problems, such as community protection, management may result in short-term effects that may not be beneficial. However, the long-term consequences of management actions are expected to be beneficial to the species.

There are specific standards included in the design criteria for threatened and endangered species, as well as management direction to reference other guidance such as the Forest Service Manual and Forest Service Handbook direction, current state and federal listings for plants and animals, species guidance documents (documents that include specific guidance for the management of individual species or habitats), scientific literature, or other sources. In other words, management is committed to the use of the "best available science" during project level analysis.

The community protection and vegetation management program emphasis and focus is on the implementation of the National Fire Plan in Wildland/Urban Interface (WUI) areas. These WUI areas are being refined as Community Wildfire Protection Plans are developed. The mechanical treatment of fuels is used in combination with prescribed fire to reduce fire hazard in the Developed Area Interface zones. All wildfires will be suppressed due to either a direct or future threat to communities.

The Vegetation Management Program includes mortality (dead tree) removal, creating defensible space, the maintenance of fuelbreaks, the construction of new fuelbreaks, tree thinning, and prescribed fire. Mortality removal is planned on National Forest System lands within one mile of threatened communities, along evacuation routes, within one-third of a mile of administrative or permitted facilities, and in or around developed recreation sites. Dense stands of mixed conifer forest will be thinned, and fire will be reintroduced. Prescribed burns in chaparral are designed to treat areas up to 5,000 acres in size, both in high hazard areas and as a strategic tool to limit wildfire spread under all but the most severe conditions in other areas of the national forests.

Wildland/Urban Interface areas are managed as a flexible Geographic Information System layer of information that can be adjusted to accommodate Community Wildfire Protection Plans. The focus is community protection and fuels management.

For the initial three to five years, mechanical treatments will be used for vegetation management, and the use of herbicides for management or fuelbreak maintenance is not anticipated. If herbicide use is planned, the effects will be described and disclosed according to NEPA requirements prior to any application.

The alternative is focused on forest health and the management for sustainable resource use in all zones. In addition, vegetation treatment for forest health purposes can occur in all zones.

The Invasive Species Program emphasis places the highest priority on surveying for early detection in order to contain and control invasive species in riparian areas; in threatened, endangered, and sensitive species habitat; and in areas with the known potential to be affected by invasive species. Management flexibility is retained in order to prioritize locations where treatment is needed. This flexibility also allows for joint collaboration and funding opportunities when jurisdictional boundaries are involved.

The Watershed Management Program focuses on the maintenance of water quality and quantity and the protection and/or the restoration of watershed health. Restoration activities are anticipated at prioritized recreation use areas, which involve using a combination of strategies such as environmental education and interpretative programs; construction techniques including boardwalks, fencing and signing; Forest Service presence; and other strategies.

Issue 3: Commodity Values and Uses (Commercial Uses, Facility Operation and Maintenance)

The administration of special uses (authorized occupancy and use of National Forest System land) is emphasized as activities are planned and implemented. Existing permitted uses will continue, including authorized access to specific sites or areas.

Active grazing areas with no or minimal conflicts with threatened, endangered, proposed, candidate and sensitive species management are retained. The number of vacant grazing areas and other areas that may be suitable for grazing are expected to decrease where there are resource constraints for threatened and endangered species and other resources. Six new grazing areas are analyzed on the Los Padres National Forest.

Minerals and energy exploration and development may occur except where specific areas have been withdrawn from mineral entry. The administration of existing operations and the processing of new requests emphasize compliance with permit requirements. Oil and gas development on the Los Padres National Forest is subject to specific terms and conditions depending on the land use zone where the development may occur. When mining carbonate rock on the San Bernardino National Forest, the Carbonate Habitat Management Strategy will be utilized.

Issue 4: Urban Development and Forest Habitat Linkages (Resource Management, Commercial Uses, Fire)

Existing designated communication and utility (utility, water, and transportation) corridors continue to be used. Management emphasis is to expand within existing facilities before developing new facilities where possible. If new development is needed, the land use zoning on all national forests includes the opportunity for expansion based on site-specific analysis and environmental review.

Existing land adjustment strategies continue with a focus on the protection of listed habitat and the preservation of wildlife corridors for species migration. Acquisition of parcels within wilderness, wild and scenic river corridors, and important biological areas would be emphasized. Acquisition is focused primarily toward the consolidation of land within national forest boundaries; however, the national forests may participate in partnerships or other collaborative efforts to acquire land outside of national forest boundaries for habitat linkages.

Issue 5: Special Area Designations (Public Use and Enjoyment, Resource Management)

There are recommendations for additional wilderness on all four southern California national forests, as well as recommendations for three rivers on the Los Padres National Forest to be designated as wild and scenic rivers.

Inventoried Roadless Areas that were evaluated, but not recommended, for wilderness are zoned primarily in the Back Country Non-Motorized zones (35 percent). The goal is to manage these areas for little or no development while retaining the undeveloped natural character of the area. The zoning emphasizes non-motorized public access and offers advantages to managers that include resource protection, maintenance of habitat linkages, a greater range of recreation opportunities and higher capacity for various levels of use. In Alternative 3, 43 percent are recommended for wilderness designation.

Under this alternative, 115.5 miles of river on the Los Padres National Forest are recommended to Congress for inclusion to the National Wild and Scenic River System.

Alternative 4

The theme of Alternative 4 is to emphasize recreation, with intensive levels of management controls and mitigation of effects on biological diversity and ecological integrity. A wide range of recreation opportunities is emphasized. Fewer areas are recommended for wilderness designation than under Alternatives 2, 3, and 6. Alternative 4 includes the most Back Country acres, except for Alternative 5, and more Back Country Non-Motorized acres than Alternatives 2 and 5 (see land use zone maps of Alternative 4 in the Atlas).

Alternative 4 is focused on the maintenance of healthy forests, community protection, managed sustainable recreation uses, and the management of threatened and endangered species. The alternative theme includes the opportunity for a moderate level of growth of recreation activities and the facilities to support increased use. Managed sustainable use of the national forests is compatible with the maintenance of long-term biological diversity and ecological integrity. The focus on community protection is complimentary to the National Fire Management Policy.

The acreage and percentages in each zone are displayed by national forest (Angeles, Cleveland, Los Padres and San Bernardino National Forests) in the Alternative Comparison tables shown on page 26 for all alternatives, and for alternative 4 alone below.

Table 333. Comparison of Alternative Acres by Land Use Zone

Alternative 4	ANF	CNF	LPNF	SBNF	Grand Total
BC	321,671	192,307	733,086	346,604	1,593,668
BCNM	133,715	102,775	97,858	102,820	437,169
CBZ	3,793	6,001	0	1,834	11,629
EF	15,429	0	0	0	15,429
EW	81,924	75,523	860,678	130,362	1,148,487
RW	12,321	485	46,192	21,514	80,511
DAI	94,129	43,786	43,566	62,619	244,099
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Table 334. Percent of Each Land Use Zone by Alternative

Alternative 4	ANF	CNF	LPNF	SBNF	Grand Total
BC	48.5%	45.7%	41.2%	52.1%	45.1%
BCNM	20.2%	24.4%	5.5%	15.4%	12.4%
CBZ	0.6%	1.4%	0.0%	0.3%	0.3%
EF	2.3%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	1.9%	0.1%	2.6%	3.2%	2.3%
DAI	14.2%	10.4%	2.4%	9.4%	6.9%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

(The zones in the Alternative Comparison tables include Developed Area Interface, Back Country, Back Country Non-Motorized, Critical Biological, Experimental Forest, Existing Wilderness, and Recommended Wilderness).

The back country zones are areas of the national forest where development has been minimal. Of these zones, the most developed zone is Back Country, where management for motorized public access on designated roads and trails is emphasized. This zone includes some roads, administrative facilities, and trails that are designated for motorized uses.

The Back Country Non-Motorized zone is managed for pedestrian, equestrian, and mechanized public access. These are areas of the national forests that have not been developed and where few, if any, roads exist. The management intent is to keep it that way. The zone includes the opportunity for a range of recreation opportunities, the maintenance of important habitat or linkages (wildlife migration routes) to other undeveloped areas with important habitat, and the maintenance of undeveloped natural space.

Compared to other alternatives, there is a higher level of focus on:

The maintenance or expansion of existing facilities before constructing new facilities. Managers anticipate the expansion of existing facilities and the construction of some new facilities, although the level of new construction can be characterized as moderate.

The management of recreation growth, including:

- Maintaining the sustainability of the recreation resource by improving the facilities that support the resource (i.e., developed recreation facilities).
- Monitoring recreation use and its effects.
- Managing recreation use (including use limitations such as carrying capacities, seasonal closures, or other strategies) in order to offset the effects of the uses on other resources, such as wildlife and vegetation. Strategies may include:
- Emphasizing the "hardening" of developed or dispersed public use areas (including facilities like campgrounds, picnic areas, or interpretive sites) as needed to allow use to continue. Hardening a site means using design and construction principles to increase a site’s ability to withstand use without facility or natural resource deterioration.
- Expanding existing facilities before building new ones in order to accommodate additional demand.
- Constructing new facilities where the expansion of existing facilities will not accommodate additional demand.
- Re-routing or re-locating facilities (such as roads or trails).
- Emphasizing enforcement (such as recreation use on designated routes).
- Placing emphasis on public education programs and collaborative outreach projects on the national forests and in their local and/or surrounding communities.
- Planning for more use when the national forests expect an increase in or demand for a particular use (motorized use for example).

Issue 1: Public Values and Uses (Public Use and Enjoyment, Facility Operation and Maintenance)

Public Education Programs have a "visible focus" that includes collaborative involvement with local communities, public education, partnerships, cooperative programs, media publication and more. A visible focus means that there are funds and staff available for these types of programs, which in turn ensures participation and presence by the agency.

Another focus of the Public Education Programs is outreach to cultural communities within the "zone of influence" for each national forest. By including and emphasizing outreach to cultural communities, each national forest will have a better concept and understanding of how to manage and incorporate cultural heritage and traditions in their forest management planning.

Off-highway vehicle route expansion has been considered and zoned for on every national forest. Improvements to the existing system that focus on opportunities for long distance routes are expected, but the level of construction can be characterized as low. Any findings and/or improvements will be approved through the normal process, which includes following NEPA procedures including site-specific environmental analysis and public collaboration.

Modest improvements to the non-motorized trail systems are also expected. This includes improvements to trails that are open to mountain bike use. What this means is that there will be a small increase in National Forest System trails over time rather than maintaining the status quo.

Road management is focused on the maintenance and improvement of the national forests' existing transportation systems, with safety being the primary emphasis and concern. The Roads Analysis Process will be used in order to manage the existing National Forest System roads, utilizing the following available options:

- maintenance
- improvements towards higher road management objectives (higher road management objectives means that management would improve the road to accommodate different types and levels of motorized use)
- re-routing existing roads
- closure (permanent and temporary)
- adopting new routes

Management is not making a commitment to solve the non-system route problem (the proliferation on non-system user-created routes) all at once; however, management is committed to the goal of eliminating non-system user-created routes over time. Management's intent is to resolve the problem through their normal program of work incrementally over time. The strategies to accomplish this objective are expected to vary depending on the site-specific analysis. All decisions made will be the result of the normal NEPA processes, site-specific analysis, and public collaboration.

The focus of trail management (for both motorized and non-motorized trail systems) is primarily on maintenance and improvement of existing systems. Managers do anticipate that there will be modest growth as improvements occur. Management is based on the concept of limited expansion over time.

Administrative access will be permitted in all land use zones used in this alternative; however, in wilderness areas administrative access is generally limited to emergency situations. In Back Country Non-Motorized zones, administrative access is "by exception" using temporary routes. The routes in this zone will be closed after management occurs. Helicopter landing sites can be accommodated. Motorized uses in Critical Biological zones may be allowed on designated routes if they can be maintained without any effect on the listed species. The Back Country and Developed Area Interface zones are managed for public motorized access.

Issue 2: Ecosystem Elements and Functions

The community protection and vegetation management program emphasis and focus are on the implementation of the National Fire Plan in Wildland/Urban Interface (WUI) areas. These WUI areas are being refined as Community Wildfire Protection Plans are developed. The mechanical treatment of fuels is used in combination with prescribed fire to reduce fire hazard in the Developed Area Interface zones. All wildfires will be suppressed due to either a direct or future threat to communities.

The Vegetation Management Program includes mortality (dead tree) removal, creating defensible space, the maintenance of fuelbreaks, the construction of new fuelbreaks, tree thinning, and prescribed fire. Mortality removal is planned on National Forest System lands within one mile of threatened communities, along evacuation routes, within one-third of a mile of administrative or permitted facilities, and in or around developed recreation sites. Dense stands of mixed conifer forest will be thinned, and fire will be reintroduced. Prescribed burns in chaparral are designed to treat areas up to 5,000 acres in size, both in high hazard areas and as a strategic tool to limit wildfire spread under all but the most severe conditions in other areas of the national forests.

Wildland/Urban Interface areas are managed as a flexible Geographic Information System layer of information that can be adjusted to accommodate Community Wildfire Protection Plans. The focus is community protection and fuels management.

For the initial three to five years, mechanical treatments will be used for vegetation management, and the use of herbicides for management or fuelbreak maintenance is not anticipated. If herbicide use is planned, the effects will be described and disclosed according to NEPA requirements prior to any application.

The alternative is focused on forest health and the management for sustainable resource use in all zones. In addition, vegetation treatment for forest health purposes can occur in all zones.

A moderate level of emphasis is provided for implementing an integrated species conservation strategy. This strategy consists of the following main components: education and interpretation; project surveys and general inventory; monitoring and evaluation; and habitat protection through project impact analysis and development of project-specific standards to mitigate direct and indirect impacts.

The protection of threatened and endangered species is emphasized in all zones, which means activities will be planned that are neutral or beneficial to the species. In order to resolve current problems, such as community protection, management may result in short-term effects that may not be beneficial. However, the long-term consequences of management actions are expected to be beneficial to the species.

There are specific standards included in the design criteria for threatened and endangered species, as well as management direction to reference other guidance such as the Forest Service Manual and Forest Service Handbook direction, current state and federal listings for plants and animals, species guidance documents (documents that include specific guidance for the management of the individual species or habitats), scientific literature, or other sources. In other words, management is committed to the use of the "best available science" during project-level analysis.

The Invasive Species Program emphasis places the highest priority on surveying for early detection in order to contain and control invasive species in riparian areas, as well as threatened, endangered, and sensitive species habitat, and on areas with the known potential to be affected by invasive species. Management flexibility is retained in order to prioritize locations where treatment is needed. This flexibility also allows for joint collaboration and funding opportunities when jurisdictional boundaries are involved.

The Watershed Management Program focuses on the maintenance of water quality and quantity and the protection and/or restoration of watershed health. Restoration activities are anticipated at prioritized recreation use areas, using a combination of strategies such as environmental education and interpretative programs; construction techniques including boardwalks, fencing and signing; Forest Service presence; and other strategies.

Issue 3: Commodity Values and Uses (Commercial Uses, Facility Operation and Maintenance)

The administration of special uses (authorized occupancy and use of National Forest System land) is emphasized as activities are planned and implemented. Existing permitted uses will continue, including authorized access to specific sites or areas.

All active grazing areas are retained. The number of vacant grazing areas and other areas that may be suitable for grazing are expected to decrease where there are resource constraints for threatened and endangered species and other resource concerns. Six new grazing areas are analyzed on the Los Padres National Forest.

Minerals and energy exploration and development can occur except where specific areas have been withdrawn from mineral entry. The administration of existing operations and the processing of new requests emphasize compliance with permit requirements. Oil and gas development on the Los Padres National Forest is subject to specific terms and conditions depending on the land use zone where the development may occur. When mining carbonate rock on the San Bernardino National Forest, the Carbonate Habitat Management Strategy will be utilized.

Issue 4: Urban Development and Forest Habitat Linkages (Resource Management, Commercial Uses, Fire)

Existing designated communication and utility (utility, water, and transportation) corridors continue to be used. Management emphasis is to expand within existing facilities before developing new facilities where possible. If new development is needed, the land use zoning on all national forests includes the opportunity for expansion based on site-specific analysis and environmental review.

Land adjustment strategies would emphasize road and trail rights-of-way acquisition for public access to existing National Forest System land. Land adjustment would support recreation use and visitor access to accommodate recreation demand. Wilderness, lands with high scenic integrity, important heritage resources, and lands with dispersed recreation opportunities would be priorities for acquisition. Existing strategies would continue to focus on the protection of threatened and endangered species habitat and the preservation of wildlife corridors for species migration. Acquisition is focused primarily toward the consolidation of land within national forest boundaries; however, the national forests may participate in partnerships or other collaborative efforts to acquire land outside of national forest boundaries for habitat linkages.

Issue 5: Special Area Designations (Public Use and Enjoyment, Resource Management)

There are recommendations for additional wilderness on all four southern California national forests, as well as recommendations for three rivers on the Los Padres National Forest to be designated as wild and scenic rivers.

Inventoried Roadless Areas that were evaluated, but not recommended, for wilderness are zoned primarily in the Back Country (56 percent) and Back Country Non-Motorized (26 percent). Seven percent are recommended for wilderness designation.

Under this alternative, 68.4 miles of river on the Los Padres National Forest are recommended to Congress for inclusion to the National Wild and Scenic River System.

Alternative 4a (selected)

Alternative 4a adjusts the preferred alternatives by using selected elements from other alternatives, as well as making changes to the scheme of land use zones in response to public comment and internal review of the draft Environmental Impact Statement (DEIS) and forest plans.

Alternative 4a is focused on the maintenance of healthy forests, community protection, managed, sustainable recreation setting and uses, and the management of threatened and endangered species. The alternative theme includes the opportunity for a low level of growth of recreation activities and the facilities to support increased use. Managed sustainable use of the national forests is compatible with the maintenance of long-term biological diversity and ecological integrity. The focus on community protection is complementary to the National Fire Plan.

In the preferred alternatives (2 and 4), zoning includes a large amount of the Back Country zone, which gives the impression that cross-country motorized uses are a management emphasis. In the selected alternative, (Alternative 4a), management intent has been clarified. Many acres that were in the Back Country zone in the preferred alternatives have been shifted into other zones, including a modified Back Country zone called Back Country Motorized Use Restricted. Additional adjustment of the zones resulted in an increase in the Back Country Non-Motorized zone (see Land Use Zone Maps in the Part 2, Strategy for each of the four National Forests). The acreage and percentages in each zone are displayed by national forest (Angeles, Cleveland, Los Padres and San Bernardino National Forests) in the Alternative Comparison tables shown on page 26 for all alternatives, and for alternative 4a alone below.

Table 333. Comparison of Alternative Acres by Land Use Zone

Alternative 4a	ANF	CNF	LPNF	SBNF	Grand Total
BC	161,392	77,064	332,050	169,786	740,292
BCMUR	52,791	50,356	319,884	37,553	460,584
BCNM	248,399	161,320	171,035	239,936	820,690
CBZ	3,920	2,131	1,762	2,281	10,094
DAI	85,828	43,107	60,150	59,408	248,493
EF	15,498	0	0	0	15,498
EW	81,924	75,523	860,678	130,362	1,148,487
RW	13,231	11,377	35,821	26,428	86,857
Grand Total	662,983	420,878	1,781,380	665,754	3,530,995

Table 334. Percent of Each Land Use Zone by Alternative

Alternative 4a	ANF	CNF	LPNF	SBNF	Grand Total
BC	24.3%	18.3%	18.6%	25.5%	21.0%
BCMUR	8.0%	12.0%	18.0%	5.6%	13.0%
BCNM	37.5%	38.3%	9.6%	36.0%	23.2%
CBZ	0.6%	0.5%	0.1%	0.3%	0.3%
DAI	12.9%	10.2%	3.4%	8.9%	7.0%
EF	2.3%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	2.0%	2.7%	2.0%	4.0%	2.5%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

(The zones in the Alternative Comparison tables include Developed Area Interface, Back Country, Back Country Motorized Use Restricted, Back Country Non-Motorized, Critical Biological, Experimental Forest, Existing Wilderness, and Recommended Wilderness).

The back country zones are areas of the national forest where development has been minimal. Of these zones, the most developed zone is Back Country, where management for motorized public access on designated roads and trails is emphasized. This zone includes some roads, administrative facilities, and trails that are designated for motorized uses.

The Back Country Motorized Use Restricted zone was developed specifically in response to public comments expressing concern about motorized access to the national forests for community protection, fuel treatment, or fire suppression in areas that are managed for non-motorized public access. Accordingly, this zone accommodates motorized access for administrative purposes only. Administrative access is a term that defines a range of uses including Forest Service activities, other agency activities, tribal activities, and special uses.

The Back Country Non-Motorized zone is managed for pedestrian, equestrian, and mechanized public access. These are areas of the national forests that have not been developed and where few, if any, roads exist. The management intent is to keep it that way. The zone includes the opportunity for a range of non-motorized recreation opportunities, the maintenance of important habitat or linkages (wildlife migration routes) to other undeveloped areas with important habitat, and the maintenance of undeveloped natural space.

Compared to other alternatives, there is a higher level of focus on:

- The sustainability of the recreation setting and the maintenance or expansion of existing facilities before constructing new facilities. Managers anticipate the expansion of existing facilities and the construction of some new facilities although the level of new construction can be characterized as low.
- The management of recreation growth including:
    - Maintaining the sustainability of the recreation resource through maintenance and improvements of the setting (natural appearance of the physical and biological environment) to improve the desired condition of the natural resources that support the recreation setting (i.e., dispersed recreation setting).
    - Monitoring recreation use and its effects.
    - Managing recreation use (including use limitations such as carrying capacities, seasonal closures, or other strategies) in order to offset the effects of the uses on other resources, such as wildlife and vegetation. Strategies may include:
    - Emphasizing the sustainability of dispersed recreation use with a focus on management of use.
    - Emphasizing the "hardening" of developed or dispersed public use areas (including facilities like campgrounds, picnic areas, or interpretive sites) as needed to allow use to continue. Hardening a site means using design and construction principles to increase a site's ability to withstand use without facility or natural resource deterioration.
    - Expanding existing facilities before building new ones in order to accommodate additional demand.
    - Constructing new facilities where the expansion of existing facilities will not accommodate additional demand.
    - Re-routing or re-locating facilities (for example, roads or trails).
    - Emphasizing enforcement (for example, recreation use on designated routes).

- Placing emphasis on public education programs and collaborative outreach projects on the national forests and in their local and/or surrounding communities.
- Planning for more use when the national forests expect an increase or demand of a particular use (motorized use for example).

Issue 1: Public Values and Uses (Public Use and Enjoyment, Facility Operation and Maintenance)

Public Education Programs have a "visible focus" that includes collaborative involvement with local communities, public education, partnerships, cooperative programs, media publication, and more. A visible focus means that there are funds and staff available for these types of programs, which in turn ensures participation and presence by the agency.

Another focus of the Public Education Programs is outreach to cultural communities within the "zone of influence" for each national forest. By including and emphasizing outreach to cultural communities, each national forest will have a better concept and understanding of how to manage and incorporate cultural heritage and traditions in their forest management planning.

Off-highway vehicle expansion has been considered and zoned for on every national forest. Improvements to the existing system that focus on sustainable opportunities for long distance routes are expected, but the level of construction can be characterized as low. Any findings and/or improvements will be approved through the normal process, which includes following NEPA procedures including site-specific environmental analysis and public collaboration.

Modest improvements to the non-motorized trail systems are also expected. This includes improvements to trails that are open to mountain bike use. What this means is that there will be a small increase in National Forest System trails over time rather than maintaining the status quo.

Road management is focused on the maintenance and improvement of the national forests' existing transportation systems, with safety being the primary emphasis and concern. The Roads Analysis Process will be used in order to manage the existing National Forest System roads, utilizing the following available options:

- maintenance
- improvements towards higher road management objectives (higher road management objectives means that management would improve the road to accommodate different types and levels of motorized use)
- re-routing existing roads
- closure (permanent and temporary)
- adopting new routes

Management is not making a commitment to solve the non-system route problem (the proliferation on non-system user-created routes) all at once; however, management is committed to the goal of eliminating non-system user-created routes over time. Management's intent is to resolve the problem through their normal program of work incrementally over time. The strategies to accomplish this objective are expected to vary depending on the site-specific analysis. All decisions made will be the result of the normal NEPA processes, site-specific analysis, and public collaboration.

The focus of trail management (for both motorized and non-motorized trail systems) is primarily on maintenance and improvement of existing systems. Managers anticipate that there will be low growth as improvements occur. Management is based on the concept of limited expansion over time.

Administrative motorized access will be permitted in all land use zones used in this alternative; however, in wilderness areas, administrative access is generally limited to emergency situations. In Back Country Non-Motorized areas, administrative access is "by exception" using temporary routes. The temporary routes in this zone will be closed after management occurs. Helicopter landing sites can be accommodated. Motorized access (for administrative purposes only) will also be allowed in the Back Country Motorized Use Restricted zone.

The Back Country Motorized Use Restricted zone is managed for non-motorized public access. Motorized uses in Critical Biological zones may be allowed on designated routes if they can be used and maintained without negative effect on the listed species. The Back Country and Developed Area Interface zones are managed for public motorized access.

Issue 2: Ecosystem Elements and Functions

The community protection and vegetation management program emphasis and focus are on the implementation of the National Fire Plan in Wildland/Urban Interface (WUI) areas. These WUI areas are being refined as Community Wildfire Protection Plans are developed. Wildland/Urban Interface areas are mapped using a flexible Geographic Information System layer of information that can be adjusted to accommodate Community Wildfire Protection Plans. The focus is community protection and fuels management. The majority of mechanical fuel treatments used in combination with prescribed fire to reduce fire hazard is expected in the Developed Area Interface zone. All wildfires will be suppressed as they represent either a direct or future threat to communities.

The Vegetation Management Program includes mortality (dead tree) removal, creating defensible space, the maintenance of fuelbreaks, the construction of new fuelbreaks, tree thinning, prescribed fire, and replanting. Selective mortality removal is planned on National Forest System lands within one and a half miles of threatened communities, along evacuation routes, within one-third of a mile of administrative or permitted facilities, and in or around developed recreation sites. Dense stands of mixed conifer forest will be thinned, and fire will be reintroduced. Prescribed burns in chaparral are designed to treat areas up to 5,000 acres in size, both in high hazard areas and as a strategic tool to limit wildfire spread under all but the most severe conditions in other areas of the national forests.

For the initial three to five years, mechanical treatments and prescribed fire will be used for vegetation management, including the selective use of herbicides for management of fuelbreaks and WUI Defense zones. If herbicide use is planned, the effects will be described and disclosed according to NEPA requirements prior to any application.

The alternative is focused on forest health and the management for sustainable resource use in all zones. In addition, vegetation treatment for forest health purposes can occur in all zones.

A moderate level of emphasis is provided for implementing an integrated species conservation strategy. This strategy consists of the following main components: education and interpretation; project surveys and general inventory; monitoring and evaluation; and habitat protection through project impact analysis and development of project-specific standards to mitigate direct and indirect impacts.

The protection of threatened and endangered species is emphasized in all activities and zones, which means activities will be planned that are neutral or beneficial to the species. In order to resolve current problems, such as community protection, management may result in short-term effects that may not be beneficial. However, the long-term consequences of management actions are expected to be beneficial to the species. In addition, efforts will be made to restore degraded habitats and imperiled populations using a variety of strategies and to maintain and enhance landscape linkages for the movement of wildlife.

There are specific standards included in the design criteria for threatened and endangered species, as well as management direction to reference other guidance such as the Forest Service Manual and Forest Service Handbook direction, current state and federal listings for plants and animals, species guidance documents (documents that include specific guidance for the management of the individual species or habitats), scientific literature, or other sources. In other words, management is committed to the use of the "best available science" during project level analysis.

The Invasive Species Program places the highest priority on surveying for the early detection of invasive species in order to contain and control them in riparian areas; in threatened, endangered, proposed, candidate, and sensitive species habitat; and in areas where there is a high potential for rapid rate of spread. Management flexibility is retained in order to prioritize locations where treatment is needed. This flexibility also allows for collaboration and the pursuit of funding opportunities with neighboring landowners and other interested agencies and groups.

The Watershed Management Program focuses on the maintenance of soil and water quality and quantity and the protection and/or the restoration of watershed health. Land disturbing activities such as development and maintenance of roads, trails, recreation sites, facilities, minerals and energy sites, vegetation management projects, WUI Defense zones, or other disturbed areas are designed to minimize impacts to soil and water resources. Watershed restoration projects are implemented to retain soil on site for the improvement of watershed health and the protection and/or restoration of riparian area function. Restoration activities involve using a combination of strategies such as rehabilitation of disturbed areas, protection of sensitive areas, environmental education, interpretive programs, Forest Service presence, and others. Monitoring is used to assess the implementation and effectiveness of proposed mitigation measures and restoration activities.

Issue 3: Commodity Values and Uses (Commercial Uses, Facility Operation and Maintenance)

The administration of special uses (authorized occupancy and use of National Forest System land) is emphasized as activities are planned and implemented. Existing authorized uses will continue, including authorized access to specific sites or areas. Slow growth is expected to meet demand.

All active grazing areas are retained. The number of vacant grazing areas and other areas that may be suitable for grazing are expected to decrease where there are resource constraints. Six new grazing areas are analyzed on the Los Padres National Forest.

Minerals and energy exploration and development may occur except where specific areas have been withdrawn from mineral entry. The administration of existing operations and the processing of new requests emphasizes compliance with permit requirements. Oil and gas development on the Los Padres National Forest is subject to specific terms and conditions depending on the land use zone where the development may occur. When mining carbonate rock on the San Bernardino National Forest, the Carbonate Habitat Management Strategy will be utilized.

Issue 4: Urban Development and Forest Habitat Linkages

Existing designated transportation and utility corridors and communication sites continue to be used. Management emphasis is to expand within existing facilities before developing new facilities where possible. If new development is needed, the land use zoning on all national forests includes the opportunity for expansion based on site-specific analysis and environmental review.

Land adjustment strategies would continue at present levels with emphasis on adjustment to sustain, improve, protect and/or preserve biological habitat, wildlife corridors for animal movement, adjacent communities, public access, and better manageability of National Forest System land. Wilderness, lands with high scenic integrity, important heritage resources, and lands with dispersed recreation opportunities would also be priorities for acquisition. Acquisition would be focused primarily on consolidation of land within national forest boundaries; however, the national forests may participate in partnerships or other collaborative efforts to acquire land outside of national forest boundaries for habitat linkages or other administrative purposes. Most landownership complexity improvement would be expected in Wildland/Urban Interface areas, wildlife corridors, sensitive biological habitats, and riparian areas.

Issue 5: Special Area Designations (Public Use and Enjoyment, Resource Management)

There are recommendations for additional wilderness on all four southern California national forests, as well as recommendations for three rivers on the Los Padres National Forest to be designated as wild and scenic rivers. The wilderness recommendations consist primarily of additions to existing wilderness. Of the Inventoried Roadless Areas (IRAs) evaluated, eight percent of that acreage is recommended for designation as wilderness (Recommended Wilderness). Some undeveloped areas outside of IRA is also recommended for wilderness.

Inventoried Roadless Areas that were evaluated but not recommended for wilderness are zoned primarily in the Back Country Non-Motorized (38 percent) or Back Country Motorized Use Restricted (23 percent) zones. The goal is to manage these areas for little or no development while retaining the undeveloped natural character of the area. This zoning emphasizes non-motorized public access and offers advantages to managers that include resource protection, maintenance of habitat linkages, a greater range of recreation opportunities, and higher capacity for various levels of use. Other zoning of IRAs includes 24 percent in Back Country and 4 percent in Developed Area Interface.

Under this alternative, 68.4 miles of river on the Los Padres National Forest would be recommended to Congress for inclusion to the National Wild and Scenic River System.

Alternative 5

Alternative 5 was developed in response to public comments from groups and individuals who would like increased motorized access to and within the national forests with fewer user restrictions.

The theme of this alternative is to emphasize land use zones compatible with forest resource development. Acres in Back Country zones increase, and no acres are provided in Recommended Wilderness or Back Country Non-Motorized zones (see land use zone maps of Alternative 5 in the Atlas). The acreage and percentages in each zone are displayed by national forest (Angeles, Cleveland, Los Padres and San Bernardino National Forests) in the Alternative Comparison tables shown on page 26 for all alternatives, and for alternative 5 alone below.

Table 333. Comparison of Alternative Acres by Land Use Zone

Alt 5	ANF	CNF	LPNF	SBNF	Grand Total
BC	469,459	301,481	881,722	472,471	2,125,133
CBZ	1,440	0	0	0	1,440
EF	15,429	0	0	0	15,429
EW	81,924	75,523	860,678	130,362	1,148,487
DAI	94,730	43,873	38,980	62,919	240,503
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Table 334. Percent of Each Land Use Zone by Alternative

Alt 5	ANF	CNF	LPNF	SBNF	Grand Total
BC	70.8%	71.6%	49.5%	71.0%	60.2%
CBZ	0.2%	0.0%	0.0%	0.0%	0.0%
EF	2.3%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
DAI	14.3%	10.4%	2.2%	9.5%	6.8%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

(The zones in the Alternative Comparison tables include Developed Area Interface, Back Country, Experimental Forest, and Existing Wilderness).

The Back Country zones are areas of the national forest where development has been minimal. This zone includes some roads, administrative facilities, and trails that are designated for motorized uses.

Compared to other alternatives, there is a higher level of investment in:

- The retention and improvement of access for all uses, including motorized, mountain bike, equestrian, and commodity uses. Investments would be made reactively to allow recreation use to continue as fully as possible with few restrictions. The reconstruction of existing degraded campgrounds and picnic areas and the construction of new campgrounds and picnic areas are featured to fully accommodate the projected demand for motorized recreation use. Little new road construction is planned, but the use of more roads is anticipated because some unclassified roads would be incorporated into the national forest transportation system. A minimal use of conservation education emphasizes reaching those visitors who participate in motorized recreation.
- Intensive monitoring of resource activities is necessary to maintain a high level of use without resource damage. Conservation efforts consist of mitigating impacts, including off-site mitigation.

Habitat restoration, proactive surveys, and recovery objectives for federally listed species are not emphasized.

- Land use zoning provides opportunities to increase commodity uses of the national forests.

Issue 1: Public Values and Uses (Public Use and Enjoyment, Facility Operation and Maintenance)

Off-highway vehicle expansion has been considered and zoned for on every national forest. Improvements to the existing system that focus on opportunities for long distance routes are expected; in addition, many unclassified routes are expected to be added to the system. Any findings and/or improvements will be approved through the normal process, which includes following NEPA procedures including site-specific environmental analysis and public collaboration.

Modest improvements to the non-motorized trail systems are also expected. This includes improvements to trails that are open to mountain bike use. What this means is that there will be a small increase in National Forest System trails over time rather than maintaining the status quo.

Road management is focused on the maintenance and improvement of the national forests' existing transportation systems, with safety being the primary emphasis and concern. The Roads Analysis Process will be used in order to manage the existing National Forest System roads, utilizing the following available options:

- maintenance
- improvements towards higher road management objectives (higher road management objectives means that management would improve the road to accommodate different types and levels of motorized use)
- re-routing existing roads
- closure (permanent and temporary)
- adopting new routes

Management is not making a commitment to solve the non-system route problem (the proliferation of non-system user-created routes) all at once; however, management is committed to resolving the problem with the goal of incorporating some of the user-created routes into the national forest transportation system over time where needed to meet recreation demand (those not needed or environmentally sustainable will be eliminated). The strategies to accomplish this objective are expected to vary depending on the site-specific analysis. All decisions made will be the result of the normal NEPA processes, site-specific analysis, and public collaboration.

The focus of trail management (for both motorized and non-motorized trail systems) is primarily on maintenance and improvement of existing systems. Managers anticipate that there will be modest growth as improvements occur. Management is based on the concept of limited expansion over time.

All zones (other than existing wilderness and special designations) are managed for public motorized access.

Issue 2: Ecosystem Elements and Functions

The community protection and vegetation management program emphasis and focus are on the implementation of the National Fire Plan in Wildland/Urban Interface (WUI) areas. These WUI areas are being refined as Community Wildfire Protection Plans are developed. The mechanical treatment of fuels is used in combination with prescribed fire to reduce fire hazard in the Developed Area Interface zones. All wildfires will be suppressed due to either a direct or future threat to communities.

The Vegetation Management Program includes mortality (dead tree) removal, creating defensible space, the maintenance of fuelbreaks, the construction of new fuelbreaks, tree thinning, and prescribed fire.

Mortality removal is planned on National Forest System lands within one mile of threatened communities, along evacuation routes, within one-third of a mile of administrative or permitted facilities, and in or around developed recreation sites. Dense stands of mixed conifer forests will be thinned, and fire will be reintroduced. Prescribed burns in chaparral are designed to treat areas up to 5,000 acres in size, both in high hazard areas and as a strategic tool to limit wildfire spread under all but the most severe conditions in other areas of the national forests.

Wildland/Urban Interface areas are managed as a flexible Geographic Information System layer of information that can be adjusted to accommodate Community Wildfire Protection Plans. The focus is community protection and fuels management.

For the initial three to five years, mechanical treatments will be used for vegetation management, and the use of herbicides for management or fuelbreak maintenance is not anticipated. If herbicide use is planned, the effects will be described and disclosed according to NEPA requirements prior to any application.

A low level of emphasis is provided for implementing an integrated species conservation strategy. This strategy consists of the following main components: education and interpretation; project surveys and general inventory; monitoring and evaluation; and habitat protection through project impact analysis and development of project-specific standards to mitigate direct and indirect impacts.

There are specific standards included in the design criteria for threatened and endangered species, as well as management direction to reference other guidance such as the Forest Service Manual and Forest Service Handbook direction, current state and federal listings for plants and animals, species guidance documents (documents that include specific guidance for the management of the individual species or habitats), scientific literature, or other sources. In other words, management is committed to the use of the "best available science" during project level analysis.

The Invasive Species Program emphasis places the highest priority on surveying for early detection in order to contain and control invasive species in riparian areas; in threatened, endangered, and sensitive species habitat; and in areas with the known potential to be affected by invasive species. Management flexibility is retained in order to prioritize locations where treatment is needed. This flexibility also allows for joint collaboration and funding opportunities when jurisdictional boundaries are involved.

The Watershed Management Program focuses on the maintenance of water quality and quantity and the protection and/or the restoration of watershed health. Restoration activities are anticipated at prioritized recreation use areas, which involve using a combination of strategies such as environmental education and interpretative programs; construction techniques including boardwalks, fencing and signing; Forest Service presence; and other strategies.

Issue 3: Commodity Values and Uses (Commercial Uses, Facility Operation and Maintenance)

The administration of special uses (authorized occupancy and use of National Forest System land) is emphasized as activities are planned and implemented. Existing permitted uses will continue, including authorized access to specific sites or areas.

All active and most vacant grazing areas are retained. Six new grazing areas are analyzed on the Los Padres National Forest.

Minerals and energy exploration and development may occur except where specific areas have been withdrawn from mineral entry. The administration of existing operations and the processing of new requests emphasize compliance with permit requirements. Oil and gas development on the Los Padres National Forest is subject to specific terms and conditions depending on the land use zone where the development may occur. When mining carbonate rock on the San Bernardino National Forest, the Carbonate Habitat Management Strategy will be utilized.

Issue 4: Urban Development and Forest Habitat Linkages (Resource Management, Commercial Uses, Fire)

Existing designated communication and utility (utility, water, and transportation) corridors continue to be used. If new development is needed, the land use zoning on all national forests includes the opportunity for expansion based on site-specific analysis and environmental review.

Land adjustment strategies would focus on consolidation, habitat protection, and better access to support occupancy and use. Acquisition is limited and focused primarily toward the consolidation of land within national forest boundaries.

Issue 5: Special Area Designations (Public Use and Enjoyment, Resource Management)

There are no recommendations for additional wilderness or other special designations on the four southern California national forests.

Inventoried Roadless Areas that were evaluated, but not recommended, for wilderness are zoned primarily in the Back Country zone (94 percent).

Alternative 6

Alternative 6 was developed in response to public comments from groups and individuals who would like increased protection of all forest resources. A detailed alternative was submitted during scoping called the "Conservation Alternative." Alternative 6 is patterned after the Conservation Alternative; however, elements were modified to reflect a legal and implementable alternative that was presented in the same format as the other alternatives.

Alternative 6 is focused on the maintenance of healthy forests, community protection, low impact sustainable recreation uses, and the management of threatened and endangered species. The alternative theme includes the opportunity for a low level of growth of low impact recreation activities and reduction of facilities that encourage concentrated use. Managed sustainable use of the national forests is compatible with the maintenance of long-term biological diversity and ecological integrity. The focus on community protection is complimentary to the National Fire Management Policy.

The acreage and percentages in each zone are displayed by national forest (Angeles, Cleveland, Los Padres and San Bernardino National Forests) in the Alternative Comparison tables shown on page 26 for all alternatives, and for alternative 6 alone below.

Table 333. Comparison of Alternative Acres by Land Use Zone

Alternative 6	ANF	CNF	LPNF	SBNF	Grand Total
BC	123,063	57,578	138,153	135,445	454,240
BCNM	198,268	168,887	426,295	274,133	1,067,583
CBZ	4,729	6,715	852	2,426	14,721
EF	15,429	0	0	0	15,429
EW	81,924	75,523	860,678	130,362	1,148,487
RW	144,861	67,958	310,955	57,883	581,656
DAI	94,709	44,216	44,447	65,504	248,876
Grand Total	662,983	420,877	1,781,380	665,753	3,530,993

Table 334. Percent of Each Land Use Zone by Alternative

Alternative 6	ANF	CNF	LPNF	SBNF	Grand Total
BC	18.6%	13.7%	7.8%	20.3%	12.9%
BCNM	29.9%	40.1%	23.9%	41.2%	30.2%
CBZ	0.7%	1.6%	0.0%	0.4%	0.4%
EF	2.3%	0.0%	0.0%	0.0%	0.4%
EW	12.4%	17.9%	48.3%	19.6%	32.5%
RW	21.8%	16.1%	17.5%	8.7%	16.5%
DAI	14.3%	10.5%	2.5%	9.8%	7.0%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%

(The zones in the Alternative Comparison tables include Developed Area Interface, Back Country, Back Country Non-Motorized, Critical Biological, Experimental Forest, existing wilderness, and recommended wilderness).

The back country zones are areas of the national forest where development has been minimal. Of these zones, the most developed zone is Back Country, where management for motorized public access on designated roads and trails is emphasized. This zone includes some roads, administrative facilities, and trails that are designated for motorized uses.

The Back Country Non-Motorized zone is managed for pedestrian, equestrian, and mechanized public access. These are areas of the national forests that have not been developed and where most of the low maintenance level (ML 1 and 2) roads exist. Administrative access is permitted on these roads; however, they are closed to motorized public access. The management intent is to keep it that way. The zone includes the opportunity for a range of recreation opportunities, the maintenance of important habitat or linkages (migration routes) to other undeveloped areas with important habitat, and the maintenance of undeveloped natural space.

Compared to other alternatives, there is a higher level of investment in:

- Low-impact recreation and a transportation system that is reduced to a core system of highly maintained roads. Unclassified roads are closed and then decommissioned over time as budgets allow.
- No new facilities are constructed, and existing facilities are modified or decommissioned to better protect sensitive resources. There is a maximum use of visitor capacity controls and proactive environmental designs to minimize impacts. Conservation education and partnerships would create an effective and wide-ranging program, including an expansion of partnerships, targeted youth programs, and a promotion of multilingual environmental education.
- Habitat restoration: A focus is on increasing the knowledge base about species through surveys and studies, and then using this knowledge to benefit wildlife through proactive habitat management.

Issue 1: Public Values and Uses (Public Use and Enjoyment, Facility Operation and Maintenance)

Public Education Programs have a "visible focus" that includes collaborative involvement with local communities, public education, partnerships, cooperative programs, media publication, and more. A visible focus means that there are funds and staff available for these types of programs, which in turn ensures participation and presence by the agency.

Another focus of the Public Education Programs is outreach to cultural communities within the "zone of influence" for each national forest. By including and emphasizing outreach to cultural communities, each national forest will have a better concept and understanding of how to manage and incorporate cultural heritage and traditions in their forest management planning.

Existing off-highway vehicle route retention has been considered and zoned for on every national forest. Improvements to the existing system are not expected other than those required for resource protection. Any findings and/or improvements will be approved through the normal process, which includes following NEPA procedures including site-specific environmental analysis and public collaboration.

Low-level improvements to the non-motorized trail systems are expected. This includes improvements to trails that are open to mountain bike use. What this means is that there will be a small increase in National Forest System trails over time rather than maintaining the status quo.

Road management is focused on the maintenance and improvement of the national forests' existing transportation systems, with safety being the primary emphasis and concern. The Roads Analysis Process will be used in order to manage the existing National Forest System roads, utilizing the following available options:

- maintenance
- improvements towards higher road management objectives (higher road management objectives means that management would improve the road to accommodate different types and levels of motorized use)
- re-routing existing roads

- closure (permanent and temporary)
- adopting new routes

Management is not making a commitment to solve the non-system route problem (the proliferation on non-system user-created routes) all at once; however, management is committed to the goal of eliminating non-system user-created routes over time. Management's intent is to resolve the problem through the normal program of work incrementally over time. The strategies to accomplish this objective are expected to vary depending on the site-specific analysis. All decisions made will be the result of the normal NEPA processes, site-specific analysis, and public collaboration.

The focus of trail management (for both motorized and non-motorized trail systems) is primarily on maintenance and improvement of existing systems. Managers anticipate that there will be low growth as improvements occur. Management is based on the concept of limited expansion over time.

Administrative access will be permitted in all land use zones used in this alternative; however, in wilderness areas, administrative access is generally limited to emergency situations. In Back Country Non-Motorized zones, Administrative access is "by exception" using temporary routes or as needed for sites accessed by the existing road system. The temporary routes in this zone will be closed after management occurs. Helicopter landing sites can be accommodated. Motorized uses in Critical Biological zones may be allowed on designated routes if they can be maintained without any effect on the listed species. The Back Country, Urban/Rural Interface and Developed Area Intermix zones are managed for public motorized access.

Issue 2: Ecosystem Elements and Functions

A very high level of emphasis is provided for implementing an integrated species conservation strategy. This strategy consists of the following main components: education and interpretation; project surveys and general inventory; monitoring and evaluation; and habitat protection through project impact analysis and development of project-specific standards to mitigate direct and indirect impacts.

The protection of threatened and endangered species is emphasized in all activities and zones, which means activities will be planned that are neutral or beneficial to the species. In order to resolve current problems, such as community protection, management may result in short-term effects that may not be beneficial. However, the long-term consequences of management actions are expected to be beneficial to the species.

There are specific standards included in the design criteria for threatened and endangered species, as well as management direction to reference other guidance such as the Forest Service Manual and Forest Service Handbook direction, current state and federal listings for plants and animals, species guidance documents (documents that include specific guidance for the management of the individual species and habitats), scientific literature, or other sources. In other words, management is committed to the use of the "best available science" during project level analysis.

The community protection and vegetation management program emphasis and focus are on the implementation of the National Fire Plan in Wildland/Urban Interface WUI) areas. These WUI areas are being refined as Community Wildfire Protection Plans are developed. The mechanical treatment of fuels is used in combination with prescribed fire to reduce fire hazard in the Developed Area Interface zones. All wildfires will be suppressed due to either a direct or future threat to communities; in limited areas outside of WUI zones and WUI environment, a fire use strategy will be considered under appropriate conditions spelled out in the Forest Fire Management Plan on the Los Padres National Forest.

The Vegetation Management Program includes mortality (dead tree) removal, the maintenance of fuelbreaks, tree thinning, and prescribed fire. Mortality removal is planned on National Forest System lands within one mile of threatened communities, along evacuation routes, within one-third of a mile of administrative or permitted facilities, and in or around developed recreation sites. Dense stands of mixed conifer forest will be thinned, and fire will be reintroduced. Prescribed burns in chaparral outside of Wildland/Urban Interface areas are deemphasized in order to provide a strong focus on direct community protection.

Wildland/Urban Interface areas are managed as a flexible Geographic Information System layer of information that can be adjusted to accommodate Community Wildfire Protection Plans. The focus is community protection and fuels management.

For the initial three to five years, mechanical treatments and prescribed fire will be used for vegetation management, including the selective use of herbicides for management of fuelbreaks and WUI Defense zones. If herbicide use is planned, the effects will be described and disclosed according to NEPA requirements prior to any application.

The Invasive Species Program emphasis places the highest priority on surveying for early detection in order to contain and control invasive species in riparian areas, in threatened, endangered, and sensitive species habitat, and on areas with the known potential to be affected by invasive species. Management flexibility is retained in order to prioritize locations where treatment is needed. This flexibility also allows for joint collaboration and funding opportunities when jurisdictional boundaries are involved.

The Watershed Management Program focuses on the maintenance of soil and water quality and quantity and the protection and/or the restoration of watershed health. Development of new facilities will focus on minimizing impacts to soil and water resources. Restoration activities involve using a combination of strategies, such as repair of human-caused stream channel degredation; environmental education and interpretative programs; construction techniques including boardwalks, fencing and signing; Forest Service presence; and other strategies.

Issue 3: Commodity Values and Uses (Commercial Uses, Facility Operation and Maintenance)

The administration of special uses (authorized occupancy and use of National Forest System land) is emphasized as activities are planned and implemented. Existing permitted uses will continue, including authorized access to specific sites or areas.

Some active grazing areas are retained. The number of vacant grazing areas and other areas that may be suitable for grazing are expected to decrease where there are resource constraints for threatened and endangered species and other resources. Six new grazing areas are analyzed on the Los Padres National Forest.

Minerals and energy exploration and development may occur except where specific areas have been withdrawn from mineral entry. The administration of existing operations and the processing of new requests emphasizes compliance with permit requirements. Oil and gas development on the Los Padres National Forest is subject to specific terms and conditions depending on the land use zone where the development may occur. When mining carbonate rock on the San Bernardino National Forest, the Carbonate Habitat Management Strategy will be utilized.

Issue 4: Urban Development and Forest Habitat Linkages (Resource Management, Commercial Uses, Fire)

Existing designated communication and utility (utility, water, and transportation) corridors continue to be used. Management emphasis is to expand within existing facilities before developing new facilities where possible. If new development is needed, the land use zoning on all national forests includes the opportunity for expansion based on site-specific analysis and environmental review.

Land adjustment strategies focus on the protection of threatened and endangered species habitat and the preservation of wildlife corridors for species migration. Acquisition of parcels within wilderness areas, wild and scenic river corridors, and land important for ecosystem protection would be given priority. The national forests are likely to participate in partnerships or other collaborative efforts to acquire land outside of national forest boundaries for habitat linkages, as well as acquisition of priority national forest inholdings.

Issue 5: Special Area Designations (Public Use and Enjoyment, Resource Management)

There are recommendations for additional wilderness on all four southern California national forests (49 percent of the land use zones), as well as recommendations for three rivers on the Los Padres National Forest to be designated as wild and scenic rivers.

Inventoried Roadless Areas that were evaluated, but not recommended, for wilderness are zoned primarily in the Back Country Non-Motorized zones (38 percent). The goal is to manage these areas for little or no development while retaining the undeveloped natural character of the area. The zoning emphasizes non-motorized public access and offers advantages to managers that include resource protection, maintenance of habitat linkages, a greater range of recreation opportunities, and higher capacity for various levels of use.

Under this alternative, 124.1 miles of river on the Los Padres National Forest are recommended to Congress for inclusion to the National Wild and Scenic River System.

Past Decisions Not Being Revisited in Plan Revision

Recreation Fees

President Bush signed the 2005 Consolidated Appropriations Act (PL 108-447), which includes the 10-year Federal Lands Recreation Enhancement Act (REA) on December 8, 2004. The Act permits federal land management agencies to continue charging modest fees at campgrounds, rental cabins, high-impact recreation areas, and at day-use sites that have certain facilities.

The previous Recreation Fee Demonstration Program (Fee Demo Program) was enacted by Congress in 1996. Both the U.S. Department of Agriculture and the Department of the Interior have testified before Congress in strong support of a long-term, multi-agency recreation fee program. Recreation fees provide crucial resources that allow the federal agencies to respond to increased demand on public lands. The goal is to provide visitors with a quality recreation experience through enhanced facilities and services.

The Federal Lands Recreation Enhancement Act benefits visitors to federal public lands by:

- Reinvesting a majority of fees back to the site of collection to enhance visitor services and reduce the backlog of maintenance needs for recreation facilities (including trail maintenance, toilet facilities, boat ramps, hunting blinds, interpretive signs and programs);
- Providing an interagency fee program that reduces confusion over differing fee programs and passes by reducing four national passes down to one;
- Providing more opportunities for public involvement in determining recreation fee sites and fees;
- Providing focused criteria and limits on areas and sites where recreation fees can be charged; and
- Providing more opportunities for cooperation with gateway communities through fee management agreements for visitor and recreation services, emergency medical services and law enforcement services.

Many recreation activities and sites will continue to be free. The Act includes additional provisions that build on experiences from the Fee Demo Program and improve the fee program by clarifying the circumstances in which fees may be charged. The Act prohibits certain fees for:

- General access to national forests and grasslands and Bureau of Land Management areas;
- Horseback riding, walking through, driving through, or boating through areas where no facilities or services are used;

- Access to overlooks or scenic pullouts;
- Undesignated parking areas where no facilities are provided for; and
- Picnicking along roads or trails.

In addition, individuals under 16 will not be charged an entrance or standard amenity fee.

Alternatives Considered but Eliminated from Detailed Study

No Change - Continue Existing Forest Plans with No Modifications

This alternative is similar to Alternative 1, except that modifications such as those made in response to the 2001 Programmatic Biological Opinion from the U.S. Fish and Wildlife Service are not incorporated. This alternative was considered but dropped from detailed consideration because it does not meet the purpose and need stated in Chapter 1 and is not in compliance with the Endangered Species Act.

Alternative Elements Submitted by the Public

Several comment letters received during scoping suggested specific alternatives or portions of an alternative. None of these (including the detailed "Conservation Alternative") were incorporated exactly as they were submitted. This input was used to help frame the range of alternatives and to craft the theme and emphasis of several alternatives. Alternative 5 incorporated requests to minimize special area designations and allow for a wide range of uses of natural backcountry areas. Alternative 6 is based on key elements of the "Conservation Alternative" submitted by a coalition of environmental organizations. Each of these alternatives was modified to reflect the full range of forest plan decision elements and provide a consistent framework to allow comparison of the alternatives. Elements of the submitted alternatives that national forest managers considered to be both legal and implementable were used as appropriate.

Alternative Comparison (Land management Plan Decisions)

A summary of how land management plan decisions vary by alternative is provided in the following discussion and tables. Each section considers one of the strategic decisions made at the forest plan level discussed in the Land Management Decisions section of Chapter 2. The first table shows how the forest plan alternatives vary in the type and degree of emphasis placed on each major Forest Service program area .

Forest-wide Goals and Objectives

Table 564. Strategic Range of Alternative Emphasis

Program Element	Program Emphasis:			
	Most Intensive			Least Intensive
Public Motorized Access	Encourage (5)	Maintain (1,4)	No Net Gain (2)	Reduce (3, 4a, 6)
Dispersed Recreation	Encourage (4,5)	Maintain (1,2, 4a)	No Net Gain (3)	Reduce (6)
Recreation opportunities (ROS)	Increase Motorized opportunities (5)	Maintain existing ROS objectives (1, 2, 4)	ROS objectives reflect current use patterns (4a)	Reduce motorized opportunities (3, 6)
Developed Recreation	Improve existing sites and build new (4)	Improve existing sites (5, 4a)	Maintain existing sites (2)	Remove Problem Sites (1,3,6+)

Program Element	Program Emphasis:			
	Most Intensive			Least Intensive
Environmental Education	Increase program emphasis (3, 4, 6)	Focused program increases (4a)	Minimal emphasis (1, 2)	Reduce program emphasis (5)
Aesthetics	Actively manage landscape elements (3,6)	Actively maintain landscape elements (2,4)	Maintain through project design (4a)	Restrictions on other activities (1)
Heritage	Restoration and Enhancement (3 and 6)	Transition (4a) between 3 and 6, and 2 and 4.	Maintenance and/or Management (2 and 4)	Support/Restrict Other Functions (5)
Tribal and Native American Interests	Contribution of traditional knowledge and involvement in national forest practices (6)	Proactive, partnership focus (3, 4, and 4a)	Resolve conflicts between other national forest users and traditional users (5)	Reactive to accommodation of traditional uses (1 and 2)
Conservation of Biological Diversity	Recover species/ improve habitat (6,3)	Avoid species/ improve habitat (4a,2)	Minimize adverse effects (4,1)	Prevent jeopardy (5)
Community Protection	Mix of activities in WUI and remote locations	Focus on vegetation treatment in WUI (1-6)	Focus on vegetation treatment in remote areas.	Suppression Only
Forest Health	Restoration/improvement of Ecosystem Function (6)	Focused Restoration/ improvement (3)	Prevention of Degradation (1,2,4, 4a)	Restrict other activities (5)
Water and Aquatic Resources	Restoration / improvement of Ecosystem Function (6)	Focused Restoration / improvement (3, 4a)	Prevention of Degradation (1,2,4)	Restrict other activities (5)
Physical (Soil and Geological)	Restoration/improvement of Ecosystem Function (6)	Focused Restoration/ improvement (3, 4a)	Prevention of Degradation (1,2,4)	Restrict other activities (5)
Range	Utilize all existing grazing areas/Consider new (5)	Maintain all existing grazing areas (1)	Manage use on existing active and vacant grazing areas. Remove unsuitable vacant grazing areas (2,4,4a)	Remove grazing areas in TEPS habitats or other resource concerns (3,6)
Minerals	Accommodate (5)	Mitigate (2,4,4a)	Restrict (1)	Low (3,6)
Oil and Gas and Renewable Energy Resources	Accommodate (5)	Mitigate (2,4,4a)	Restrict (1)	Low (3,6)
Special Products	Accommodate (5)	Mitigate (2,3,4a)	Restrict (1)	Remove (4,6)

Program Element	Program Emphasis:			
	Most Intensive			Least Intensive
Water use	Accommodate (5)	Mitigate (2,3,4a)	Restrict (1)	Remove (4,6)
Land Adjustment	Expansion including outside National Forest System boundary. Emphasize Acquisition (6+,3-)	Expansion within National Forest System boundary including corridors. (2,4, 4a)	Consolidation Emphasize exchange. (1)	Custodial (5)
Infrastructure Development	Accommodate Requests (5)	Selectively Accommodate (1)	Selectively Accommodate Moderate restrictions on development. (2,3,4a)	Discourage development on National Forest System land. Maximize restrictions on development. (6,4)
Special Uses	Accommodate Requests (5)	Selectively Accommodate (1)	Selectively Accommodate Moderate restrictions on development. (2,3, 4a)	Discourage development on National Forest System land. Maximize restrictions on development. (6,4)
Transportation and Utility Corridors	Accommodate Requests (5)	Selectively Accommodate (1)	Selectively Accommodate Moderate restrictions on development. (2,3, 4a)	Discourage development on National Forest System land. Maximize restrictions on development. (6,4)

Lands that are Suitable and Capable for Resource Production

Livestock Grazing: The number of suitable grazing acres varies by alternative, most notably in Alternative 6 (see table 108: Grazing Suitability by Forest by Alternative). Alternatives 2 through 6 recommend closure of some vacant grazing areas or portions of some vacant grazing areas and analyzed six new grazing areas on the Los Padres National Forest (see table 183: Number of Vacant Grazing Areas Expected to be Available for Grazing by Alternative).

Table 108. Grazing Suitability by Forest by Alternative

		Angeles	Cleveland	Los Padres	San Bernardino	Totals
# Grazing Areas		7	33	141	26	207
NFS Capable Area		23,291	47,401	407,736	123,794	602,222
Alt 1	#	7	33	135	26	201
	Acres	23,273	44,259	398,652	119,365	585,549
Alt 2	#	5	26	116	18	165
	Acres	16,791	41,065	346,554	45,672	450,082
Alt 3	#	5	25	108	18	156
	Acres	16,791	36,120	313,694	45,672	412,277
Alt 4	#	5	26	113	18	162
	Acres	16,791	41,065	345,361	45,672	448,889
Alt 4a	#	5	26	113	18	162
	Acres	16,791	41,132	345,361	45,672	448,956
Alt 5	#	5	33	125	26	189
	Acres	16,791	42,646	364,959	118,481	542,877
Alt 6	#	5	22	94	18	139
	Acres	2,030	15,061	54,462	15,766	87,319

NFS: National Forest System

Table 183. Number of Vacant Grazing Areas Expected to be Available for Grazing by Alternative

		Angeles	Cleveland	Los Padres	San Bernardino	Totals
Alt 1	#	2	8	40	10	60
	Acres	6,407	8,409	111,361	78,105	204,282
Alt 2	#	0	2	22	2	26
	Acres	0	5,690	59,527	4,412	69,629
Alt 3	#	0	1	14	2	17
	Acres	0	723	26,667	4,412	31,802
Alt 4 and 4a	#	0	2	19	2	23
	Acres	0	5,690	58,334	4,412	68,436
Alt 5	#	0	8	30	10	48
	Acres	0	8,409	78,788	77,221	164,418
Alt 6	#	0	1	15	2	18
	Acres	0	202	5,873	415	6,490

Mineral and Energy Resources: In all alternatives, 51,200 acres are identified as available for oil and gas (leasable) development on the Angeles National Forest; suitability for development has not been determined. Activities in the area may be restricted under Alternatives 2 through 6 because the available acres include a portion of a river eligible for wild and scenic river designation. Suitability of the river has not been determined. No available areas are identified for oil and gas development on the Cleveland or San Bernardino National Forests in any alternative. The available and suitable areas on the Los Padres National Forest are identified in the FEIS for the Los Padres National Forest forest-wide leasing analysis (2005).

The level of mineral exploration activity is driven by geology and public demand and is administered with available funds. The amount of land available for mineral and energy development is highest in Alternative 5, followed by Alternative 1, primarily because of lands recommended for wilderness in other alternatives (wilderness is withdrawn from mineral entry). The least amount of land available for mineral exploration activity is in Alternative 6, followed by Alternative 3. Alternatives 2, 4 and 4a have a moderate amount of land available for mineral and energy development.

Table 312. Percent of Land Area Expected to be Withdrawn from Mineral Entry

Forest	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Angeles	2.7%	14.9%	19.2%	4.8%	2.5%	24.9%	4.9%
Cleveland	0.3%	5.3%	20.6%	1.5%	0.0%	17.7%	3.2%
Los Padres	0.0%	3.5%	8.1%	2.6%	0.0%	17.5%	2.1%
San Bernardino	0.0%	3.1%	20.6%	3.5%	0.0%	9.1%	4.3%

Mineral Withdrawals: Reserving and withdrawing land from mineral entry affect management of locatable, leasable and mineral materials. Because Critical Biological zones, designated wildernesses, and other special land use designations (research natural areas, wild and scenic rivers) are generally considered unsuitable or unavailable for mineral uses, Alternatives 3 and 6 consistently anticipate larger acreages of mineral withdrawals, while Alternatives 1 and 5 anticipate the fewest mineral withdrawals (see table 312: Percent of Land Area Expected to be Withdrawn from Mineral Entry).

Lands Special Uses: The southern California national forests currently have approximately 2,250 special uses authorized to use and occupy nearly 37,000 acres of National Forest System land. The acreage suitable for lands special uses remains unchanged under Alternative 1, decreases slightly under Alternatives 2 and 4, and decreases by an estimated 22 percent, 43 percent and 62 percent under Alternatives 4a, 3 and 6 respectively. Alternative 5 anticipates 27 percent more acreage available for lands special-use authorizations (see table 308: Acreage Suitable for Consideration of Non-Recreation Special Uses).

Table 308. Acreage Suitable for Consideration of Non-Recreation Special Uses

Forest	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Angeles	443,201	402,467	273,643	415,800	564,189	217,772	300,012
Cleveland	260,096	234,472	163,721	236,093	345,354	101,794	170,526
Los Padres	759,404	766,855	348,030	776,651	920,702	182,600	712,084
San Bernardino	394,735	376,198	278,034	409,222	535,391	200,949	266,746
Total	1,857,436	1,779,992	1,063,428	1,837,766	2,365,636	703,115	1,449,368

Utility and Transportation Corridors and Communication Sites: In all alternatives, utility and transportation corridors and communication sites that are designated in the current land management plans would continue to be used. New utility corridors, transportation corridors and communication sites are limited to suitable land use zones and can be designated only after specific analysis and environmental review are completed.

The Western Regional Corridor Planning Partnership (WRCPP) has identified two new unoccupied utility corridor segments on the Cleveland National Forest: the Elsinore Mountain to San Mateo corridor and the El Cajon Mountain corridor. They would be zoned as suitable and may be designated in the future under some alternatives: Elsinore/San Mateo would be suitable under Alternatives 1, 4, 4a and 5; and El Cajon Mountain would be suitable under Alternatives 1, 2, 4, 4a, and 5.

Special Designations and Recommendations to Congress

Maps: Maps of all special designations considered in each alternative may be found in the Land Use Zone Maps published in the Atlas and in the four Part 2: Strategy publications.

Inventoried Roadless Areas: The inventoried roadless areas within the southern California national forests total approximately 1.1 million acres, which is about 32 percent of the total National Forest System lands in southern California (see table 548: Inventoried Roadless Areas by Land Use Zone). Areas recommended to Congress for wilderness designation in the record of decision (ROD) would be managed to maintain their wilderness character until final congressional action is taken on the recommendations. Any recommendation for wilderness designation is a preliminary administrative recommendation that would receive further review and possible modification by the Chief of the Forest Service, the Secretary of Agriculture, and the President of the United States. Congress has reserved the authority to make final decisions on wilderness designation.

Table 548. Inventoried Roadless Areas by Land Use Zone

Land Use Zone	Alt.1	Alt.2	Alt.3	Alt.4	Alt.4a	Alt.5	Alt.6
BC	595,008	547,377	162,997	587,439	253,584	984,662	73,654
BCMUR	0	0	0	0	245,209	0	0
BCNM	380,763	263,518	370,347	313,260	397,675	0	396,230
CB	1,373	2,174	853	3,009	2,990	0	1,608
DAI	39,866	35,308	35,051	35734.3	38,511	32,347	36,454
EF	7,148	7,148	7,148	7,148	7,148	7,148	7,148
EW	21,123	21,123	21,123	21,123	21,123	21,123	21,123
RW	0	169,917	449,046	77,567	79,041	0	509,062

The number of acres of recommended wilderness varies depending on the wilderness evaluation and the theme of each alternative (see table 335: Total acres of recommended wilderness, by alternative, by forest). Alternative 3 recommends the largest number of wilderness acres for the Cleveland and San Bernardino National Forests. Alternative 6 recommends the largest number of wilderness acres for the Angeles and Los Padres National Forests, as well as the largest new wilderness acreage overall. Alternative 2 recommends the next highest acreage, followed by Alternatives 4 and 4a. Alternatives 1 and 5 recommend no roadless areas for wilderness designation. If an area is not recommended for wilderness designation, it would be allocated to one of the other available land use zones. For details see Appendix D. Inventoried Roadless Areas (IRAs).

Table 335. Total acres of recommended wilderness, by alternative, by forest

Forest	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Angeles	0	80,904	107,632	12,321	0	144,861	13,231
Cleveland	0	16,415	81,840	485	0	67,958	11,377
Los Padres	0	62,363	143,810	46,192	0	310,955	35,820
San Bernardino	0	18,923	135,339	21,514	0	57,883	26,439
TOTALS	0	178,605	468,621	80,512	0	581,657	86,867

Note: Acres include any areas being proposed as wilderness, including IRAs, portions of IRAs, or other areas identified by the Forests

Existing Wilderness: There are 21 designated wilderness areas on the southern California national forests, totaling over 1 million acres or 32 percent of the total National Forest System lands. Visitation in most of the wildernesses is expected to increase regardless of alternative, mostly in the form of day hiking, backpacking, and equestrian use. Corresponding increases in recreation-associated impacts on sensitive wilderness resources at popular trail and camping areas can be expected, especially in the more heavily visited wildernesses near urban areas. Most of the wilderness backcountry would remain unvisited because of steep terrain and dense vegetation.

Wild and Scenic Rivers (WSR): The National WSR system is a network of free-flowing rivers designated by Congress. No alternative recommends a reduction in length or the elimination of any of the three existing wild and scenic river designations on the Los Padres National Forest. National Forests are directed to evaluate their rivers during plan revision for inclusion in the WSR system. The national forests evaluated all of their rivers, including 47 in detail, and found 26 rivers (with at least one part or segment) totaling 378.8 miles to be eligible as WSR.

For the Angeles, Cleveland, and San Bernardino National Forests, Alternatives 2 through 6 are the same because all of the 20 rivers identified as eligible for inclusion in the WSR system are managed to protect and/or enhance the river's outstandingly remarkable values and maintain their highest potential classification until suitability studies are completed at a later date.

The seven eligible rivers on the Los Padres National Forest were further evaluated for suitability under the alternatives developed for this plan revision, resulting in varying miles of river recommended for designation by alternative (see table 336: Recommended Wild and Scenic River Mileage by Classification and Alternative (Los Padres NF)). Alternative 6 not only recommends all eligible rivers for designation, but also recommends the highest percentage of mileage in the 'wild river' classification (the class with the highest level of protection). Alternative 3 recommends slightly fewer eligible river miles for designation, followed by Alternatives 2, 4 and 4a. Alternatives 1 and 5 recommend no rivers for designation. Wild and scenic river designations are similar to wilderness designations in that Congress has reserved the authority to make final decisions on the designations. For details, see Appendix E. Wild and Scenic Rivers.

Table 336. Recommended Wild and Scenic River Mileage by Classification and Alternative (Los Padres National Forest)

Classification	Miles Eligible by Potential Classification	Alt 1	Alt 2	Alt 3	Alt 4 and 4a	Alt 5	Alt 6
Wild	44.7	0.0	27.1	37.1	13.0	0.0	44.7
Scenic	65.3	0.0	65.3	60.2	40.5	0.0	61.2
Recreational	18.2	0.0	9.5	18.2	14.9	0.0	18.2
Total Miles	124.1	0.0	101.9	115.5	68.4	0.0	124.1

Research Natural Areas (RNAs): Research natural areas are established by the Regional Forester to maintain areas of natural ecosystems and areas of special ecological significance. There are currently 14 RNAs on the southern California national forests, totaling 15,019 acres. Fifteen potential RNAs have been identified for possible inclusion in the system (see table 321: Summary of Candidate Research Natural Areas Recommended By Alternative). The number of proposed RNAs varies depending on the theme of each alternative. Alternative 6 recommends carrying forward the greatest number of RNAs and acres and would make the greatest contribution to the Forest Service Pacific Southwest Region (R5) and national RNA network. Alternative 3 recommends the next highest number of new RNAs and acres, followed by Alternative 2 and 4a. Alternatives 4 and 1 recommend substantially fewer new RNAs and acres. Alternative 5 recommends only one new RNA and the fewest acres. For details see Appendix F. Research Natural Areas.

Table 321. Summary of Candidate Research Natural Areas Recommended By Alternative

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Candidate RNAs	4	12	14	5	1	15	10
Total Acres	9,037	28,798	29,876	11,141	2,220	32,100	18,731

Special Interest Areas (SIAs): Special interest areas may be designated by the Regional Forester to protect and manage for public use and enjoyment those special recreation areas with scenic, geological, botanical, zoological, paleontological, archaeological, or other special characteristics or unique values. There are currently 15 SIAs totaling 27,809 acres on the southern California national forests. Twenty-seven additional areas with special and unique resources are proposed for designation under some alternatives (see table 337: Summary of Candidate Special Interest Areas Recommended By Alternative). The number of proposed SIAs varies depending on the theme of each alternative. Alternatives 3 and 6 provide for the widest variety of new SIAs and types. Alternatives 2, 4 and 4a propose some additional SIAs. Alternative 5 proposes very few and Alternative 1 proposes no new SIAs. No alternative recommends a reduction in size or the elimination of any existing SIAs. In Alternatives 2, 3, 4 and 6 there is an increase in SIAs focusing on heritage resources, which would increase the opportunities for the protection, enhancement and public enjoyment of heritage resources. For details see Appendix G. Special Interest Areas.

Table 337. Summary of Candidate Special Interest Areas Recommended By Alternative

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Total	0	13	27	10	7	27	14
Total Acres	0	34,809	68,655	28,521	4,812	77,740	53,289

National Monuments: The Santa Rosa and San Jacinto Mountains National Monument (SRSJMNM) is the only national monument within the southern California national forests. No alternative recommends the reduction or elimination of the monument. Because no new national monuments are being proposed or analyzed in any alternative of the land management plan revision, the environmental consequences described in Chapter 3 refer only to the National Forest System lands within the SRSJMNM. Administration will not vary by alternative because direction for the SRSJMNM is detailed in law, regulation, agency policy, and a specific management plan.

Province-wide and Forest Specific Design Criteria

Design criteria are found in Parts 2 and 3 of the forest plans. These do not vary by alternative.

Management Area Prescriptions

The extent and locations of the various land use zones are given in tables 333 and 334, found on page 26, and shown in the land use zone maps published in the Atlas.

Monitoring and Evaluation

Monitoring indicators are the same for each alternative; however, anticipated outcomes vary as discussed in the next section, Alternative Comparison (Trends for Key Environmental Indicators).

Alternative Comparison (Trends for Key Environmental Indicators)

Comparison of how each alternative is expected to affect long-term trends of key environmental indicators is the focus of this section of the FEIS. Chapter 3 includes detailed documentation of the anticipated environmental effects. This section examines the environmental indicators in response to expected changes in management emphasis resulting from Land Management Plan Decisions for each of the alternatives.

The forest plans establish long-term goals that display desired outcomes of management actions over the years of plan implementation (see Part 1: Southern California National Forests Vision, Strategic Goals section). Forest Goals are designed to display the role the national forests play in moving toward goals and objectives established in the National Strategic Plan as summarized below:

National Strategic Plan Goal 1- Reduce the risk from catastrophic wildland fire.

Outcome: Reduced risk to communities and the environment from catastrophic wildland fire by improving the health of the nation's forests and grasslands.

"A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Wildland Fire Strategy" (Department of Interior and Department of Agriculture, 2001) describes the need to reduce the risk of wildland fire to communities and the environment because:

- increased population growth in the wildland-urban interface place more citizens and property at risk;
- many of the traditional approaches to land management and suppression of wildland fire have resulted in dense, diseased or dying forests, which has contributed to severe fires and increased threats to communities and ecosystems; and
- post-fire ecosystem health problems from insects, pathogens, and invasive species are increasing.

Miles of rural landscape once buffered urban areas from the effects of wildland fire. Now forests are increasingly part of the wildland-urban interface, creating a greater challenge for fire protection. Recent research has identified 73 million acres of National Forest System lands and 59 million acres of privately-owned forestland at high risk of ecologically destructive wildland fire (condition classes 2 and 3, Fire Regime I and II) (Schmidt et al., 2002).

The following objectives support this goal:

1. Objective: Improve the health of National Forest System lands that have the greatest potential for catastrophic wildland fire.
2. Objective: Consistent with resource objectives, wildland fires are suppressed at a minimum cost, considering firefighter and public safety, benefits, and values to be protected.
3. Objective: Assist 2,500 communities and those non-National Forest System lands most at risk with development and implementation of hazardous fuel reduction and fire prevention plans and programs.

National Strategic Plan Goal 2- Reduce the impacts from invasive species.

Outcome: Improve the health of the nation's forests and grasslands by reducing the impacts from invasive species.

Invasive species, particularly insects, pathogens, plants, and aquatic pests, pose a long-term risk to the health of the nation’s forests and grasslands. These species interfere with natural and managed ecosystems, degrade wildlife habitat, reduce the sustainable production of natural resource-based goods and services, and increase the susceptibility of ecosystems to other disturbances such as fire and flood. Rampant population growth and impact often occurs when new organisms are introduced into ecosystems and their natural enemies do not follow. Habitat fragmentation (the division of forest and grassland habitat into smaller, more isolated patches) limits containment and eradication of invasive species.

Economic impacts to forests and grasslands from invasive species currently exceeds $4 billion per year, without considering the cost of environmental consequences, such as loss of native fauna and flora in large areas. The best defense against invasive species is either preventing their introduction or aggressively eradicating newly detected pest species. The Forest Service accomplishes both courses of action by implementing the National Invasive Species Management Plan in cooperation with other USDA agencies, other federal departments, States, tribes, and private sector partners.

The following objective supports this goal:

1. Objective: Improve the effectiveness of treating selected invasive species.

National Strategic Plan Goal 3- Provide outdoor recreation opportunities

Outcome: Provide high-quality outdoor recreational opportunities on forests and grasslands, while sustaining natural resources, to help meet the nation's recreation demands.

By mid-century our nation's population is projected to increase by nearly 50 percent. Simultaneously, public access to privately owned forestland is expected to continue to decline. This situation will increase the pressure on public lands to provide additional recreation opportunities. If public lands are to continue to provide additional recreation benefits without experiencing unacceptable impacts to resources, emphasis must be placed on effective management solutions. In particular, it is critical that we improve management of off-highway vehicle access and use on National Forest System lands to preserve high-quality experiences for all recreational users.

The following objectives support this goal:

1. Objective: Improve public access to National Forest System land and water and provide opportunities for outdoor health-enhancing activities.
2. Objective: Improve the management of off-highway vehicle use to protect natural resources, promote safety of all users, and minimize conflicts among various uses through the collaborative development and implementation of locally-based travel management plans.

National Strategic Plan Goal 4- Help meet energy resource needs

Outcome: Consider opportunities for energy development and the supporting infrastructure on forests and grasslands to help meet the nation's energy needs.

The nation's forests and grasslands play a significant role in meeting America’s need for producing and transmitting energy. Unless otherwise restricted, National Forest System lands are available for energy exploration, development, and infrastructure occupancy (e.g., well sites, pipelines, and transmission lines).

The following objective supports this goal:

1. Objective: Work with other agencies to identify and designate corridors for energy facilities, improve permit application processing efficiency, and establish appropriate land tenure (including transferability clauses) in easements and other authorizations to provide for long-term project viability.

National Strategic Plan Goal 5- Improve watershed condition

Outcome: Increase the area of forest and grassland watersheds in fully functional and productive condition.

An estimated 3,400 towns and cities currently depend on National Forest System watersheds for their public water supplies. Our national forests and grasslands contain more than 3,000 public water supplies for campgrounds, administrative centers, and similar facilities. Communities that draw source water from national forests and grasslands provide water to 60 million people, or one-fourth of the nation's people. Although most forested watersheds are in fully functioning or satisfactory condition, many streams on National Forest System lands do not meet State water-quality standards. Some municipal watersheds, especially in the West, are at risk from catastrophic wildland fire and from impacts due to excessive use. These problems are compounded by land parcelization. The loss of valuable corridors connecting National Forest System land with other undisturbed tracts of land increases the difficulty of effectively managing watershed conditions. Sustaining functional watershed conditions over time maintains the productive capacity of our land and water.

The following objectives support this goal:

1. Objective: Assess and restore high-priority watersheds and maintain riparian habitat within these watersheds.
2. Objective: Monitor water quality impacts of activities on National Forest System lands.
3. Objective: Restore and maintain native and desired nonnative plant and animal species diversity within terrestrial and aquatic ecosystems and reduce the rate of species endangerment by contributing to species recovery.

National Strategic Plan Goal 6—Mission related work in addition to that which supports the agency goals

Outcome: Improve the productivity and efficiency of other mission-related work and support programs.

The Forest Service provides direction for natural resource stewardship through direct land management practices, indirect management under partnership agreements, and research and development programs. The agency also provides many goods and services such as recreational opportunities, clean water, and wood products, to the American people. We consistently strive to maintain the organizational structure and capacity to deliver the necessary mission work.

The following objectives support this goal:

1. Objective: Provide current resource data, monitoring, and research information in a timely manner.
2. Objective: Meet Federal financial management standards and integrate budget and performance.
3. Objective: Maintain the environmental, social, and economic benefits of forests and grasslands by reducing their conversion to other uses.
4. Objective: Maintain Office of Safety and Health Administration standards.
5. Objective: Develop and maintain the processes and systems to provide and analyze scientific and technical information to address agency priorities.

Desired outcomes are generally not an immediate response to program activities; rather, they measure changes over time, or "trends." Alternative comparison in this section provides a scenario for how each alternative might be expected to influence trends in the key environmental indicators. Table 499 (Part 1 Monitoring Summary) provides a summary of the key indicators the national forests intend to monitor to measure progress toward these goals as the forest plans are implemented.

Table 499. Part 1 Monitoring Summary

Goal	Activity, Practice Or Effect To Be Measured	Monitoring Question	Indicators	Data Reliability	Measuring Frequency (Years)	Report Period (Years)
1.1	Vegetation Treatments in WUI	Has the forest made progress in reducing the number of acres that are adjacent to development within WUI defense zones that are classified as high risk?	Fire Hazard/Risk	High	1	5
1.2.1	Vegetation Condition	Is the forest making progress toward increasing the percentage of montane conifer forests in Condition Class 1?	Condition Class	Mod	5	5
1.2.2	Vegetation Condition	Is the forest making progress toward maintaining or increasing the percentage of chaparral and coastal sage scrub in Condition Class 1?	Condition Class	Mod	5	5
1.2.3	Vegetation Condition	Has the forest been successful at maintaining long fire-free intervals in habitats where fire is naturally uncommon?	Veg. Type Extent Fire	Mod	5	5
2.1	Invasive species	Are the national forests' inventory of invasive plants and animals showing a stable or decreasing trend in acres of invasives?	Invasive Plants and Animals	Mod	1	5
3.1	Visitor Use of the Forest	Are trends in indicators and visitor satisfaction surveys indicating that the forest has provided quality, sustainable recreation opportunities that result in increased visitor satisfaction?	Visitor Satisfaction	Mod	5	5
3.2	Wilderness Use	Are trends in indicators and visitor satisfaction surveys depicting the forest has provided solitude and challenge in an environment where human influences do not impede the free play of natural forces?	Natural Processes Wilderness	Mod	5	5
4.1a	Mineral and Energy Development	Has the forest been successful at protecting ecosystem health while providing mineral and energy resources for development?	Energy Success at protecting Ecosystem Health	Mod	1	5
4.1b	Mineral and Energy Development	Has the forest been successful at protecting ecosystem health while providing renewable resources for development?	Renewable Resources Success at protecting Ecosystem Health	Mod	1	5

Goal	Activity, Practice Or Effect To Be Measured	Monitoring Question	Indicators	Data Reliability	Measuring Frequency (Years)	Report Period (Years)
4.2	Energy Infrastructure Support	Are designated utility corridors being fully utilized prior to designation of new corridors serving similar market needs?	Utility Corridors	Mod	1	5
5.1	Watershed	Is the forest making progress toward sustaining Class 1 watershed conditions while reducing the number of Condition Class 2 and 3 watersheds?	Sustaining Class 1 watershed conditions while reducing the number of Condition Class 2 &3 watersheds	High	1	5
5.2	General Forest Activities	Is the forest making progress toward reducing the number of streams with poor water quality or aquatic habitat conditions?	Stream Condition–in Impaired State listed 303(d) streams	Mod	5	5
6.1	Livestock Grazing	Is forest rangeland management maintaining or improving progress towards sustainable rangelands and ecosystem health by increasing the number of key areas in good and fair condition?	Rangeland Condition	Mod	1	5
6.2	General Forest Activities	Are trends in resource conditions indicating that habitat conditions for fish, wildlife, and rare plants are in a stable or upward trend?	MIS	Mod	5	5
7.1	Built Landscape Extent Land Adjustment	Is the forest balancing the need for new infrastructure with restoration opportunities or land ownership adjustment to meet the desired conditions?	Road Density Inventories Road Miles Land Ownership Complexity	High	5	5

Forest Goal 1.1 - Community Protection: Improve the ability of southern California communities to limit loss of life and property and recover from the high intensity wildfires that are a natural part of this state's ecosystem.

This goal is a primary emphasis both nationally and for each of the four southern California national forests. Through strategies targeted at improving wildland fire suppression effectiveness, the national forests hope to reverse the long-term trend of increasing losses to more frequent wildland fire. A key part of this strategy is reducing fire hazard in the Wildland/Urban Interface (WUI) through vegetation treatments designed to provide direct community protection. Tracking the acres of vegetation treatment and changes in vegetation condition class over time monitors accomplishment of this goal. Forest plan decisions that influence this goal include establishment of desired conditions for each major fire regime, designation of land use zones (including special designation overlays), establishment of program objectives and strategies to implement the National Fire Plan, and establishment of design criteria including standards.

Implementation of the National Fire Plan community protection goals is a national priority and is therefore incorporated in all alternatives. Fire staff have estimated that the WUI Defense zone treatments are likely to be accomplished within the next 10-15 years, while Threat zone treatments are likely to be fully implemented in the chaparral but not conifer forests at current rates of accomplishment. The trend of increasing fire frequency documented in recent fire history studies is expected to continue and is not likely to be significantly influenced by vegetation treatments in the WUI zones. The goal is to reduce the threat of wildland fire to life, property and natural resources using tools that are appropriate to each fire regime. All alternatives are expected to reduce future loss of life and property as vegetation treatments in the Wildland/Urban Interface are implemented and fire hazard is reduced.

Some direct loss of wildlife habitat is expected to occur due to vegetation type conversion in the WUI Defense zone. Less intensive vegetation treatments in the WUI Threat zone are likely to result in short-term habitat loss that is rotated through different parts of the national forests; however, long-term retention of habitat values can be expected through appropriate project design.

Forest Goal 1.2 - Restoration of Forest Health: Restore forest health where alteration of natural fire regimes have put human and natural resource values at risk.

The focus on community protection during at least the first part of the planning cycle is expected to allow little direct vegetation treatments outside the WUI zones, with the exception of strategically located fuelbreaks and associated prescribed burns. Vegetation condition in fire regime IV is at risk from inadvertent type-conversion from excessively frequent fire. The fire regime condition class may be used as a tool to monitor those areas at risk over time. Focused fire suppression and prevention are the primary strategies identified in all alternatives to address this concern. Due to the trend of continued urbanization, national forest staff anticipate that more land area will be at risk from excessively frequent fire in the future.

Forest Goal 1.2.1: Reduce the potential for wide-spread losses of montane conifer forests caused by severe, extensive, stand-replacing fires.

The focus on community protection during at least the first part of the planning cycle is expected to allow little direct vegetation treatments outside the WUI Threat and Defense zones, with the exception of strategically located fuelbreaks in all alternatives. Incorporation of forest plan desired conditions into wildfire suppression strategies is expected to make progress toward this goal; however, a trend of increasing loss of forest cover is expected to continue in all alternatives outside of the WUI zones. The condition class of fire regime I vegetation may be used to measure progress toward the goal of reducing risk to loss from altered fire regimes in montane conifer forests. Alternative 6 would direct more attention to protection of bigcone Douglas-fir through vegetation treatments and is therefore more likely to reduce the rate of loss that has been observed.

Forest Goal 2.1 - Invasive Species

Under Alternative 1 there is no explicit direction to develop and implement a province-wide noxious weed management strategy. Each Ranger District would continue to manage noxious weeds on a case-by-case basis with little coordination across districts or national forests. Control of arundo and tamarisk in riparian areas would remain a priority on all units. Management of invasive nonnative plants and animals would likely continue at their current rates on other units of the four southern California national forests.

Under Alternatives 2 through 6, revised forest plan direction would provide a strategy (for all four southern California national forests) for invasive species that includes objectives for education, prevention, control, restoration and research. Revised forest plan standards would decrease the risk that invasive nonnative plants and animals become established. There would be less risk that seeds, mulches or animal feed used on National Forest System land would be contaminated by weed seeds. There would be less risk that vehicles and machines authorized to travel off-road (such as fire engines) would introduce invasive nonnative plants. There would be less risk that special-use permittees would use or dispose of invasive nonnative plants and animals.

In Alternatives 2 through 6, invasive nonnative species would continue to persist at many current locations and may also increase in range and abundance. This is due to the current presence of numerous populations of invasive nonnative plants and animals on the national forests, the presence of numerous vectors such as people and vehicles, and the continued disturbance of many acres of land. This would occur despite revised forest plan direction, concurrent efforts to control invasive nonnative plants and animals, and increased opportunities to implement control measures. About 60 miles of stream would be treated annually for invasive nonnative species such as arundo and tamarisk, and about 300 acres of uplands would be treated for a variety of invasive nonnative plants.

Forest Goal 3.1 - Managed Recreation in a Natural Setting

Recreation visitation and use are expected to increase in all alternatives; however, the location, type, rate and intensity are expected to vary. Some peak-season visitors would be displaced or would be unable to find their desired recreation setting or opportunity, especially in popular high-use places. Because desired uses vary considerably, each alternative has general advantages for certain groups of users while being less desirable for other groups. Conflicts among uses and natural resources protected by existing legislation (such as the Endangered Species Act) are expected to occur. Alternatives differ in their resolution of these conflicts by varying where and when activities are allowed.

Most visitors now participate in recreation activities that involve driving for pleasure, viewing natural features and wildlife, walking and general relaxation. These activities would generally remain the same for Alternative 1; there would be a greater emphasis on motorized recreation in Alternative 5 and a greater emphasis on non-motorized recreation in Alternatives 3 and 6. Alternative 4 provides the most emphasis on accommodating recreation demand and use, and Alternatives 2 and 4a emphasize continuing a mixture or range of recreation opportunities. Some motorized and developed recreation opportunities would be lost or foregone in Alternatives 3, 4a and 6 if road systems are reduced or if campgrounds and picnic areas are closed to reduce resource impacts. Satisfaction throughout all alternatives would be mixed, mostly depending on which activities are available to which user groups and how well the national forests accommodate increased visitation. The broadest range of recreation opportunities is expected in Alternatives 4 and 5, and to some degree Alternatives 2 and 4a. The range of opportunities is less in Alternatives 3 and 6.

Operational capacities are being reached and exceeded at some popular facilities now. Many more facilities (especially large, more developed sites near urban areas during the summer season, weekends and holidays) would reach and exceed this limit over the next 15 years, especially in Alternatives 1, 2, 3 and 6. Alternative 4 is the only alternative that is projected to meet most future recreation demands. Alternative 5 focuses primarily on accommodating the increased demand for motorized uses.

Dispersed vehicle camping offers a unique recreation opportunity to visitors from heavily urbanized areas in southern California. Resource impacts result not only from the dispersed campsite location and associated activities but also from off-road driving and creation of roads to the campsite. Dispersed vehicle camping impacts pose a major threat to the viability of a number of plant and wildlife species and their habitats, riparian areas and water quality. These concerns are the greatest in Alternative 5 and the least in Alternatives 3, 4a and 6; Alternatives 1, 2 and 4 are in between primarily because of accessible acreage according to land use zones. Specific national forest policies would continue to differ in each alternative.

Conservation education and partnership programs and projects would continue to be an emphasis in all alternatives at varying levels. These programs and projects remain beneficial to the Forest Service, partners and the public, varying by alternative theme.

Wilderness education is emphasized in Alternatives 2, 3, 4, 4a and 6 in an effort to protect wilderness values. In all of the alternatives, information, management and regulation enforcement are also expected to help protect wilderness values.

Alternative 1 continues the current minimal level of programs and projects. Alternatives 2, 4 and 4a would increase conservation education and partnerships and focus on recreation. Alternatives 3 and 6 would develop a maximum use of a focused and coordinated conservation education program and partnerships focused on habitat and species-at-risk. Alternative 5 would minimally use conservation education and would focus on motorized activities.

Currently, national forest landscapes are largely natural or natural-appearing, except for a few areas that have been noticeably altered. The most obvious general effects on scenic resources are derived from unplanned natural occurrences, such as wildfire, and from vegetation and landform alterations associated with management activities to address tree mortality, forest health, fire suppression, road construction, and utility and communication-site infrastructure. Landscape management strives to meet the public's scenery expectations for the management of national forest landscapes.

The Scenery Management System recognizes the interdependence of aesthetics and ecological systems and promotes natural-appearing landscapes. In most alternatives, landscapes would be managed to maintain a natural appearance, characterized by scenic integrity objectives of high and very high.

Forest Goal 3.2 - Retain a Natural Evolving Character within Wilderness.

Visitor satisfaction in wilderness is gauged by the general level of development expected in adjacent areas and key indicators of how well the wilderness system can be expected to provide solitude, challenge and untrammeled ecological processes desired for these areas. Existing wilderness is retained in all alternatives, leaving areas recommended for designation as the primary measure of variation between alternatives.

Visitation in most existing wilderness is expected to increase regardless of alternative, mostly in the form of day hiking, backpacking, and equestrian use. Corresponding increases in recreation-associated impacts on sensitive wilderness resources at trail and camping hotspots can be expected, especially in the more popular wildernesses near urban areas. Most of the wilderness backcountry will remain unvisited because of steep terrain and dense vegetation. Additional areas recommended as wilderness (if designated) could redistribute some of this use. In some cases, the use in existing relatively undisturbed areas could increase as a result of that wilderness designation. Alternatives 3 and 6 have the most opportunity for additional areas to provide wilderness experiences. Wilderness education will be emphasized in Alternatives 2, 3, 4, 4a and 6 in an effort to protect wilderness values. In all alternatives, information, management and regulation enforcement are expected to also help protect wilderness values. Additional management could include strategies such as greater conservation education, field presence (including volunteers), quota and permit systems, group size limits, camping and fire restrictions, and designated campsites.

Roads are not allowed within wilderness; however, construction and reconstruction of roads near wilderness boundaries can potentially affect wilderness resources by increasing access to the wilderness. Road-building activities near wilderness boundaries have the potential (in some types of terrain and vegetative cover) to increase inappropriate wilderness use by creating potential unauthorized motorized entry points. In the short term, increased noise levels would change the user's perception of being in a remote area. Improved access could also result in increased recreation use. Alternative 5 would allow the most roaded access. There are few buildings in existing wilderness, and few effects are anticipated. It is anticipated that few, if any, new non-motorized trails will be constructed in any designated wilderness. Existing trails within wilderness are mostly in fair to poor condition; insufficient trail maintenance has the potential to allow soil movement and loss and to increase public safety concerns. More emphasis on reconstruction or maintenance of non-motorized trails would be placed in Alternatives 2, 4, 4a and 6.

Forest Goal 4.1a - Administer Minerals and Energy Resource Development while Protecting Ecosystem Health.

Reserving and withdrawing lands from mineral entry has the effect of reducing the amount of lands available for minerals location, leasing, and mineral materials development. Table 312: Percent of Land Area Expected to be Withdrawn from Mineral Entry (page 65) lists expected percentages of withdrawals for each national forest by alternative. Alternatives 3 and 6 consistently anticipate considerably larger acreages of mineral withdrawals, while Alternative 5 anticipates little to no increase from current (Alternative 1) levels. In Alternatives 2, 4 and 4a moderate increases in withdrawn acres are anticipated.

The impact of conditions and stipulations on minerals and energy operations depends mostly on where those operations are located and what resources or activities they may affect. Those restrictions are likely to be similar under all alternatives for any given area. Alternatives 6, 3 and 4a could impose additional restrictions for increased protection of species, habitats and watersheds.

Forest Goal 4.2: Infrastructure needed to transport energy into and out of southern California and between sub-regional areas is developed in designated utility corridors

The key consideration or main factor that affects the management of non-recreation special uses (and the designation of sites and corridors) is the suitability of land use zones for consideration of these uses. The land use zones suitable for consideration of non-recreation special uses and the designation of sites and corridors on National Forest System land are Developed Area Interface, Back Country, and Back Country Motorized Use Restricted. Alternatives that include more acreage zoned as suitable for these uses (and include more access) would have a higher potential to consider and meet the demand for non-recreation special uses. Table 308: Acreage Suitable for Consideration of Non-Recreation Special Uses, page65, illustrates the variation in suitable acreage by alternative.

Forest Goal 5.1: Improve watershed conditions through cooperative management.

The watershed resource consists of surface water, groundwater, riparian areas, and the landscapes that make up the watersheds. Generally, adverse impacts on watersheds can be minimized or eliminated when all applicable measures (as described under the resource protection measures) are effectively applied. Alternative 6 would have the lowest risk to watershed resources and involves the most diverse types of restoration efforts. Watershed resources quantity and quality are expected to increase under Alternative 3. Because Alternatives 4 and 4a would be proactive in response to possible detrimental effects through mitigation and an adaptive management approach, watershed resources would be at less risk than under Alternatives 1, 2 and 5. Under Alternative 2, watershed resources would be sustained at slightly above the level that under Alternative 1, which would not substantially change the current risk to watershed resources. Alternative 5 would have the highest risk to water resources quantity and quality and to aquifer integrity because of its increased potential for land disturbance and likely increased pressure to develop water sources on the national forests.

Forest Goal 5.2: Improve riparian conditions.

Water and riparian resources receive protection from national forest management under all alternatives through the application of design criteria (standards) that would limit the extent and duration of any adverse environmental effects. Nevertheless, some adverse effects are unavoidable.

The possibility for damage to riparian ecosystems would be greater in those alternatives that would allow more ground-disturbing activities (for example, road building and reconstruction, recreation facility construction, and commodity development), such as Alternative 5 and, to a lesser degree, Alternatives 4 and 4a. The resource protection measures described above are expected to prevent widespread or long-term deterioration of water or riparian resources. During implementation of this plan, some short-term adverse effects can be expected, but no long-term negative effects are anticipated. It is impractical to complete a cumulative watershed effects analysis at the scope and scale of this strategic level of forest planning. Cumulative watershed effects analyses using the USDA Forest Service, Region 5 methodology (FSH 2509.22) will be developed at the project level.

Forest Goal 6.1: Move toward improved rangeland conditions as indicated by key range sites.

The forest plan does not make site-specific decisions that would determine which grazing areas will be used. Most existing active grazing areas would continue under Alternatives 1 through 5, with a substantial reduction under Alternative 6. Vacant grazing areas recommended for closure vary in Alternatives 2 through 4a and 6. Rangeland condition is most likely to be affected by the overall intensity of grazing that can be expected. Alternatives 1 through 5 apply suitability criteria that are expected to retain grazing use at moderate levels. Alternative 6 would limit where grazing could occur due to a change from 60 percent to 20 percent in the slope suitability criterion; as a result grazing would occur primarily in the flatter, more productive areas (lands with the greatest forage productivity) at moderate levels. Annual and long-term monitoring of rangeland condition in key grazing areas would continue in all alternatives. Slow improvement in condition is anticipated based on forest plan design criteria and observed trends.

Forest Goal 6.2: Provide ecological conditions to sustain viable populations of native and desired nonnative species.

Biological diversity will be managed in all alternatives but will vary by the theme of each alternative and the emphasis of each program area (see table 202: Comparison of Conservation Emphasis in Alternatives, page 79). A wide variety of plant and animal species will receive protection from impacts of national forest management activities through the application of standards that would limit the extent and duration of disturbance that could occur. Standards are the same in Alternatives 2 through 6. Federally listed species would receive the greatest level of protection and benefit through standards, with Forest Service sensitive species having only slightly less. Because there are so many listed and sensitive species on the national forests of southern California distributed across a variety of habitat types, however, the protection provided by standards would help sustain many other species as well.

The degree to which alternatives would maintain or improve habitat conditions for species that are at risk from Forest Service activities varies, based primarily on the extent of motor vehicle access that would be allowed by land use zoning and secondarily on the amount of emphasis that would be put into carrying out habitat improvement activities. Many of the activities that pose a threat to sustainability of species and habitats are associated with motor vehicle access (e.g., see Table 203: Threats to plant species-at-risk, page 80). The projected effects of forest plan decisions, including land use zones and special designations, on the expected distribution and persistence of 149 species identified as being potentially at substantial risk from Forest Service activities were expressed as viability outcomes for forest plan alternatives.

Table 202. Comparison of Conservation Emphasis in Alternatives

Conservation Emphasis	Existing Situation**	Relative Changes	Relative Changes	Relative Changes	Relative Changes	Relative Changes	Relative Changes
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
Education/Information/Interpretation	Periodic (not focused)	Periodic (not focused)	Frequent (focused)	Continuous (focused)	Continuous (focused)	Occasional (not focused)	Frequent (focused)
Survey/Inventory/ Increased Knowledge	Continued gradual increase	Moderate increase	Rapid increase	Gradual increase	Moderate increase	Gradual increase	Rapid increase
Habitat Restoration/Improvement	Continued progress	Moderate	Strong	Limited (focused on developed recreation sites)	Moderate (focused on developed and dispersed recreation sites)	Limited	Strong
Monitor and Mitigate	Relatively little	Relatively little	Less needed	More needed	Less needed	Most needed	Least needed
Habitat Protection	Continued progress	Better	Better	Better	Better	Worst	Best
Overall progress towards Desired Condition (Rating 1st = fastest, 7th = slowest)	6th Slow	5th Slow	2nd Substantial	4th Substantial	3rd Substantial	7th Little or none	1st Substantial

**Existing situation is qualitatively described in Alternative 1. The other alternatives are qualitatively described in relation to changes from Alternative 1.

Table 203. Threats to Plant Species-At-Risk

Potential Threats	Percent of plant species-at-risk that are affected (from species accounts)
Private land development	20
Vegetation management, including WUI zone fuel treatments, fuelbreaks and prescribed fire	31
Recreation	14
Narrow endemism	14
OHV use	10
Grazing	10
Roads	9
Weeds	6
Altered hydrology	5
Mining	16
Frequent fire	4
Infrequent fire	4

For most animal species, Alternatives 3, 4a, and 6 would produce the greatest number of more favorable viability outcomes compared to the current situation (Alternative 1) for at-risk species, followed by Alternative 2. Alternative 6 would provide the most favorable outcomes for at-risk insect and plant species, with Alternative 3 second. Alternatives 4a and 2 would have next highest numbers of favorable viability outcomes for insect and plant species. Alternative 4, which would make the greatest effort to accommodate increased recreation demand while emphasizing biodiversity protection, would have slightly more favorable viability outcomes than Alternative 1 for at-risk species. Alternative 5 would have fewer favorable viability outcomes than under current conditions due to the increased area available for public motorized access, which would result in greater levels of potential habitat disturbance and alteration, and greater emphasis on accommodating requests for special uses, which frequently result in habitat disturbance.

Native and desirable nonnative species not considered to be at risk from Forest Service activities would persist in more or less their current abundance and distributions under all alternatives. However, Alternatives 6 and 3, which emphasize biodiversity conservation and more wilderness recommendations, and Alternative 4a, which has more acreage in Back Country Motorized Use Restricted zoning, would be more likely to result in improved habitat conditions for these species, particularly when compared to Alternative 5.

Forest Goal 7.1: Retain natural areas as a core for a regional network while focusing the built environment into the minimum land area needed to support growing public needs.

Numerous early laws that guided acquisition, disposal, reservation and management of public lands largely patterned the original land reservations for the national forests. The resulting ownership pattern of the national forests became one of mixed ownerships between public and non-public lands that still remain to this day. Modern management emphasis of the recent forest plans has been toward consolidation of National Forest System lands for better manageability and to sustain natural resources. Continued emphasis on reducing landownership complexity would promote administrative efficiency, improve habitat condition, protect watersheds, improve access, provide community protection and foster retention of clear title to National Forest System land.

Table 313: Ownership Complexity displays present landownership complexity as a ratio of National Forest System land area to the property boundary edge of non-national forest ownerships. A lower ratio generally indicates a less complex or more consolidated ownership pattern. Areas with the highest

complexity ratios could be emphasized for adjustment. Progress could be tracked by monitoring changes to the ratios.

Table 313. Ownership Complexity

Forest	Miles NFS	Miles/sq.mile	Miles Private	Miles/sq.mile
Angeles	1,242	1.13	462	0.42
Cleveland	1,299	1.44	1,058	1.17
Los Padres	2,918	0.95	1,728	0.56
San Bernardino	1,665	1.32	1,018	0.81

Over time, adjustments to consolidate landownership have increased the land base of the national forests at a rate of about 2,000 acres per year, while decreasing the amount of boundary with non-National Forest System lands by about 30 miles per year within the Congressional boundaries of the national forests. This rate of adjustment is expected to continue for all alternatives; however, the theme of each alternative would influence which parcels are selected for adjustment and benefits obtained.

Affected Environment

Natural Resources Environment

Vegetation Condition and Forest Health

Alpine and Subalpine Habitats

Alpine and subalpine habitats occur at elevations above 8,500 feet (2,800 meters), with the highest peaks at around 11,500 feet (3,500 meters). However, on cooler aspects in the Transverse and Peninsular Ranges, subalpine plants dip to elevations as low as 7,900 feet (2,400 meters) (Barbour 1988, Stephenson and Calcarone 1999).

Because they are restricted to high mountain peaks, alpine and subalpine habitats are naturally isolated and generally small in size. Some refer to alpine areas in southern California as "subalpine barrens" because they occur at elevations below the regional climatic treeline (Billings 1988). Analogous to island ecosystems, the large distances separating alpine peaks generally result in distinctive floras on each peak. For example, the alpine floras of the San Bernardino and the San Jacinto Mountains are only about 40 percent similar to one another (Barbour 1988).

Isolated distributions and limited areal extents combined with the distance from similar habitats in the Sierra Nevada Mountains result in a relatively species-poor alpine flora in the southern California mountains, especially in the San Gabriel and San Jacinto Mountains (Barbour 1988). A few alpine plants in southern California are narrow endemics (native to and restricted to a relatively limited area) while others are widely distributed with disjunct populations on peaks in the Sierra Nevada Mountains, Great Basin, and even in the Rocky Mountains (Major and Taylor 1988).

Alpine cushion plants and their plant communities occur above treeline (Barbour 1988, Stephenson and Calcarone 1999). Plants in this habitat exhibit a number of adaptations to the harsh climate and soil conditions of these environments. Most are highly efficient in their use of nutrients, often show opportunistic pulses of growth that take advantage of nutrient availability, and have abbreviated reproductive cycles that enable them to flower and set seed in the short growing seasons of high elevations. Many species are fragile cushion plants that have low, compact growth and thick, leathery leaves, enabling them to minimize water and heat loss as well as to withstand wide daily temperature extremes, intense insolation, droughty soils and persistent winds. Seedling establishment of these species tends to be sporadic and limited by the availability of soil moisture, extreme temperatures, and frost heaving (Billings 1988, Major and Taylor 1988).

Alpine habitats are vulnerable to trampling by hikers and other forms of ground disturbance (Billings 1988), but these impacts are limited to a small number of locations around developed recreation areas and along trails and roads (Stephenson and Calcarone 1999). In some areas, trampling from hiking, rock climbing, camping, and road building has removed or degraded alpine habitats (Stephenson and Calcarone 1999) but, for the most part, they remain largely intact and undisturbed.

Subalpine forests are dominated by lodgepole pine (*Pinus contorta* ssp. *murrayana*), limber pine (*P. flexilis*), and white fir (*Abies concolor*). Typically, they are characterized by slow-growing, small-diameter trees which create forests with open canopies and tree heights ranging from 33 to 59 feet (10 to 15 meters). Understory cover is typically sparse and discontinuous.

Lodgepole pine dominates lower subalpine forests above 7,900 feet (2,400 meters) in areas of maximum snow depth. On mesic exposures, lodgepole pines grow from 60 to 70 feet tall (18 to 21 meters) in relatively dense stands. The forest understory usually is species-poor and has low cover, primarily because canopy shade and an extended period of snow cover inhibit understory development. Some of the common understory shrubs include whitethorn (*Ceanothus cordulatus*), greenleaf manzanita (*Arctostaphylos patula* ssp. *platyphylla*), and bush chinquapin (*Chrysolepis sempervirens*) (Barbour 1988).

On higher peaks, lodgepole pine forms krummholz, a term used for woodlands made up of deformed trees growing in widely spaced, low-growing, multi-stemmed prostrate mats. Krummholz is an environmental rather than genetic response to the harsh growing conditions near treeline. Because branches and needles are exposed to extreme winter weather and are vulnerable to winterkill (desiccation from strong winds and cold temperatures) and mechanical damage from blowing snow and ice, the height of krummholz clumps roughly corresponds to winter snow depth (Major and Taylor 1988, Thorne 1988).

Limber pine mixes with lodgepole pine throughout the subalpine zone but is common only at the higher elevations up to treeline, as well as on drier sites and rocky soils. Squaw currant (*Ribes cereum*), Great Basin sagebrush (*Artemisia tridentata*), snowberry (*Symphoricarpos* sp.) and squirreltail grass (*Elymus elymoides*) are frequent understory species in limber pine woodlands and forests. Above the treeline, limber pine (like lodgepole pine) also forms a krummholz (Major and Taylor 1988, Thorne 1988).

Factors controlling reproduction, growth and vegetation patterns in alpine and, to a lesser extent, in subalpine environments include poorly developed, shallow, rocky soils; short and highly variable growing seasons; extreme daily and annual temperatures; and high solar insolation (Major and Taylor 1988). Although total precipitation in these habitats is comparable to lower elevation montane conifer forests, alpine and subalpine habitats have much colder average temperatures and a higher percentage of precipitation falls as snow (Barbour 1988).

Available heat, extended duration of the snow-pack, low soil moisture, and an abbreviated growing season limit subalpine tree establishment and delineate the elevation of the treeline (Barbour 1988). Subalpine species exhibit numerous adaptations to the physical stresses of these high-elevation environments, including an efficient use of soil nutrients, high needle retention, high tolerance of poor soils, and the ability to reproduce in short, highly variable growing seasons (Barbour 1988). Seedling establishment of subalpine conifers like limber pine occurs sporadically and depends heavily on seed caching by species like Clark's nutcracker (*Nucifraga columbiana*). Once established, trees grow slowly but are long-lived.

Montane chaparral scrub in the subalpine zone typically occurs on rock outcrops, ridges, and xeric slopes. Characteristic species in this community are Sierra juniper (*Juniperus occidentalis* ssp. *australis*), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), and shrub species typical of subalpine forests. Unlike low-elevation chaparral, montane chaparral typically has a discontinuous, open canopy (Thorne 1988).

Lightning-ignited fires in alpine and subalpine habitats are confined to individual trees or small patches of vegetation (Minnich 1988). Fires are infrequent in these high-elevation forests because of low, discontinuous fuel loading. Fire suppression has not significantly altered the average interval between fires. The extremely steep terrain in the San Gabriel Mountains makes these forests particularly vulnerable to human-caused ignitions originating at lower elevations. Subalpine forests now burn in human-ignited, stand-replacing crown fires that spread from lower elevations during severe weather conditions. Several crown fires have burned subalpine forests in the San Gabriel Mountains in the last two decades but it is not known if they were unusually severe (Stephenson and Calcarone 1999).

Montane Conifer Forests

Montane conifer forests cover are dominated by varying combinations of ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*P. jeffreyi*), white fir, black oak (*Quercus kelloggii*), canyon live oak (*Q. chrysolepis*), sugar pine (*P. lambertiana*), incense cedar (*Calocedrus decurrens*), and Sierra juniper. Late seral montane conifer forests typically range from 100 to 200 feet (30 to 60 meters) in height, have a 50 to

80 percent average overstory cover, and have trees up to 40 inches (1 meter) in diameter at breast height (dbh) (4.5 feet [1.5 meters] above ground). Understory grass and herbaceous cover is usually low, averaging only 5 to 10 percent (Barbour 1988). Drier slopes and transmontane areas have trees of much smaller stature (40 to 65 feet [12 to 20 meters]) with open canopies (20 to 40 percent cover), giving them a "parklike" appearance (Barbour 1988; Thorne 1982, 1988; Vasek and Thorne 1988).

Ponderosa pine forests are common between elevations of 5,000 to 6,900 feet (1,524 to 2,100 meters) on cismontane slopes; at their lower limits they mix with lower montane forests (see page 91). Because Jeffrey pine is more cold and drought-tolerant than ponderosa pine, it replaces ponderosa pine at all elevations on the interior slopes. Above 6,900 feet (2,100 meters) ponderosa pine forests give way to those of Jeffrey pine.

Both ponderosa and Jeffrey pines form open woodlands with less than 50 percent canopy cover, especially on gentle slopes and drier south- and west-facing exposures. Understory shrubs are common in openings and in canopy gaps and include manzanita (*Arctostaphylos* spp.), curl-leaf mountain mahogany, Great Basin sagebrush, bitter cherry (*Prunus emarginata*), western chokecherry (*Prunus virginianus* var. *demissa*), mountain whitethorn, and snowberry. Canyon live oak (*Quercus chrysolepis*) and black oak (*Q. kelloggii*) can also be common mid-story tree associates (Barbour 1988, Thorne 1982). At the lower elevations of transmontane slopes, Jeffrey pine woodland merges with, and is eventually replaced by, pinyon-juniper woodlands.

White fir and sugar pine occupy mesic, steep, north- and east-facing aspects. In the San Gabriel and San Bernardino Mountains, white fir and sugar pine are abundant between 5,500 and 9,800 feet (1,675 and 2,590 meters). Incense cedar is also a frequent component of these stands. Understory shrubs include species of currant and gooseberry (*Ribes* spp.), snowberry, blue elderberry (*Sambucus caerulea*), and thimbleberry (*Rubus parviflorus*) (Thorne 1982).

The northern Santa Lucia Range (Monterey Ranger District, Los Padres National Forest) and the San Diego Ranges have relatively depauperate montane conifer forests. In the northern Santa Lucia Range, montane conifer stands consist of canyon live oak, sugar pine, Santa Lucia fir (*Abies bracteata*) and ponderosa pine (Stephenson and Calcarone 1999). In the San Diego Ranges, these forests form relatively dense stands of ponderosa pine, white fir and sugar pine that cover mesic slopes of the Cuyamaca and Palomar Mountains. The drier, more southern Laguna Mountains have a stronger transmontane affinity and support open stands of Jeffrey pine, black oak, and canyon live oak (Beauchamp 1986).

Historically, montane conifer forests were dominated by multi-layered, old-growth stands with large-diameter trees and frequent canopy openings. Frequent, patchy, low-to moderate-intensity surface fires maintained this open structure, and species composition was well represented by light-loving conifers like ponderosa, Jeffrey and sugar pine. Fire return intervals averaged 30 to 50 years (Everett 2003). Frequent fires maintained open understories, reduced the density of shade-tolerant white fir and incense cedar, and favored recruitment of Jeffrey, ponderosa and sugar pines (Minnich 1988).

In the late 1800s, the structure and species composition of montane conifer forests changed dramatically as a result of logging and, later in the early 1900s, by fire suppression. Air pollution, periodic drought, diseases, and bark beetle infestations have compounded the effects of logging and fire suppression. As a result of these changes, the density of suppressed understory trees has increased markedly, especially densities of shade-tolerant species like white fir and incense cedar, which in many locations have replaced ponderosa and Jeffrey pines in both the overstory and understory (Minnich 1988). Large-diameter, canopy dominants have shifted toward white fir and incense cedar, with a concomitant reduction of Jeffrey pine, ponderosa pine, and black oak. However, because white fir and incense cedar have been unable to colonize the drier, transmontane slopes, species composition and stand structure in these regions has changed little over time (Stephenson and Calcarone 1999).

The last 95 years of fire suppression have been unusually effective in montane conifer forests. Nearly 66 percent of these forests have no recorded fires in the modern era, and 88 percent have not burned in the last 40 years (Stephenson and Calcarone 1999). The few fires that have occurred were either wind-driven in steep terrain (for example, the 1980 Thunder Fire in the San Gabriel Mountains) or spread into these forests from fires starting at lower elevations, usually in chaparral (e.g., the 1950 Conejos, 1970 Laguna, and 2003 Cedar Fires in the Cuyamaca and Laguna Mountains; the 1970 Bear and the 2003 Old and Grand Prix Fires in the San Bernardino Mountains).

The remarkable success of fire suppression has created an unnatural increase in the density of understory trees, especially shade-tolerant white fir and incense cedar. Increases in stand densities have fundamentally changed ecosystem processes in many of these forests. Understory competition has caused tree mortality, outbreaks of disease, and a reduction in recruitment of large overstory trees. More importantly, fires behave differently in these altered forest conditions. In the past, understory fuels burned primarily as surface fires with occasional passive crown fires and infrequent active crown fires; however, in recent decades the risk of stand-replacing crown fire events has increased dramatically because of forest-floor fuel accumulations, fuel ladders of small trees, and standing dead or dying trees. As a result, fires have become more intense and burn larger, more continuous areas.

Although stand-replacing fires in southern California conifer forests still are relatively uncommon, there is a well-founded concern that they will become more common, as evidenced by the recent history of other national forests that have experienced similar fuel profile changes. On the Boise National Forest in Idaho, for example, years of near-complete fire exclusion ended when a series of crown fires consumed 45 percent of the ponderosa pine forests between 1986 and 1995. The severity of these fires was attributed directly to excessive fuel loading that developed during the prolonged absence of fire. Similar large and unusually intense wildfires have also plagued the Sierra Nevada Mountains and the mountains of northern Arizona (Stephenson and Calcarone 1999).

At greatest risk of catastrophic fire are mesic forests where dense understory trees develop rapidly. The Forest Service developed a predictive, GIS-based spatial model to estimate the amount of area likely to have overcrowded forest conditions and associated crown fire risk. The model predicts that almost 30 percent (108,500 acres [43,909 hectares]) of montane conifer forests on the four southern California national forests now or will suffer overstocking by understory trees (Stephenson and Calcarone 1999).

In the past five years, an unprecedented drought in southern California has led to widespread tree mortality. In October 2003, fires burned quickly from drought-stressed chaparral into some forested areas of southern California. As destructive as the October 2003 fires were, many other montane forests continue to be at risk from similar fires, because over 90 percent of drought-affected or "dead tree" forests did not burn in the October 2003 fires.

Most of the land base capable for commercial timber harvest in southern California is on the San Bernardino National Forest. Localized timber harvesting began with European settlement, and an active timber program was sustained on the San Bernardino National Forest from the late 1940s through the mid 1980s (Minnich 1988). Harvest levels peaked in the 1960s, with a maximum of 27.4 million board feet (MMBF) taken from the San Bernardino National Forest in 1963.

Nevertheless, the relatively small volumes produced in these areas were not sufficient to support economically viable sawmill operations, and logs had to be trucked long distances to the nearest mill. The same problem ultimately reduced timber harvest operations in the San Bernardino National Forest. The national forest's timber program ended in the late 1970s after closure of the last mill in the area (Stephenson and Calcarone 1999).

In the last two decades, timber programs on the four southern California national forests have focused on maintaining and improving forest health: that is, treating centers of insect and disease; understory thinning, and fuels reduction; meeting local demand for fuelwood; and identifying and removing hazard trees. Small-scale salvage operations to remove trees killed by wildfire or bark beetles have also taken place (Stephenson and Calcarone 1999).

A major focus of southern California national forests' management of montane conifer forest is to reduce the risk of crown fires through an active vegetation management program. The general direction of national forest management will be to create more open, less dense forests than those that exist today and to reduce stand-threatening ladder and ground fuels. At the same time, it is recognized that complete elimination of stand-replacing fires is unrealistic and not necessarily desirable, since weather, topography and fuels create localized patches of high intensity, passive crown fires. Rather, the goal will be to reduce the likelihood of the type of fires that burned in October 2003.

Forest Insects and Pathogens

The recent, historically unprecedented drought has dramatically increased tree and chaparral mortality on the four southern California national forests. Drought-weakened trees became increasingly vulnerable to attack by insects. The drought began in 1999. By 2001, tree mortality was apparent in the San Bernardino Mountains, in the eastern portion of the San Gabriel Mountains (Angeles and San Bernardino National Forests), in the San Jacinto Mountains (San Bernardino National Forest), and in the Palomar and Laguna Mountains (Cleveland National Forest). Although equally severe droughts likely occurred prior to European settlement, this drought is thought to be unprecedented in its effects. Southern California national forests are artificially dense (attributed to fire suppression, as described above) and in many places are highly impacted by air pollution, leading to greater mortality than would likely have occurred under presettlement stand conditions.

Table 565 shows the acres of woody plant mortality mapped 2001 to 2004. These figures included shrub mortality in addition to forest trees. Precipitation was significantly above average over the winter of 2004 to 2005, and new tree mortality associated with drought and pests is expected to be low.

Table 565. Acres of Woody Plant Mortality On The Four Southern California National Forests.

National Forest	2001	2002	2003	2004
Angeles	394	965	11,570	62,600
Cleveland	401	7,465	82,319	134,675
Los Padres	No data	19,214	5,522	13,710
San Bernardino	5,793	66,401	521,752	147,204

Data from USDA Forest Service, R5, Forest Health Protection aerial surveys.

The numbers in Table 1 include mortality above 1 percent (background) that was mapped each year. Each year’s maps represent new mortality but not necessarily on new acres; thus the same area may have been mapped each year if mortality continued.

The effects of drought have been most severe in the San Bernardino Mountains and Peninsular Ranges. In some areas of the San Bernardino Mountains tree mortality exceeded 80 percent. Trees died because they could not obtain enough soil moisture to sustain minimal metabolic processes to enable them to resist insects. Bark beetles (*Dendroctonus* spp. and *Ips* spp.) quickly invade and kill drought-stressed trees. In addition to the extensive tree mortality, large areas of chaparral also suffered extensive top-kill and some shrub death.

A number of pathogens have contributed to tree losses, the most serious of which are the dwarf mistletoes (*Arceuthobium* spp.) and annosum root disease (*Heterobasidion annosum*). Either of these agents alone can kill trees in years of adequate precipitation, dwarf mistletoe (a parasitic plant) by utilizing the host’s water and photosynthate, and root disease by killing roots. Drought exacerbates the physiological effects of these pathogens. Other significant forest pests include true mistletoes (*Phoradendron* spp.), which attack hardwoods and some conifers (e.g., white fir and juniper), Armillaria root disease (*Armillaria* *mellea*) in oaks and conifers, and blackstain root disease (*Leptographium wageneri*) in pinyon pine (*Pinus monophylla*) in the San Bernardino Mountains.

The most aggressive and rapidly reproducing of the native bark beetles in southern California is the western pine beetle (*Dendroctonus brevicomis*), which can overcome the defenses of even vigorously growing trees. The other aggressive species are the mountain pine beetle (*D. ponderosae*) and the Jeffrey pine beetle (*D. jeffreyi*). All of the bark beetles have specific host ranges and other ecological needs (tree size and condition, climatic range). For example, the principal hosts of mountain pine beetle are ponderosa, lodgepole, and sugar pine, while the principal hosts of western pine beetle are Coulter and ponderosa pine. Jeffrey pine beetles only attack Jeffrey pines. These latter two species have 1 to 2 generations/year in southern California, while the western pine beetle may have 4 to 5. Thus the mountain and Jeffrey pine beetles were slower to respond to the presence of large numbers of drought stressed trees.

Other insects which cause significant damage in the national forests of southern California include the pine and fir engraver beetles (*Ips* spp. and *Scolytus ventralis*) and the California flatheaded borer (*Melanophila californica*). These species rarely attack vigorously growing trees. See table 556 (Forest Pest Species), page **89** for a list of pest species and the trees they affect.

Southern California national forests are also threatened by nonnative pests. *Phytophthora ramorum* (cause of sudden oak death and other diseases) is present on the Monterey Ranger District, Los Padres National Forest, and on adjacent lands of various ownerships. The pathogen is killing coast live oak (*Quercus lobata*) and tanoak (*Lithocarpus densiflorus*) in ecosystems with coast redwood (*Sequoia sempervirens*), California bay laurel (*Unbellularia californica*), and other species. The infestation extends to just south of Plaskett Creek. Surveys indicate it is not present in other wildland areas in southern California, but the pathogen has been detected and eradicated on nursery container plants in several southern California nurseries.

Tanoak and coast live oak mortality has occurred on approximately 8,400 acres in the Big Sur region, and the area of mortality likely will continue to grow. The Los Padres National Forest is working with a consortium of federal, state and private entities searching for ways to slow or stop the spread of this disease, as well as to learn how mortality changes the fire regime and successional dynamics of mixed evergreen forests. The Los Padres National Forest is implementing sanitation and education/outreach programs to prevent pathogen spread by employees or others. See `http://www.suddenoakdeath.org` for further information on *Phytophthora ramorum* and the diseases it causes.

Pine pitch canker, caused *Fusarium circinatum*, occurs on a variety of native and ornamental pines. Monterey and Bishop pines (*Pinus radiata, P. muricata*) receive the most damage. Infection may cause branch dieback and death, although many trees are able to live with this pathogen. The disease occurs in coastal areas in and adjacent to the Los Padres National Forest from Santa Barbara to Monterey. Go to `http://frap.cdf.ca.gov/pitch_canker/` for updated information.

White pine blister rust (*Cronartium ribicola*) is a serious threat to white pines in southern California, although it has not yet (May, 2005) been found south of Breckenridge Mountain on the Sequioa National Forest in California.

Table 556. Forest Pest Species

PEST SPECIES	**Ponderosa pine**, *Pinus ponderosa*	**Sugar pine**, *Pinus lambertiana*	**Jeffrey pine**, *Pinus jeffreyi*	**Coulter pine**, *Pinus coulteri*	**White fir**, *Abies concolor*	**Singleleaf pinyons**, *Pinus monophylla* **and** *P. californiarum* **ssp.** *californiarum*	**Incense cedar**, *Calocedrus decurrens*	**Giant sequoia (not native to southern California)**, *Sequoiadendron giganteum*	**California black oak**, *Quercus kelloggii*
Western pine beetle, *Dendroctonus brevicomus*	X	-	-	X	-	-	-	-	-
Mountain pine beetle, *Dendroctonus ponderosae*	X	X	-	@	-	@	-	-	-
Jeffrey pine beetle, *Dendroctonus jeffreyi*	-	-	X	-	-	-	-	-	-
Red turpentine beetle, *Dendroctonus valens*	#	#	#	#	-	#	-	-	-
Pine engraver beetles, *Ips* spp.	#	#	#	#	-	-	-	-	-
Pinyon pine engraver, *Ips confusus*	-	-	-	-	-	#	-	-	-
California flatheaded borer, *Melanophila californica*	X	#	X	#	-	-	-	-	-
Fir engraver, *Scolytus ventralis*	-	-	-	-	#	-	-	-	-
Fir roundheaded borer, *Tetropium abietis*	-	-	-	-	#	-	-	-	-
Ambrosia beetles, *Monarthrum* spp.	-	-	-	-	-	-	-	-	#
Bark beetles, *Pseudopityophthorus* spp.	-	-	-	-	-	-	-	-	#
Dwarf mistletoe, *Arceuthobium* spp.	#	#	#	#	-	#	-	-	-
White fir mistletoe, *Phoradendron pauciflorum*	-	-	-	-	#	-	-	-	-
Oak mistletoe, *Phoradendron villosum* subsp. *villosum*	-	-	-	-	-	-	-	-	#
Annosus root disease, *Heterobasidion annosum*	X	X	X	X	X	-	X	X	-
Armillaria root disease, *Armillaria mellea*	#	#	#	#	#	-	-	-	#
Black stain root disease, *Leptographium wageneri*	-	-	-	-	-	X	-	-	-

X = relatively high ability to kill vigorously growing trees
# = lower ability to kill vigorously growing trees
@ = occasional host
The Jeffrey pine beetle occurs in the San Gabriel and San Bernardino Mountains but not in the mountains of Riverside and San Diego Counties
Black stain root disease occurs in the San Bernardino Mountains but has not been found in other portions of southern California.
It is not clear that the California flatheaded borer can kill trees unassisted
None of these pests are associated with Parry pinyon, *Pinus quadrifolia*.

Montane Meadows

Montane meadows are grass- and herb-dominated plant communities within lower and upper montane conifer and mixed hardwood-conifer forests. Typically, montane meadows are highly productive, with continuous vegetative cover and a species-rich flora dominated by sedges, rushes, grasses, and herbs (Thorne 1988). Meadow species composition varies with interactions of moisture, elevation and geographic location. Saturated soils during the growing season and competition from meadow grasses and herbs prevent the colonization of meadows by upland vegetation. Meadows are classified as wet, dry, or alkaline but are usually relatively wet throughout the year compared to more seasonally dry adjacent upland plant communities (Holland 1986). Narrow meadows bordering stream courses are referred to as "stringer meadows" (Holland 1986).

Montane meadows have a patchy distribution in mountains of southern California. Typically, they are restricted to sites where there is a combination of gentle slope gradient, relatively impervious bedrock, high soil moisture retention, shallow depth to groundwater, and fine-textured soils. In fact, many meadows form along fault zones or other geologic contact points that impound groundwater (Stephenson and Calcarone 1999).

The San Bernardino and San Gabriel Mountains, which have high relief and rugged topography characteristic of recent mountain formation, support small, widely scattered meadows. The Peninsular Ranges and the southern Los Padres Ranges have less dissected topography; broad, intervening valleys are more common. In these settings, meadows are more expansive. The northern Santa Lucia and Santa Ana Mountains are almost devoid of meadows.

Factors that alter hydrogeomorphic processes can affect meadow stability and species composition. In mountain environments throughout the western United States, changes to montane meadow environments over the past 150 years have resulted from water storage and diversion, road and trail construction, livestock grazing, and changes in the fire regime. Many of these historical changes have produced similar effects: stream channel incision, meadow desiccation, a decrease in the cover and vigor of native vegetation, and the invasion of montane tree species and nonnative plant species. In general, the level of disturbance to meadow habitats decreases with increasing elevation.

Meadow habitats are particularly sensitive to activities and disturbances that alter hydrology, remove vegetation, or cause soil erosion, especially during the winter and spring when the ground is saturated. In meadow systems, particularly those on steeper slopes, erosion removes topsoil and fine-textured alluvium, resulting in gully formation. The resulting channelized surface runoff causes erosion and stream incision, which channels water away from the meadow, thereby lowering of its water table. Over time, meadow drainage leads to a shift to more drought-tolerant vegetation.

Grazing and trampling by livestock and ground disturbances by hikers, mountain bicyclists, and off-highway vehicles create conditions favorable for the establishment and spread of invasive nonnative plants into meadows (Stephenson and Calcarone 1999). Livestock grazing has been a long-standing activity in montane meadows in the southern California mountains since at least the early 1800s (Minnich 1988). Livestock have fundamentally altered or degraded vegetation and hydrogeomorphic processes of many montane meadows by increasing erosion, gully formation, stream incision, and streambank destabilization, and by shifting plant species composition from native perennials to nonnative annuals (Stephenson and Calcarone 1999).

When assessing the impacts of livestock grazing on meadows, it is important to distinguish the impacts of historical grazing from those of current grazing levels. Overgrazing in the late 1800s and early 1900s caused permanent environmental changes orders of magnitude greater than those resulting from current practices. Livestock use was particularly high in the meadows of the San Bernardino and San Jacinto Mountains; it is reported that 30,000 sheep were herded into Big Bear Valley in the late 1860s. Numerous accounts show that the highest levels of vegetation loss and erosion occurred during this period. Although sheep grazing was discontinued in the early 1900s, signs of their impacts persist to this day (Minnich 1988, Stephenson and Calcarone 1999).

Since 1900, summer has been the principle period of livestock use of montane meadows on the four southern California national forests. During the twentieth century, the intensity and extent of cattle grazing has declined steadily (Minnich 1988). Once the dominant use of meadows in the San Bernardino and San Jacinto Mountains, grazing has been greatly reduced as ranching in the surrounding valleys has declined. Today, the majority of livestock grazing occurs on the Los Padres National Forest and, to a lesser extent, on the Cleveland National Forest. Over time, gully systems may stabilize and form riparian habitat, as exemplified by the Knapp Ranch on the Angeles National Forest and in Thorne Meadow on the Los Padres National Forest (Stephenson and Calcarone 1999).

Because they are located in valley bottoms and have high moisture content, montane meadows have a low probability of burning from lightning fires. Native Americans may have deliberately set fire to some meadows for vegetation clearance, to increase forage quality for game animals, and to increase the productivity of desirable plant species (Denevan 1992, Lewis 1973). Shepherds in the nineteenth century set fires in meadows to improve forage for sheep (Minnich 1988). Fire suppression and the cessation of deliberate burning in the twentieth century may have favored tree and shrub encroachment into meadows, especially along their edges (Benedict 1989, DeBenedetti and Parsons 1979, 1984; Helms 1987, Helms and Ratliff 1987, Taylor 1990, Vale 1987, Vankat 1977).

In southern California, montane meadows are popular locations for recreation. Numerous organization camps, recreation areas and public campgrounds are concentrated in both montane conifer forests and meadows (such as Laguna Mountain, Cuyacama, Idyllwild, Barton Flats, Big Bear/Holcomb Valley, Lake Arrowhead, Big Pines, Crystal Lake, Mount Pinos/Cuddy Valley, and Pine Mountain). Recreation has affected meadow environments through road and trail construction and maintenance, trampling, unauthorized motor vehicle use, and mountain bikes. These activities have caused erosion, vegetation loss and channelized surface runoff, all of which contribute to gully formation, stream incision, meadow drying, and the invasion of upland and nonnative plants (Stephenson and Calcarone 1999).

Runoff from roads and trails appears to cause the most severe impacts to meadow habitats. Roads and trails can result in erosion and gully formation. Invasion of nonnative plant species has affected the plant composition of many meadows, especially those at lower elevations. For instance, the nonnative common dandelion (*Taraxacum officinale)* is hybridizing with the native California dandelion (*T. californicum*). The latter species is endemic to montane meadows on the San Bernardino National Forest and is endangered under the federal Endangered Species Act (Stephenson and Calcarone 1999).

Lower Montane Forests

Lower montane forests occupy the transition zone between foothill chaparral and montane conifer forests, mainly between 3,000 and 5,500 feet (914 and 1,676 meters), although they can extend to higher or lower elevations on some exposures. For the most part, lower montane forests are fragmented and patchily distributed across the Santa Lucia Mountains and along the coastal slopes of the Transverse and Peninsular Ranges. Stands tend to be relatively small, varying from 50 to 800 acres (20 to 325 hectares), and are often restricted to distinctive topographic settings in the midst of expanses of chaparral (Stephenson and Calcarone 1999).

Lower montane forests are frequently termed mixed evergreen forests because they are dominated by a combination of coniferous and broadleaf evergreen species. Bigcone Douglas-fir (*Pseudotsuga macrocarpa*), Coulter pine (*Pinus coulteri*), canyon live oak, coast live oak (*Quercus agrifolia*), and black oak are the most common lower montane tree species in the Transverse and Peninsular Ranges. In the Santa Lucia Mountains, tree species include madrone (*Arbutus menziesii*), California bay, tanoak, interior live oak (*Quercus wislizenii*), Santa Lucia fir (*Abies bracteata*), Douglas-fir (*Pseudotsuga menziesii* var.

menziesii), ponderosa pine, and knobcone pine (*P. attenuata*) (Barbour 1988, Stephenson and Calcarone 1999).

Coulter pine is a major lower montane forest tree between elevations of 3,950 and 5,900 feet (1,200 to 1,800 meters). It typically forms a canopy with 10 to 100 percent cover and often has a continuous understory shrub layer (Barbour 1988, Thorne 1988). In the Transverse and Peninsular Ranges, Coulter pine co-mingles with canyon live oak; at lower elevations it mixes with chaparral. At higher elevations, it grows with ponderosa pine and black oak.

Bigcone Douglas-fir and canyon live oak typically grow together in mesic sites such as shaded canyons, draws, old landslides, or on steep north- and east-facing aspects. Other species occasionally present with it on these sites include big-leaf maple (*Acer macrophyllum*), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) and California bay. At the upper end of their elevational range, lower montane forests range across all aspects and are less confined to canyons and escarpments (Barbour 1988, Stephenson and Calcarone 1999). Although bigcone Douglas-fir and Coulter pine seldom grow together, both readily associate with canyon live oak.

Small, disjunct stands of knobcone pine occupy the transition zone between chaparral and lower montane woodlands and higher elevation montane conifer forests (Vogl and others 1988). Knobcone pine is usually restricted to dry, shrub-covered, rocky sites with shallow soils (Stephenson and Calcarone 1999).

Fire is the dominant disturbing force shaping lower montane forests. Because these forests frequently occur as small patches within chaparral-dominated landscapes, lower montane forest fire regimes are heavily influenced by surrounding chaparral. For example, fires rarely start in bigcone Douglas-fir forests but instead spread into them from the surrounding chaparral (Minnich 1988).

Because it has thick bark and the ability to canopy-sprout, bigcone Douglas-fir is relatively fire-resistant (Gause 1966). Nevertheless, periodic wildfires have restricted this species to protected areas on steep, ravelly slopes with little understory vegetation or on rock outcrops and landslides. For the most part, the high-intensity wildfires that rage in chaparral only kill trees on the periphery of bigcone Douglas-fir populations or, if they burn into the stands, kill understory trees (Minnich 1977); however, occasionally fires destroy entire populations. Regeneration in these stands, if it occurs at all, is typically slow and highly unpredictable (Minnich 1980).

Consistent with the idea that bigcone Douglas-fir is restricted to fire refugia in steep terrain, stands most vulnerable to wildland fires occur on gentle slopes. Minnich (1980) recorded 37 percent survival of bigcone Douglas-fir following wildfires on slopes of less than 20 degrees, but more than 90 percent survival on slopes steeper than 40 degrees. Although bigcone Douglas-fir has the ability to crown sprout, sprouting is less likely when trees burn in crown fires.

Bigcone Douglas-fir seeds germinate in mineral soil, and seedlings require canopy shade and small openings for successful establishment. Consequently, if a stand is lost to a crown fire, regeneration may first require the establishment of canyon live oak, after which viable bigcone Douglas-fir seeds must disperse to the site from disjunct stands or from individuals surviving the fire (Stephenson and Calcarone 1999).

The primary management concern in lower montane habitats is the loss of bigcone Douglas-fir populations in stand-replacing wildfires. In the San Bernardino Mountains, Minnich (1999) documented a net loss of 18 percent of the aerial extent of bigcone Douglas-fir between 1938 and 1978. The highest losses took place in low elevation sites on steep chaparral-covered slopes (greater than 30 degrees) (Minnich 1980).

The closed-cone conifers have in common varying degrees of fire dependency. Fire opens closed cones, triggering massive seed releases that usually produce abundant late winter and early spring recruitment (Borchert and others 2004). Although all of these species exhibit closed-cone behavior, each has a unique set of life history attributes that dictate species-specific fire management. For example, both Tecate and Cuyamaca cypresses (*Cupressus forbseii*, *C. stephensonii*) require several decades to accumulate cone banks of sufficient size to replace mature, fire-killed trees (Zedler 1981). Others, like knobcone pine, produce cones at an early age (sometimes as early as two years; Keeley and others 1999b) and, compared to the cypress species and Coulter pine, are more resilient to short-interval fires (e.g., 15 to 20 years).

Coulter pine is the most widespread serotinous conifer on the four southern California national forests, covering 65,680 acres. This pine exhibits wide cone-habit variation, ranging from near complete serotiny where it grows in highly flammable chaparral and canyon live oak forests to mostly open cones in forests and woodlands subject to infrequent, low- to moderate-intensity surface fires (Borchert 1985).

Coulter pine exhibits numerous fire-adapted traits: seedlings establish profusely after periodic crown fires; it has a relatively short life span (50 to 100 years); seedlings thrive in full sunlight; and it bears serotinous cones which liberate seeds when subjected to intense heat. As a result, Coulter pine is more compatible with the chaparral fire regime than bigcone Douglas-fir. The biggest threats to Coulter pine (and to knobcone pine and the closed-cone cypresses) are multiple fires in short succession (for example, less than 25 years apart) or, more rarely, complete fire exclusion. Multiple, short-interval fires kill trees before an adequate closed-cone seed crop has developed (Sawyer and others 1988, Thorne 1988). Like Coulter pine, knobcone pine also produces serotinous cones and is even more dependent on fire for seed dispersal and seedling recruitment (Vogl and others 1988).

When overstory Coulter pines senesce and die without being burned, seedling establishment and stand persistence may be jeopardized. For example, during the height of the drought in the late 1980s, a bark beetle epidemic killed approximately 70 percent of Coulter pines on Palomar Mountain. Pine re-establishment has been poor because of competition and shading from chaparral.

The recent drought-caused mortality in Coulter pine in the San Bernardino National Forest has created another unusual situation. At least 27 percent (4,140 acres) of Coulter pine woodlands and forests have experienced some degree of drought-caused mortality. Moreover, in large areas, mortality is complete or near-complete. Thus, there is a genuine concern that dead and dying trees could lose their cone banks before fire opens them. Seeds that normally are released by fire could fall prematurely as cones deteriorate and open and seeds germinate in forest-floor conditions unsuitable for seedling establishment; or, because dead pines topple within five years, fire could kill seeds in closed-cones still on the trees or partially open cones on the ground.

Monterey Coastal Habitats

The coastal landscape of the Monterey Ranger District of the Los Padres National Forest is unique among the four southern California national forests. Because the northern Santa Lucia Mountains are located in the higher latitudes, have high relief, and are close to the Pacific Ocean, they receive substantially more precipitation than the other national forests of southern California, including the Main Division of the Los Padres National Forest. As a result, the floristic composition of the vegetation is in many respects more similar to vegetation in northern than in southern California.

The proximity of the Pacific Ocean renders Monterey coastal habitats among the most temperate landscapes in the four southern California national forests. Winters are cool and moist while summers are mild, especially near the immediate coast where the ameliorating effects of cold water offshore and persistent summer fog are strongest. As a result, soil moisture (especially below coastal coast redwood forest canopies) is supplemented by fog drip during the summer (Noss 2000, Zinke 1988).

The low-elevation (below 2,500 feet [762 meters]) mesic conifer forests in the northern Santa Lucia Mountains are distinctly different from other conifer forests in southern California. Coastal vegetation is comprised of a mosaic of prairies, riparian coast redwood forests, the southernmost concentrations of Douglas-fir, Pacific madrone, coast live oak forests, and Diablan coastal sage scrub.

Coast redwood forests in Monterey County are at the southern terminus of the species' range. Unlike forests in northern California, coast redwood on the Monterey Ranger District is restricted to within 200 feet (60 meters) of moist, well-drained canyons with perennial streams or to nearby north-facing slopes. Redwood forests are surrounded by various combinations of grasslands, chaparral, coastal sage scrub, mixed evergreen forests, or other conifer and hardwood forests (Noss 2000, Zinke 1988). Coast redwood and lower montane coniferous forests in this area were logged to a limited extent from the 1880s into the early 1900s. Stands were selectively cut or high-graded (Noss 2000, Stephenson and Calcarone 1999).

Santa Lucia fir is endemic to the northern Santa Lucia Mountains, where it occurs as scattered populations in relatively inaccessible, fire-proof sites such as on steep north-or east-facing slopes, rock outcrops, along ridges, in canyon bottoms, or on raised stream benches and terraces (Sawyer and Keeler-Wolf 1995, Talley 1974). In some settings, canyon live oak co-dominates with Santa Lucia fir.

Closest to the ocean, grass-dominated coastal prairies intermix with Diablan coastal sage scrub. These habitats support a number of sensitive plants and butterflies, including Hutchinson's larkspur (*Delphinium hutchinsoniae*), adobe sanicle (*Sanicula maritima*), Smith's blue butterfly (*Euphilotes enoptes smithi*), and Doudoroff's elfin butterfly (*Incisalia mossii doudoroffi*). This region also supports some of the largest areas of mixed evergreen forest on the central coast and in California. Conspicuous evergreen species include coast live oak, interior live oak, tanoak, California bay, and Pacific madrone.

Fire, livestock grazing, invasions of noxious nonnative plant species, and recreation are among the factors influencing ecosystem processes in Monterey coastal habitats. Recreation use is high, but it is largely confined to streams crossing California State Highway 1 and to several developed campgrounds situated on the coastline and along the Big Sur River.

Livestock grazing has been widespread and continues in many areas of the northern Santa Lucia Ranges. There are 51,898 acres (21,011 ha) of active allotments in the northern Santa Lucia Ranges, most of which are concentrated at lower elevations near the coast or in oak woodlands on the inland side of the mountains. Grazing has been particularly intense in coastal prairies, which have suffered a reduction in native perennial species and an invasion of nonnative plant species (Heady and others 1988).

Although fires greater than 49,400 acres (20,000 ha) probably have a long history in this region, prehistoric mudflows in the Big Sur River (Jackson 1977) suggest that the average interval between large fires has been quite long. The two most recent mudflow events both coincided with large fires in watersheds of the Big Sur River drainage. Assuming such mudflows have followed all large fires, the mean interval between fires over the period 1370 A.D. to 1972 A.D. can be estimated as 75 years.

Based on an analysis of Los Padres National Forest fire history data, Moritz (1997, 2003) concluded that fire hazard in the Santa Lucia Ranges is not significantly related to fuel age but is controlled by extreme weather events. A combination of steep terrain and poor access into rugged wilderness areas limits the ability of firefighters to control fires that spread in these weather conditions (Moritz 1997).

The distribution of Santa Lucia fir is considered stable but at continuing risk due to its highly restricted natural range and its susceptibility to fire-kill. As a narrow endemic, individual stands and the populations are vulnerable to both natural and human-caused threats such as diseases, cone parasites, catastrophic wildfire, and the invasion of nonnative species (Stephenson and Calcarone 1999).

Chaparral

Chaparral is the most widespread vegetation type on the four southern California national forests, covering more than two million acres. The term "chaparral" describes a collection of plant communities dominated by evergreen, tough-leaved (sclerophyllous), multi-stemmed woody shrubs that form a dense, continuous carpet covering vast areas of the national forests. Although there are many types of chaparral that vary widely in species composition, all share similar physiognomies and ecological relationships.

Common genera include *Ceanothus, Quercus, Prunus*, and *Rhus*. Shrub composition varies systematically in relation to gradients of latitude, longitude, elevation and slope exposure (Borchert and others 2004, Gordon and White 1994,). Different forms of chaparral are referred to by physiographic and physiognomic characteristics, such as arid (low to tall shrubs, generally on shallow soils and south-facing slopes), mesic (medium to tall shrubs on deep soils of north-facing slopes), and montane (low to medium-sized shrubs at higher elevations on thin soils covering continuous areas or interspersed with forest trees).

The number of species in individual stands of mature chaparral is relatively low, especially in the understory, because a comparatively small collection of species dominates. However, after fire and destruction of the continuous shrub canopy, plant species diversity increases markedly with the appearance of numerous short-lived annual and perennial herbaceous species that thrive for 1 to 6 years before the shrubs assume dominance.

Fire is the dominant regenerative force in chaparral; indeed, many species depend on fire for reproduction. Fire initiates the regeneration of most chaparral shrubs by removing shrub competition, releasing nutrients and minerals to the soil, and scarifying seeds (Hanes 1988, Keeley and Keeley 1984). For example, seeds of many shrubs and herbs are only present in the seed bank and will not germinate until sunlight, heat, smoke, charate, or soil nutrients are present.

While sprouts often appear within a few weeks of a fire, the first wet winter normally brings a flush of seedlings. Herbs and grasses (absent in mature chaparral, but present in the seed bank) have the highest cover for the first few years. Grass and herbaceous species decline in abundance within a few years as shrub cover develops from postfire seedlings and stump sprouts (Hanes 1988). Within five to ten years, sprouts and shrub seedlings begin to take over the cover; shrub cover peaks approximately 25 years after a fire (Hanes 1971, 1988; Keeley and Keeley 1984).

After a fire, chaparral shrubs reproduce from soil-stored seed, by resprouting, or sometimes by both (e.g., chamise, *Adenostoma fasciculatum*) (Hanes 1988, Keeley and Keeley 1984). In general, lower-intensity fires result in low mortality among sprouting species and higher seed bank survival among obligate-seeding species. The intensity and seasonality of fire, plant size, and other site conditions also have important influences on plant regeneration. High intensity fires reduce sprouting and favor species with soil-dormant seeds. In general, obligate-seeders are more common on xeric slopes and along ridges, whereas sprouters are more common on mesic slopes where they tap into deep soil moisture (Keeley and Keeley 1984).

Historic and prehistoric fire-return intervals in chaparral likely ranged from 40 to 60 years (Minnich 1988). The result of an increase in human-caused ignitions has been a decrease in the average fire return interval to 30 to 40 years or less in some regions (Keeley and others 1999a). In much of southern California, human-caused ignitions have increased commensurate with population growth (Keeley and others 1999a). One obvious consequence of this increased fire frequency has been the conversion of chaparral to nonnative grasslands, particularly near highly populated areas (Keeley 1990, Keeley and others 1999a) and along major transportation corridors.

Repeated burning first eliminates non-sprouting, obligate-seeding shrubs that require enough time between fires to mature, reproduce and restock the seedbank. On the other hand, resprouting shrubs do not depend as heavily on seedling recruitment and can survive short-interval fires, at least for a while, but they cannot endure frequent fires indefinitely and eventually disappear. Grasslands or the mixture of shrubs and grasses that replace both chaparral and coastal sage scrub become self-perpetuating, since shrubs are unable to re-colonize in the face of frequent, seedling-killing fires and heavy competition from nonnative grasses. This shrub-to-grass conversion has been most visible and widespread in the foothills of the San Gabriel and San Bernardino Mountains and along heavily-used highway corridors where ignition rates are unusually high.

Coastal Sage Scrub

Coastal sage scrub is prevalent in coastal valleys and plains below elevations of 2,500 feet (762 meters). It is one of the two major scrub formations that occur in the California floristic province, although it is far less common than chaparral. The geographic distribution of coastal sage scrub has been divided into four floristic associations (Axelrod 1978). From Baja California, Mexico north to San Francisco, California they are the Diegan, Venturan and Diablan associations. The inland Riversidian association straddles the Diegan and Venturan associations.

Coastal sage scrub is characterized by low-to-medium height shrubs with semi-woody, flexible stems and soft leaves that are facultatively drought-deciduous. Prominent shrub and subshrub species include California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), several sage (*Salvia*) species, laurel sumac (*Malosma laurina*), and chaparral yucca (*Yucca whipplei*) (Mooney 1988). Compared to chaparral, coastal sage scrub grows on more xeric slope exposures at lower elevations where soil moisture is less available (Harrison and others 1971).

Plant species composition of coastal sage scrub is associated with variables such as latitude, elevation, slope aspect and substrate (Cole 1980, DeSimone and Burk 1992, Kirkpatrick and Hutchinson 1980, O'Leary 1988). Composition depends on individual species' responses to factors such as soil moisture, disturbance, and fire (Freudenberger and others 1987, Gill and Hanlon 1998, O'Leary 1988, Wells 1962).

Like chaparral, coastal sage scrub recovers quickly after fire; vegetation structure and composition reestablish within a few years. Postfire recovery varies among sites (coastal vs. inland). Indeed, identifying the factors that influence the vegetation response is complicated because so many variables affect vegetation change (White 1995). For example, fire intensity and the interval between fires affect the structure and composition of the coastal sage scrub. Shrubs on sites in low intensity fires were larger than those on sites with high intensity fires (Malanson and O'Leary 1982).

Unlike chaparral, coastal sage scrub has a better-developed herbaceous understory that persists between fires; however, like chaparral, species diversity increases only temporarily after fire. If fires become too frequent, coastal sage scrub is highly vulnerable to conversion to annual grassland (Giessow and Zedler 1996, Keeley 1990). Short fire intervals may reduce or eliminate some species; thus, greater diversity is expected with longer fire intervals (Haidinger and Keeley 1993; Malanson 1985). In San Diego County, coastal sage scrub has become greatly reduced and highly fragmented because of agriculture and urban development, compounding the negative effects of frequent fires. Nonnative plant species have invaded many fragments, resulting in more frequent burns (Allen and others 2000).

Other threats to this vegetation type include fire management practices, air pollution, grazing, and nonnative species. Construction of fire breaks in coastal sage scrub removes habitat, causes habitat fragmentation, and creates disturbance corridors along which nonnative species can travel. Air pollutants like ozone and sulphur dioxide appear to have adverse effects on plant physiology and growth (Westman 1985, Preston 1988). Disturbance by grazing may allow invasion of nonnative species, although these species may also be able to invade by competitive exclusion (Minnich and Dezzani 1998). Because many coastal sage scrub species are not widely distributed, there is a high potential for extinction (Westman 1981a).

Foothill Oak Woodlands, Savannas, and Annual Grasslands

California annual grassland is a single-layered herbaceous community made up entirely of forbs and grasses. Most grass species are nonnative, having been introduced from Europe and Asia during the period of Spanish colonization of California, but forb species are still mainly native.

Annual grasslands are interspersed in oak woodlands and savannas, but they also occur as isolated islands in chaparral called potreros. In the Monterey region of Los Padres National Forest, coastal prairies contain numerous nonnative annual grassland species, but they also harbor many native plant species found nowhere else on the four southern California national forests.

Foothill oak savannas and woodlands occur as open-canopy (10 to 50 percent canopy cover) to nearly closed-canopy woodlands (50 to 80 percent canopy cover) in canyons, along streams, on north-facing slopes, or as savannas (less than 10 percent canopy cover) in broad valleys and rolling hills. Oak woodlands and savannas are typically two-layer communities, with an understory consisting of a nearly complete cover of grasses and forbs.

The principal tree species in these savannas and woodlands in southern California include coast live oak, blue oak (*Quercus douglasii*), Engelmann oak (*Q. engelmannii*) and valley oak. Woodlands of southern California black walnut (*Juglans californica* var. *californica*) are uncommon, small in area, and widely scattered occupying lower north-facing slopes above riparian areas. Foothill pine (*Pinus sabiniana*), Coulter pine, canyon live oak, and black oak occur in some areas, but these species are found primarily in lower montane, montane and mixed evergreen forest habitats (Barbour 1988, Stephenson and Calcarone 1999).

Oak savannas and woodlands commonly contain blue oak on the Los Padres National Forest and Engelmann oak on the Cleveland National Forest, with coast live oak widely distributed on both the Cleveland and Los Padres National Forests (Stephenson and Calcarone 1999).

Reproduction is episodic for many oak species. Acorn production begins when trees reach 20 to 30 years of age. The size of the acorn crop varies widely by year, stand, and species. Typically, a large crop is produced every three to seven years in what are called "mast" years. Rodents, gophers, birds, deer, and livestock consume acorns, and deer and livestock browse on seedlings (Giusti and Tinnin 1993, Griffin 1988). Lack of regeneration does not appear to be the result of any single factor but rather is the result of the combined effects of competition from nonnative grass species, livestock grazing, deer browsing, and an unnatural abundance of acorn-eating animals such as gophers and ground squirrels. Natural variations in precipitation, mast years, and seed predation are other likely factors.

A combination of urbanization, agricultural conversion, and poor to non-existent natural regeneration has imperiled valley oak woodlands on both public and private lands. Although valley oak has limited occurrence on National Forest System lands, the Valley Oak recommended research natural area (RNA) on the Monterey Ranger District (Los Padres National Forest) is one of the few remaining intact, relatively undisturbed examples of this oak type on the central coast. Nevertheless, even in this recommended RNA, natural recruitment may be inadequate to maintain oak populations over time and, without management intervention, the area could eventually convert to annual grasslands, as is occurring with valley oak in the Santa Ynez Valley of Santa Barbara County (Brown and Davis 1991).

Like valley oak, blue oak also has low recruitment rates on Los Padres National Forest, especially in the seedling-to-sapling stage (Borchert and others 1993, Swiecki and others 1997). Causes of low recruitment are complex and vary widely from site to site even within the same region (Harvey 1989), but mammalian predators and continuous browsing of young saplings appear to be important causes of mortality (Tyler and others 2003). As recruitment becomes more rare, areas of oak woodland and savannas will begin to convert to annual grasslands as aging oaks die without replacement (especially where Engelmann oak, valley oak, and blue oak woodlands and savannas are dominated by large, old trees with little or no natural regeneration).

Livestock production has long been the principle economic activity in foothill woodlands. Many oak woodland and savanna habitats on National Forest System lands are within grazing allotments including 60 percent of Engelmann oak woodlands and 87 percent of blue oak woodlands. Most private land near National Forest System lands has been consolidated in private livestock ranches (Stephenson and Calcarone 1999).

Livestock grazing has reduced the survival of oak seedlings in some locations, while in others it has had little effect on seedling survivial or density (Davis and others 1991). Research in this area needs to focus on the long-term relationships between oak regeneration and grazing management strategies (season, timing, duration, stocking rates). Standiford and McCreary (1996) have shown how grazing management can be applied to actually encourage the development of young seedlings (cited in Allen-Diaz and others 1999).

Riparian Habitats

Riparian habitats are typically narrow, linear woodlands or forests that line perennial and ephemeral streams. Riparian forests and woodlands differ sharply from surrounding uplands by having a canopy cover dominated by deciduous broad-leaved trees with multi-layered canopies and high species richness. Riparian habitats are highly productive and vital for wildlife as they provide food, cover, shade, ameliorated microclimate, water, nesting and foraging habitats. Many upland wildlife species use riparian habitats during some part of their life cycle.

Riparian habitats are most prevalent along mid- to large-order streams at elevations below 4,000 feet (1,219 meters) in the foothills and valleys. There are many different riparian alliances, but foothill riparian woodlands generally fall into three types based on tree species dominance: (1) Fremont cottonwood (*Populus fremontii*)/willow (*Salix* spp.), (2) California sycamore (*Platanus racemosa*)/coast live oak, and (3) white alder (*Alnus rhombifolia*) (Stephenson and Calcarone 1999).

Other trees associated with riparian habitats on the four southern California national forests include black cottonwood (*Populus balsamifera*), California bay (*Umbellularia californica*), big-leaf maple (*Acer macrophyllum*), Oregon ash (*Fraxinus latifolia*), black oak, and coast redwood. Although aspen (*Populus tremuloides*) occurs in riparian habitats in other mountains of California and is one of the most wide-ranging tree species in North America, it is virtually absent in southern California (Barbour 1988, Stephenson and Calcarone 1999).

Stream hydrology, channel geomorphology, and proximity to groundwater are a few of the factors controlling the extent of riparian, wetland, and aquatic habitats. Seasonality, volume, duration, and year-to-year variability of streamflow influence the structure and composition of plant communities along channels and in floodplains. Groundwater fluctuations also affect riparian communities by creating springs, seeps, and ephemeral water bodies.

Historic flow patterns in southern California streams reflect the region's climate of long, dry summers and short, wet winters. Peaks of stream discharge show up in the winter and early spring and then decline into the summer months. Middle and lower portions of streams (typically below 3,000 feet [914 meters]) support the highest numbers of aquatic and riparian species. However, streams flowing through bedrock canyons often have perennial flow because groundwater feeds deep pools and bedrock serves as a natural barrier to infiltration (Stephenson and Calcarone 1999).

High variability in precipitation and runoff in southern California can result in large flood events, which scour channels and redistribute sediments and bedload. The winter of 2005 offers an example of this type of regional flooding. Maximum discharge periods in high-elevation streams are governed by the timing of spring snowmelt (Stephenson and Calcarone 1999).

No other vegetation type in the southern California national forests has been so drastically altered by human activities as riparian zones. Ecological processes have been altered by the development of water storage and diversion structures, invasion of undesirable nonnative species, urbanization, and, to a lesser extent, livestock grazing, recreation, and mining. Low-elevation streams face greater threats than high-elevation streams because riparian areas and their water flows are more likely to be diverted or altered, more likely to be urbanized, and more likely to be invaded by nonnative plant and animal species.

Instream water storage and diversions have dramatically reduced the extent of riparian habitats in this region. In fact, approximately 95 to 97 percent of low-elevation floodplain riparian habitat in southern California has been eliminated, and most major streams now contain dams or diversions. In addition, many smaller streams and springs have been dammed or diverted for water supplies and local flood control. Subsurface waters have been heavily tapped for domestic water, lowering water tables and base flows of many springs and streams (Stephenson and Calcarone 1999).

Dams remove riparian habitat directly by inundation, but cause greater habitat degradation by altering downstream hydrologic regimes and sediment budgets. Typically, dams reduce the magnitude and frequency of flood events, thereby increasing base flows, greatly reducing downstream transport of sediment, and altering water temperatures.

The reduction in the magnitude and frequency of flood flows removes key disturbance processes in floodplain and riparian habitats. Many riparian trees (such as white alders, willows, and cottonwood) are short-lived and regenerate on floodplains and streambanks following flooding and sediment deposition. Thus, even though major floods remove vegetation by scouring and altering channel morphology, they also deposit sediments necessary for plant regeneration and fish spawning.

The interruption of the sediment supply by dams results in the water having greater erosive force, which in turn causes downstream channel incision. Channel incision lowers the water table and increases the vertical distance from the stream to the floodplain. Stream reaches below dams often lack sand and fine gravel and are marked by a series of deep scour pools floored with boulders and mud (Stephenson and Calcarone 1999). Temporary instream levees and sand bars suitable for plant establishment and growth do not form. As a result, many stream and river reaches lack gravels suitable for anadromous fish spawning. As stream incision progresses, stream banks supporting riparian vegetation are undercut and may disappear altogether.

The timing and duration of water releases from reservoirs greatly affects downstream riparian habitats. For example, large, sudden releases (particularly in the summer months) can scour away a whole year's reproductive effort by species such as arroyo toads (*Bufo microscaphus californicus*), California red-legged frogs (*Rana aurora*), pond turtles (*Actinemys marmorata*), and California newts (*Taricha torosa*). Potential spawning beds are compromised when sand and gravel bars are removed. Cooler instream water temperatures not only favor introduced species such as brown trout but also have detrimental effects on native warm-water fish. Conversely, low-level, year-round flow regimes facilitate the spread of exotics such as bullfrogs, sunfish, bass, bluegill, catfish and Asian clams into downstream areas that historically were summer-dry (Stephenson and Calcarone 1999).

The Los Padres National Forest is the exception to the generally high level of modification of riparian systems in southern California. Hydrologic regimes of most streams on the coastal side of the northern Santa Lucia Mountains remain unimpeded. Streams and rivers in these unaltered conditions include the Big Sur and Little Sur Rivers, San Carpoforo Creek, Willow Creek, Big Creek and others. In these aquatic habitats, there are few nonnative species, and many still support populations of southern steelhead, California red-legged frogs, foothill yellow-legged frogs (*Rana boylii*), tiger salamanders (*Ambystoma californiense*), and California giant salamanders (*Dicamptodon ensatus*) (Stephenson and Calcarone 1999).

Next to streamflow alterations, the biggest factor threatening the health of riparian ecosystems is the spread of invasive nonnative plant and animal species. Reservoirs and other artificial aquatic habitats have facilitated the introduction of a wide variety of nonnative aquatic species into stream systems. Collectively, introduced species have caused serious declines in the capability of riverine habitats to support native species (Stephenson and Calcarone 1999).

Arundo (*Arundo donax*) is among the most notorious of the riparian invaders. This tall, perennial grass has become widespread in many states. It was introduced to California in the 1820s along drainage canals for erosion control. Arundo frequently forms dense thickets in riparian areas, in drainage channels, or where the water table is near the surface. On the four southern California national forests, it occurs in foothill areas, primarily along large streams but also in areas where there is pooled water. It is now present in more than 50 watersheds and is particularly abundant along major coastal rivers, such as the Ventura, Santa Clara, Santa Ana, Santa Margarita, San Luis Rey and San Diego River systems (Stephenson and Calcarone 1999).

Arundo mostly occurs below 2,000 feet (610 meters) and has yet to spread into the mountains or up the steep, narrow canyons in lower montane areas. Because it requires well-developed soils and copious quantities of water to flourish, it often outcompetes the native vegetation, especially where the hydrologic regime has been modified. Arundo grows rapidly, 2.1 to 4.9 times faster than native willows. Because this rapid growth depends on large amounts of water, the availability of water to native riparian species is greatly reduced (Stephenson and Calcarone 1999).

Once established, arundo frequently forms continuous monocultures that inhibit the growth and reproduction of other plant species. It neither provides food nor cover for most native wildlife species, and because arundo causes dramatic reductions (50 percent or more) in the abundance and diversity of invertebrate populations, fewer bird species use this habitat. Arundo also provides less shade than the native vegetation, causing increases in water temperature and lower oxygen concentrations, which in turn adversely affect fish and other aquatic species. In addition, these thickets are highly flammable and can carry fires along riparian corridors, killing the native species (Stephenson and Calcarone 1999).

Another potent, nonnative plant invader is tamarisk which also has become widely distributed in southern California coastal and inland drainages. There are at least four species of tamarisk invading riparian habitats; these have been documented in at least 60 watersheds on southern California national forests, especially in foothill and desert streams with deep alluvial channels. Tamarisk occurs in a number of lower montane drainages as well, but seems to spread slowly in narrow bedrock channels (Stephenson and Calcarone 1999).

Another name for tamarisk is "salt cedar," because it exudes salts from its leaves. These salts accumulate in the soil, making the area less hospitable to native plants. Like arundo, tamarisk is most successful in drainages with altered hydrologic regimes. Because it is planted as an ornamental on private lands, tamarisk invasions into riparian habitat likely will continue (Stephenson and Calcarone 1999).

Like arundo, tamarisk also depends on large quantities of water and as a consequence lowers the water table, thereby reducing the amount of surface water. In some areas, tamarisk has reduced or eliminated water supplies for bighorn sheep, pupfish, salamanders, and desert palm groves. Tamarisk is poor forage. The scale-like leaves are unpalatable to grazers, and birds favor native riparian vegetation over tamarisk (Stephenson and Calcarone 1999).

Another threat to riparian areas is livestock grazing. Cattle tend to stay in riparian corridors for prolonged periods because of abundant forage, browse, and water. Prolonged grazing often causes de-vegetation of stream banks, prevention of seedling establishment, and degradation of water quality from soil erosion and compaction due to trampling. As a result, current management practices are aimed at reducing the amount of time livestock are present in riparian areas (Stephenson and Calcarone 1999). On many of the southern California national forests, livestock grazing in riparian areas has been substantially reduced, resulting in dramatic improvements in vegetation condition.

Concentrated recreation use in some portions of riparian habitats (particularly on the Angeles National Forest) has caused de-vegetation, bank trampling, littering, and pollution. Because foothill riparian areas are cool, pleasant places to escape the summer heat, recreation pressure is inevitable, especially near urban areas (Stephenson and Calcarone 1999).

Land and road development within watersheds also alter natural hydrologic regimes and can cause channel incision. Development decreases the infiltration capacity of watersheds and increases channelized runoff. Roads channel water into ditches, often increasing or altering the amount of water reaching streams. Such alterations increase peak storm runoff and the transport of pollutants and sediments from cleared lands.

Suction dredging and sand and gravel mining directly impact riparian and riverine habitats. Sand and gravel mining is concentrated in foothill streams where there are well-developed alluvial deposits. Most of these operations are on private lands, but they affect habitats and species movements along riparian corridors into the national forests. Sand and gravel mines completely alter stream channels, often creating deep pools that prevent fish migration (Stephenson and Calcarone 1999).

Suction dredging uses high-pressure water pumps to vacuum a mixture of streambed sediments and water, which pass over a sluice box mounted on a floating barge. Denser particles (including gold) are trapped in the box while the entrained sediment is discharged into the stream. Large tailing piles remain where dredges have operated for long periods. Suction dredging affects aquatic habitats by increasing turbidity, altering channel morphology and bottom substrates that serve as fish spawning areas, and by killing the eggs and larvae of fish and amphibians (Stephenson and Calcarone 1999).

Desert Montane Habitats

Pinyon-juniper woodlands, semi-desert montane chaparral, and Great Basin sagebrush occur on semi-arid desert-side slopes of the Transverse, Peninsular, and Tehachapi Ranges of southern California. Single-leaf pinyon pine (*Pinus monophylla*) generally dominates higher elevation slopes and extends into lower montane forests and woodlands, while California juniper (*Juniperus californica*), Sierra juniper, and Tucker oak (*Quercus john-tuckeri*) co-dominate many stands with pinyon, especially on gentle slopes or where there are expanses of alluvium.

Pinyon-juniper woodlands typically are open-canopied with a sparse understory. Mature stands typically are 20 to 35 feet (6 to 10 meter) in height, 30 percent overstory cover, and 5 to 10 percent shrub and herb cover (Burwell 1999, Everett and Koniak 1981, Koniak 1986, West 1988). Understory shrubs are primarily from semi-desert montane chaparral and Great Basin sagebrush communities.

Four-needle pinyon (*Pinus quadrifolia*) occurs with single-leaf pinyon and California juniper in the San Jacinto Mountains and farther south on the eastern slopes of the Sierra Juarez and Sierra San Pedro Martir in Baja California Norte. It replaces single-leaf pinyon in some stands.

Semi-desert montane chaparral and Great Basin scrub have lower and more open structures with different species compositions than cismontane chaparral. Well-developed semi-desert montane chaparral typically has shrub cover around 50 percent; mature stands of Great Basin scrub are usually open with less than 50 percent total shrub cover. Average canopy height is about 6 feet (two meters). Common species in montane chaparral include flannelbush (*Fremontodendron californicum*), bitterbrush (*Purshia tridentata*), scrub oak (*Quercus* spp.), mountain mahogany (*Cercocarpus betuloides*) and cupleaf ceanothus (*Ceanothus greggii* var. *perplexans*).

Great Basin scrub is dominated by Great Basin sagebrush; rabbitbrush (*Chrysothmnus nauseosus*) is a common associate in alluvial fans, dry meadows, and washes. Great Basin scrub is particularly prevalent on low-elevation alluvial soils surrounding Mount Pinos and in the Garner Valley region south of Mount San Jacinto. Both of these communities intergrade into pinyon-juniper woodlands.

Pinyon-juniper woodlands are stable and self-replacing. Unlike other pines, pinyon is highly shade tolerant. Indeed, it requires the microclimate beneath trees or large shrubs (nurse plants) for germination and successful seedling establishment (Barton 1993, Burwell 1999, Drivas and Everett 1988). Pinyon and juniper are slow-growing and have high water and nutrient use efficiencies. Both opportunistically use soil moisture from rare summer rainfall (Barton and Teeri 1993, DeLucia and Heckathorn 1989, DeLucia and others 1989, DeLucia and Schlesinger 1990, 1991; Drivas and Everett 1988, Everett and Thran 1992).

Pinyon-juniper woodlands are more prevalent on rocky, coarse-textured soils with low nutrient and water availability (Burwell 1999). Because of the low cover and low productivity of shrubs and herbaceous plants, and because of their position on steep slopes and dissected topography, these sites often act as fire refugia (West 1988). In addition, efficient use of water and nutrients give pinyon and juniper a competitive advantage over other species on sites with poorly developed soils, low nutrient content, and low water availability (DeLucia and Heckathorn 1989, DeLucia and others 1989, DeLucia and Schlesinger 1991, Drivas and Everett 1988, Everett and Thran 1992).

Semi-desert montane chaparral and Great Basin scrub dominate on broad, gentle slopes with deep alluvial soils. Unlike pinyon and juniper trees, montane desert shrubs tend to use soil nutrients and groundwater liberally. Shrubs are less efficient in their use of resources. Shrubs take up water until it is depleted and then shut down primary production. After depleting groundwater, Great Basin sagebrush drops its larger leaves and becomes largely inactive for the remainder of the summer (DeLucia and Heckathorn 1989, DeLucia and others 1989, DeLucia and Schlesinger 1991, Drivas and Everett 1988, Everett and Thran 1992).

Pinyon-juniper woodlands do not carry fire readily. When fires do occur, they are typically intense, stand-replacing events. Mature pinyon and juniper trees are readily consumed and have low resistance to even low-intensity burns because they have thin, resinous bark, dense branching, and self-prune poorly (Barton 1993, Leopold 1924). Generally, these woodlands have little fuel accumulation or continuity. However, productive sites that have not burned for a long time may support dense woodlands bordering on becoming forests. In general, however, fires require severe fire weather conditions, such as hot temperatures, low humidity and strong winds to carry through these woodlands (Bruner and Klebenow 1979, Minnich 1988, Young and Evans 1981).

Pinyon-juniper woodlands recover very slowly from crown fires. Several studies estimate that more than 100 years is required before these trees once again dominate a site after a stand-replacing wildfire (Barney and Frishcknecht 1974, Erdman 1970, Everett 1987, Everett and Ward 1984, Koniak 1985, Tausch and West 1988, Wangler and Minnich 1996, Young and Evans 1981). Pinyon neither stump sprouts nor do its seeds survive fire. Thus, for pinyon to regenerate, seeds must be dispersed into the site by seed-caching pinyon jays or rodents (Stotz and Balda 1995, Vander Wall 1997, Vander Wall and Balda 1977). Moreover, because seedlings require mature shrubs as nurse plants to germinate and grow, 20 to 40 years of shrub growth may be necessary before tree seedlings can become established (Burwell 1999, Koniak 1985, Wangler and Minnich 1996).

Fires historically have been infrequent in interior desert habitats. One study of pinyon-juniper woodlands in the San Bernardino Mountains estimated the average fire return interval to be 480 years and that active fire suppression has had little effect on this vegetation type (Wangler and Minnich 1996).

In recent years, however, several large fires have burned in pinyon woodlands and forests in the San Bernardino Mountains and Peninsular Ranges. Some woodlands have been reduced in size because of an increase in human-caused wildfires (Beauchamp 1986, Stephenson and Calcarone 1999). The current fire regime in pinyon-juniper woodlands is largely controlled by proximity to urbanized areas and by the level of human use of this vegetation type. For example, the high occurrence of multiple fires on the desert side of the San Jacinto Mountains has been concentrated in the relatively accessible areas near Beaumont and Palm Springs. In contrast, remote desert montane areas, such as in the southern Los Padres Ranges around Mount Pinos and in the extreme northeastern corner of the San Bernardino Mountains, have had few recorded fires (Stephenson and Calcarone 1999).

An exceptionally long recovery combined with an increase in human-caused fires has converted some pinyon-juniper woodlands to deser chaparral or desert scrub (Wangler and Minnich 1996). The nonnative cheatgrass (*Bromus tectorum*) and red brome (*Bromus madritensis* ssp. *rubens*) have invaded some of these former stands and have caused an increase in fire frequency. In some areas, pinyon-juniper woodlands have been converted to grass- and scrub-dominated communities (Stephenson and Calcarone 1999, West 1988, West and van Pelt 1987).

In much of the Mojave, Great Basin and Sonoran deserts, intense fires have been followed by the invasion of exotic grasses, particularly cheatgrass (Brooks and Pyke 2001). As a result, understory fuels have become more continuous and flammable, greatly reducing the interval between fires. There are concerns that more frequent fires (to which singleleaf pinyon and other desert species lack resilience) may convert extensive areas of desert vegetation to grasslands. This threat of conversion is highest in the northern portion of the San Bernardino National Forest and will likely expand over time.

Fires are more frequent in montane desert chaparral and Great Basin scrub communities than in pinyon-juniper woodlands because these communities have greater fuel continuity and cover broad, gentle slopes that carry fire more readily. There is no evidence, however, that fire regimes in semi-desert chaparral are outside the range of historic variability. As in pinyon-juniper woodlands, cheatgrass and red brome can colonize and degrade montane desert chaparral and Great Basin scrub communities by decreasing the interval between fires (Stephenson and Calcarone 1999).

Disease is second only to wildfire as a major cause of single-leaf pinyon mortality. Black stain root disease has killed pinyon pines on an estimated 8,000 acres, primarily in the San Bernardino Mountains. In addition to disease, single-leaf pinyon can be killed by pinyon-pine engraver beetle infestations (Stephenson and Calcarone 1999).

Site-specific land uses have degraded some areas of desert montane vegetation. These include mining, off-highway vehicle (OHV) recreation, and recreational target shooting. Large limestone deposits in the northeastern portion of the San Bernardino Mountains have been converted to open-pit mines, and substantial areas are still under mining claims that could be activated in the future. Exploratory drilling for oil and gas deposits is a major activity in the southern portion of the Los Padres National Forest. Recreational target shooters and OHV enthusiasts concentrate in desert habitats. Uncontrolled recreational target shooting has raised concerns about public safety and soil pollution from lead accumulation. While these activities have caused local degradation and fragmentation of desert habitats, they have not affected the overall integrity of the desert montane landscape on National Forest System lands (Stephenson and Calcarone 1999).

Desert Scrub

Desert scrub includes a wide array of vegetation types at lower elevations than pinyon-juniper and semi-deser chaparral, but on National Forest System land they consist primarily of creosote bush (*Larrea tridentata*) scrub on the north and east sides of the San Gabriel, San Bernardino and San Jacinto Mountains. Creosote scrub, with an understory of burroweed (*Ambrosia dumosa*) and short-lived annuals, is common on stable sites with coarse-textured soils, such as on bajadas and alluvial fans (Beauchamp 1986, Vasek and Barbour 1988).

Vegetation structure in desert scrub varies with soil depth, drainage, and moisture availabilty but rarely exceeds 25 percent canopy closure and generally is less than 6 feet (2 meters) in height (Vasek and Barbour 1988). Desert scrub habitat types share many species with desert montane habitats where their elevational ranges overlap.

Other desert scrub habitats include Mojave Desert associations dominated by Joshua tree (*Yucca brevifolia*), saltbush (*Atriplex* spp.), blackbush (*Coleogyne ramosissima*) and shadscale (*Atriplex canescens*). Colorado Desert plant communities occur in the vicinity of San Gorgonio Pass and the Coachella Valley. San Joaquin saltbush scrub (a desert scrub peculiar to the southwestern Central Valley) occurs along portions of the eastern edge of the southern Santa Lucia Ranges and near the Cuyama Valley.

Plant growth and productivity generally follow moisture availability in desert scrub. Many species have their highest growth in the spring when soil moisture from winter precipitation is still available. Short-lived annual species persist for years in the soil seed bank and germinate and grow only during the short periods of enhanced soil moisture that follows infrequent summer rains.

Relatively little is known about vegetation recovery in desert scrub following disturbance. Aridity, cool winters, and poor soil development in desert scrub areas translate into slow plant growth and low productivity. Estimates of post disturbance recovery times are thought to be in excess of several hundred years (Vasek and Barbour 1988).

Historically, fire has not been a significant disturbance in this vegetation type. However, the recent spread of invasive nonnative plant species such as cheatgrass into desert scrub habitats has the potential to type convert these habitats to desert grasslands (West 1988, Wright and others 1979, Young and Evans 1981).

Although some livestock grazing has occurred in desert scrub on National Forest System lands, most sources of habitat degradation are site-specific and include mining, oil and gas exploration, OHV use, recreational target shooting, and other types of recreation. These activities have mostly caused localized degradation and fragmentation, but have not affected the overall integrity, abundance, or distribution of desert scrub (Stephenson and Calcarone 1999).

Gabbro Outcrops

Gabbro outcrops frequently support unique plant communities. Gabbro soils are termed “mafic” because of high concentrations of minerals such as magnesium and iron and corresponding low concentrations of calcium. The low calcium-to-magnesium ratio inhibits or prevents the establishment and growth of many plant species by limiting their ability to take up essential soil nutrients (Marschner 1995). Soil pH, texture, and other factors also limit nutrient uptake. Accordingly, there are similarities between the types of vegetation growing on gabbro soils and on iron- and magnesium-rich serpentine soils. Soils derived from gabbroic igneous rock are highly erodable, clayey, and often poorly drained (Stephenson and Calcarone 1999).

Gabbro habitats mostly occur as islands within chaparral and usually contain common chaparral shrubs. However, gabbro outcrops have an inherently patchy and fragmented distribution, forming distinct ecological islands within more common substrates, such as granodiorite. Some of the unique species inhabiting these soils include Cuyamaca cypress, Tecate cypress, and a number of endemic plant species like San Diego thornmint (*Acanthomintha ilicifolia*, federally listed as threatened) and Mexican flannelbush (*Fremontodendron mexicanum*) (Stephenson and Calcarone 1999, Vogl and others 1988).

Stands of Cuyamaca cypress grow on gabbro-derived soils on steep slopes along drainages. This cypress can dominate the overstory or co-dominate with Coulter pine. Groves are typically surrounded by chaparral composed of chamise, manzanitas, and scrub oak (*Quercus berberidifolia*).

Tecate cypress grows in alkaline, clayey soils derived from igneous, mafic gabbroic rocks or metavolcanics that usually are situated on mesic, eastern or northern aspects. Populations of Tecate cypress were once more widespread, but now are restricted to these unusual soils. Like Cuyamaca cypress, Tecate cypress is the main component of southern interior cypress forest (a dense, fire-dependent, low forest that forms even-aged stands).

Like other plant communities on nutrient-poor soils, vegetation on gabbro soils is typically slow-growing, open, and lower in stature than vegetation on other soil types. Post-disturbance recovery can be slow. Because these communities typically occur within chaparral, fire is a significant force influencing species composition and habitat structure. Like many native cypresses in California, Cuyamaca cypress and Tecate cypress are obligate seeders and depend on stand-replacing wildfires for regeneration (Dunn 1987). Both cypresses have thin, exfoliating bark that provides little protection from fire; as a result, trees are killed in wildfire events. Both species produce small, closed cones at maturity that open after intense heat generated by fire that releases seeds into the ashbed (Dunn 1987, Vogl and others 1988).

Populations of Cuyamaca and Tecate cypress have been reduced in size and extent on National Forest System lands in southern California by too-frequent fires. While periodic fires are necessary for regeneration, short fire-return intervals can decrease stand densities by killing trees before they reach cone-bearing age (Stephenson and Calcarone 1999). Because Cuyamaca cypress typically does not produce enough cones until around 40 years of age, a return interval of at least 40 years is necessary to develop an aerial seed bank of sufficient size to replace the stand. The 2003 Cedar Fire burned all of the Cuyamaca cypress on National Forest System lands, leaving a single unburned stand on the adjacent Cuyamaca Rancho State Park. Recently burned populations are now at risk from repeat fires until they build sufficient cone reserves.

Tecate cypress begins cone production by about age 10, but requires another 40 years to achieve maximum cone production. Shortened fire return intervals have reduced the size and extent of the Sierra Peak stand of this cypress (Dunn 1987). Fire return intervals of at least 52 years in Tecate cypress groves resulted in the stands being fully replaced, while fires burning less than 33 years apart resulted in reduced stand densities.

A more recent and growing threat to gabbro habitats on National Forest System lands is the construction of communication facilities on mountaintops. Other threats to this habitat type include cattle grazing, unauthorized off-highway vehicle use, land development, and the invasion of undesirable nonnative plant species (Stephenson and Calcarone 1999).

Serpentine Outcrops

Serpentine outcrops are habitats in which the composition and structure of the plant community is strongly controlled by the mineral composition of the soil (Kruckeberg 1984). Serpentine soils are derived from serpentinite, a rock type recognized by its waxy texture and colors, which range from green to blue to red. Serpentinite is a type of ultramafic rock, so called because of the high concentration of mafic minerals such as magnesium, iron, nickel, chromium and cobalt (Stephenson and Calcarone 1999).

Serpentine soils typically have low concentrations of calcium, potassium, sodium and phosphorous, limiting the ability of plants to take up essential soil nutrients, but they also have clayey textures and a high water-holding capacity. Soil texture, pH, and other factors can also limit nutrient uptake. Accordingly, serpentine soil is considered impoverished of nutrients and supports only those plants adapted to, or tolerant of, its unusual chemistry (Marschner 1995).

Serpentine habitats are often recognized by a conspicuous shift in vegetation type (Martens 1989). In areas dominated by grasslands, serpentine often supports chaparral. In chaparral areas, serpentine supports sparse grassland vegetation. Oak woodlands typically shift to chaparral or grasslands on serpentine. Coniferous forests and mixed-evergreen forests generally become more open but retain conifer dominance. Extreme serpentine habitats are referred to as "barrens" because they support little or no vegetation. Less toxic sites can support up to 215 species and varieties of plants and at least nine butterfly taxa (Stephenson and Calcarone 1999). Tree species such as Sargent cypress (*Cupressus sargentii*) and knobcone pine occur on a variety of substrates, but often are reliable indicators of serpentine soils.

Serpentine plant communities tend to be relatively sparsely vegetated and dominated by species adapted to periodic fires. Changes in the intensity or frequency of fire can alter species composition in serpentine plant communities. In recent decades, several stands of closed-cone pines and cypresses have been reduced in area because of frequent fires (Dunn 1987, Stephenson and Calcarone 1999). Post-disturbance vegetative recovery on this substrate is slower than recovery on other soil types (Hanes 1988).

Historic mining has removed or degraded some areas of serpentine habitat. Mercury, chromium, nickel, magnesite, asbestos, talc, soapstone and jadeite are all found in association with serpentine and other ultramafic rocks. A number of historical and active mines are located in the Santa Lucia Ranges and future mining activities, although unlikely, could adversely affect serpentine habitats on Los Padres National Forest (Stephenson and Calcarone 1999).

Limestone and Carbonate Habitats

Carbonate habitats occur on soils rich in calcium carbonate. This substrate is derived from carbonate rocks such as limestone, marble, and dolomite that weather into carbonate soils. Carbonate soils within the San Bernardino Mountains support a variety of plant communities including blackbush scrub, pinyon-juniper woodlands, Jeffrey pine-Sierra juniper woodlands, and Joshua tree woodlands.

Carbonate habitats typically have shallow, rocky, coarse-textured soils, with limited nutrient availability. Productivity and total vegetative cover is low, and the flora contains many drought-tolerant species capable of withstanding the nutrient-poor soils. Consequently, carbonate plant communities are typically more open, less productive, and slower growing than those inhabiting surrounding soil types. These communities also support a high level of endemism, containing multiple plant species that occur nowhere else. Five federally listed plant species and numerous additional rare plants occur within in the carbonate habitats of the San Bernardino Mountains.

Carbonate habitats are highly sensitive to ground disturbance and vegetation removal. Once disturbed, recovery is slow due to the thin, nutrient-poor soils and dry climate in this part of the San Bernardino Mountains. Because of low plant biomass, carbonate vegetation is less likely to carry wildfire, support livestock grazing, or require fuel management activities. Like other forms of disturbance, wildfire and grazing significantly delay the recovery of these plant communities (Stephenson and Calcarone 1999, U.S. Fish and Wildlife Service 2001).

Carbonate rock in the San Bernardino Mountains forms one of three high-quality deposits in the western United States. As a result, these deposits have attracted large-scale mining operations with regional economic significance. Most carbonate habitats on National Forest System lands are under mining claims that may become active in the future (Stephenson and Calcarone 1999). Mining activities such as soil removal, road development, and dumping of overburden rock have led to an overall decline in the quantity and quality of carbonate habitat. The Carbonate Habitat Management Strategy (Olson 2003) is aimed at providing for continued mining of these deposits while also conserving threatened and endangered carbonate plant species and their habitat.

Mining operations and associated road construction and overburden storage continue to affect carbonate plants and their habitat. Ongoing mining operations indirectly affect carbonate habitats through production of fugitive dust, changes to surface hydrology, soil erosion, and the introduction and spread of invasive nonnative plant species (U.S. Fish and Wildlife Service 2001).

Approximately 16 miles of National Forest System roads cross or are adjacent to carbonate habitat on the San Bernardino National Forest. Unauthorized off-road driving, mountain bikes, dispersed uses around developed facilities, and special-use permit activities have negatively affected some carbonate plant populations and habitats (Stephenson and Calcarone 1999). Creation of the Wildland/Urban Interface (WUI) defense zones is the newest threat to carbonate habitat. An emergency fuelbreak constructed in 2003 during the Old Fire affected habitat occupied by federally listed and sensitive plant species, and this location will be maintained as a WUI defense zone. Habitat degradation is expected to increase over the long term due to fuelbreak maintenance, user-created trails from the adjacent housing community, and invasive nonnative species.

Pebble Plain Habitat

Pebble plain is a unique habitat consisting of distinct, open patches of rocky inclusions within lower montane forest and woodland vegetation often dominated by Jeffrey pine (*Pinus jeffreyi*), single leaf pinyon (*P. monophylla*) and junipers (*Juniperus occidentalis* ssp. *australis, J. osteosperma*). The substrate consists of clay soil (up to 53 percent) mixed with a "pavement" of quartzite pebbles and gravel that are continually pushed to the surface through frost action (Holland 1986, Neel and Barrows 1990, U.S. Fish and Wildlife Service 2001). These treeless, deep-clay deposits support an assemblage of plants reminiscent of an alpine flora. This rare plant community consists of small cushion-forming plants, tiny annuals, grasses, and succulents. Plants are well-spaced, low-growing, and sun-tolerant, but species composition varies considerably among individual pebble plains. This habitat type is found only on the San Bernardino National Forest.

Pebble plain habitat supports one of the most threatened and biologically rich plant communities in the San Bernardino National Forest and adjacent lands. Plant species in this habitat include three federally threatened, eight Region 5 sensitive, and six "watch list" plant species. Most of the 17 plant species are locally restricted to the eastern San Bernardino Mountains or the Big Bear area (USDA Forest Service 2002b). This unusual habitat also provides the host plant requirements of five species of rare butterflies, three of which are endemic to and known only from pebble plain habitat (USDA Forest Service 2002b). The Pebble Plain Habitat Management Guide is aimed at managing these habitats for the conservation of the associated species through protection, threat reduction, and education.

Vegetation growth and establishment following disturbance is slow. Because of the high clay content in the soil, this habitat is vulnerable to vehicle damage especially when soils are saturated. Deep ruts directly affect the vegetation and alter surface hydrology of pebble plains. Ground disturbance has also contributed to an increase in invasive nonnative plant species. Cheatgrass, red-stemmed filaree (*Erodium cicutarium*), bur buttercup (*Ranunculus testiculatus*), and peppergrass (*Lepidium perfoliatum*) are all encroaching into the habitat.

Presettlement acreages of pebble plain habitat are not known. An estimated 150 acres (61 ha) of pebble plain habitat was lost by creation of the Big Bear Lake reservoir in the 1800s. Historical gold mining, cattle grazing, and rock collection have also negatively affected this habitat. Subsequent urbanization of Big Bear Valley and associated high-impact land uses have contributed to substantial habitat losses (USDA Forest Service 2002b). Ongoing disturbances that further reduce the extent and quality of pebble plain habitat include roads, small mining operations, recreation, special-use authorizations, urbanization, and unauthorized grazing. Fire suppression activities have also affected this habitat.

Activities associated with roads have resulted in the direct loss of individual pebble plain plants through crushing by vehicles, horses, mountain bikes, or foot traffic. For example, the Sawmill Complex has been completely de-vegetated by vehicle use (Stephenson and Calcarone 1999, USDA Forest Service 2002b, U.S. Fish and Wildlife Service 2001). Indirect effects of roads on pebble plain habitat include an influx of invasive nonnative plants; dust from dirt roads, which reduces photosynthesis and reproduction; and an interruption of natural sheet water flow across the habitat. In addition, roads within or near pebble plain complexes provide access for unauthorized vehicle travel through the plains (Stephenson and Calcarone 1999, U.S. Fish and Wildlife Service 2001).

Road maintenance (such as grading, cleaning and repair of drainage structures) has also resulted in the removal of pebble plain plants. To reduce effects of road maintenance, the Forest Service implemented a road maintenance plan in 1999, which modified maintenance activities within this habitat (USDA Forest Service 1999b).

Historic gold mining in the Holcomb Valley area during the late 1800s greatly affected pebble plains habitat. Although the scale of gold mining has been reduced dramatically, small-scale gold mining activities continue to occur in several pebble plain complexes. Several plans of operation for mining on the national forests have the potential to affect pebble plain species (USDA Forest Service 2001b). Prospecting is now more dispersed and is a major concern because of the lack of restrictions governing this activity.

Recreation activities have also degraded pebble plain habitat. Developed sites were constructed on or near pebble plains at Aspen Glen Picnic Area, Holcomb Valley Campground, Juniper Springs Campground and the Doble Trail Camp. Although impacts cannot be eliminated entirely, measures to reduce negative effects are now in place.

Prior to 1998, the San Bernardino National Forest allowed dispersed recreational target shooting at locations throughout the national forest. Openings provided by pebble plain habitat often became sites for recreational target shooting, causing impacts to habitat from vehicle use and trash. In 1998, the Forest Service completed an analysis to find suitable locations for recreational target shooting areas that were fire safe and did not impact sensitive plant or wildlife habitat. Several dispersed sites were designated, and garbage continues to be removed from habitat previously used for recreational target shooting.

Pebble plain habitat has been affected by recreational cabins under special-use permit from the Forest Service in the Snow Valley and Metcalf Tracts. Parking areas were designated in 1999 to reduce effects of parking on the habitat. Cabin owners were also advised to plant native plant species in their yards to reduce effects to habitat from invasive nonnative plants.

Other special-use permits that affect this habitat include the Rim Nordic Ski Area, Snow Valley Ski Area, and the Onyx Communication site access road. A rehabilitation plan is being developed for the former Snow Forest Ski Area. Several utility companies have corridors in this habitat. Measures to reduce habitat impacts in these locations are currently in place.

There are no active grazing allotments on the national forest that include pebble plain habitat. Nevertheless, pebble plain habitat is affected in the Broom Flat Complex by trespass grazing on the Rattlesnake Allotment. Pebble plain habitat within the Rattlesnake Complex may also be affected. Recent construction of drift fence to prevent cattle access has been ineffective, as cattle are often reported within both complexes. The Forest Service continues to work with BLM and the permittee to solve this problem.

Wild burro territory is present within the North Baldwin, Gold Mountain, South Baldwin/Erwin Lake, Broom Flat, and Rattlesnake pebble plain complexes. In 1997, the Forest Service removed 100 burros from residential areas after several burros were hit along the highways. Since that time, effects on pebble plains on the east side of Big Bear Valley have been reduced.

Fire suppression activities that disturb or compact the soil have the highest potential to affect pebble plain habitat. Driving, construction of dozer lines, use of habitat for fire camps or staging areas, and Burned Area Emergency Rehabilitation (BAER) treatments are of the greatest concern. Hand line construction, mop-up activities, and use of alkaline water drops and aerial retardants are additional activities that may affect this habitat, but to a lesser degree. A portion of the pebble plain habitat within the Fawnskin Complex was affected by dozer line construction during the Old fire in fall 2003. The newest threat to pebble plain habitat is the creation of WUI defense zones within or adjacent to habitat. In this situation, a well planned project design can incorporate the natural openings of the pebble plain, reducing the need to remove large quantities of vegetation or to store or chip organic material on site. Over the long term, preventing unauthorized motorized and mechanized vehicle use on pebble plain habitat within or adjacent to WUI defense zones may be the biggest challenge.

Biological diversity, or biodiversity, is a term for the variety of life and the natural processes of which living things are a part. Biodiversity includes living organisms and the biological communities in which they occur. The tremendous geologic, topographic, and climatic diversity in the mountains and foothills of southern California creates a correspondingly high level of vegetative diversity (Davis and others 1995). This vegetative diversity provides a wide range of habitat for wildlife. The vegetation types that cover the land area of the four southern California national forests were described in the previous section (Vegetation Condition and Forest Health). Invasive nonnative species are also described in a later section (see Invasive Nonnative Species). This section addresses general conditions for terrestrial plants and animals, aquatic species, species-at-risk, game species, and management indicator species that were chosen to focus forest plan implementation and effectiveness monitoring and to compare the alternatives.

The mountains and foothills of southern California are home to approximately 9 native species of fish, 18 amphibians, 61 reptiles, 299 birds, 104 mammals, 2,900 vascular plants, and an unknown number of species of invertebrate animals and non-vascular plants (Stephenson and Calcarone 1999). Approximately 3,000 of these species occur on the four southern California national forests.

Many of the 3,000 species have a large proportion of their distribution on National Forest System lands. Some are endemic to the national forests (essentially found nowhere else in the world), and some have special status as federally listed threatened, endangered, candidate or Forest Service sensitive species. Other species have wide geographic ranges and are found elsewhere in California, Mexico, the West or the Southwest, though they may be rare in southern California. A number of plant and animal species were formerly common in southern California but are now rare because of urban development, particularly in coastal areas and valleys. Some of the best remaining habitat for these species occurs just within the margins on National Forest System lands.

Myers and others (2000) identified the California floristic province—essentially, most of the state outside of the deserts—as one of the top 25 "biodiversity hotspots" for worldwide conservation priority. They defined biodiversity hotspots as exceptional concentrations of endemic species that are undergoing exceptional loss of habitat. Myers and others (2000) estimated that only 25 percent of the habitat within the California floristic province remains in a natural condition, with 48 percent of the plant species and about 12 percent of the vertebrate species being endemic. While the floristic province includes a much larger area than just the four southern California national forests, the report by Myers and others (2000) highlights the importance of the southern California national forests to the maintenance of regional biodiversity. Other authors have recognized the importance as well (Calsbeek and others 2003). Spencer and others (2001) pointed out that southern Orange County and adjacent public land, including the Cleveland National Forest, support core populations of many species including imperiled wildlife and plants. San Diego County was recognized as a “hotspot” of threatened and endangered species biodiversity by Dobson and others (1997) for having high numbers of listed plant, bird and fish species.

Habitat for plants and animals in southern California has been lost or altered by:

- Development within and outside national forest boundaries;
- Agricultural development;
- Urban infrastructure such as roads and utility corridors;
- Land ownership patterns within some of the national forests, contributing to habitat fragmentation;
- Frequent wildfire in some locations;
- Fire exclusion in some locations;
- Alterations to streams within and outside of the national forests (bridges, dams, concrete channel armor and commodity uses such as mining and other special uses);
- Unrestricted vehicle use;
- Grazing by domestic livestock;
- An influx of invasive nonnative species; and
- Effects of recreation use including hiking, bicycling, horseback riding, skiing, and other activities.

The four southern California national forests include habitat today for most of the species that were present before European settlement, although some, like the grizzly bear and wolf, have been extirpated. As natural habitat has been lost to human development and agriculture, the national forests provide refugia for many plants and animals. These lands have provided not only habitat, but also enough land for wide-ranging animal territories and corridors for migration and dispersal between fragmented landscapes.

The national forests include large blocks of natural habitat that are primarily managed for sustainable resource uses while protecting the ecological integrity of ecosystems for present and future generations. The International Union for Conservation of Nature and Natural Resources (IUCN) has guidelines for classifying "protected" areas. The IUCN (1994) defines protected area as "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means" (p. 7). Most of the land on the four southern California national forests falls within one of the six IUCN classifications of protected area (IUCN 1994). Those national forest areas that are most undeveloped or relatively natural are represented by land use zones including existing wilderness, Back Country Non-Motorized, Critical Biological and recommended wilderness—areas where motorized activities are prohibited or restricted and human use is consequently low. Approximately 47 percent of the national forests' land base is currently available only for non-motorized use and thus minimally subject to disturbance. Many animals and plants benefit from the solitude and isolation from the direct and indirect effects of humans and national forest management or permitted activities. During the last planning period, the level of protection for some species and habitats was increased by additional wilderness designations.

National forest wilderness management focuses on allowing natural conditions to prevail, usually by eliminating or limiting human intervention in natural processes. Therefore, the overall effect of wilderness designation is to provide additional protection and maintenance of natural biological diversity. Populations of federally listed threatened and endangered species located within any designated wilderness would be protected from development, though not from effects of non-mechanized recreation (hiking and stock use). Invasive nonnative plants are an ever-increasing concern in many of the national forest wildernesses in southern California. Fire exclusion as a result of effective wildfire suppression may have contributed to stand densification in mixed conifer forests within some wilderness areas.

The California Department of Fish and Game, through state game regulations, manages the wildlife within wilderness and other areas on the national forests, including hunting seasons for deer, bear and bighorn sheep. No fish stocking of lakes or streams occurs within any southern California national forest wilderness; however, there is potential for some stocked fish to migrate upstream into a wilderness. Habitat manipulation for wildlife, including prescribed fire, would be prohibited in wilderness areas unless it is specifically needed to restore natural ecosystem conditions or to perpetuate federally listed threatened or endangered species.

Fragmentation is defined as the breaking up of contiguous blocks of habitat, by features such as highways or urban development, into progressively smaller patches that are increasingly isolated from one another and of less value for conservation (Noss and others 1997). Some landscapes are naturally patchy, while others are relatively uniform. Fragmentation would affect these two types of landscapes and the species that use them in different ways. The definition of fragmentation does not address the question of how long these isolations last. Habitat changes from roads, agriculture or urban development are long-term or permanent. By contrast, most habitat alterations from fire, drought or national forest management activities are relatively temporary. Urbanization and freeways have fragmented landscapes in and around the national forests.

Many plants and animals evolved with natural disturbances and are adapted to live in an unpredictable environment. Periodic drought and wildland fire play a major role in determining the structure and composition of the woodlands, forests, and extensive shrublands present in the Mediterranean environment of coastal southern California. Periodic post fire flooding alters riparian ecosystems. Human activities also play a role in the distribution of plants and animals. Some nonnative species (such as bullfrogs and brown trout) have been intentionally or unintentionally introduced into the national forests. Extensive and locally intensive human activities (including road building, mining, vegetation management, domestic livestock grazing, recreation, and human-caused fire) have altered the composition and structure of many national forest ecosystems. Suppression of wildfire, meanwhile, has lengthened the fire return interval in many conifer forest stands, resulting in a higher proportion of dense stands than would be expected to occur under natural fire regimes.

Over the past 15 years, approximately 36,000 acres of land have been acquired (through purchase, exchange or donation) by the four southern California national forests. This represents about 1 percent of the total acreage on the national forests. Most of the acquired acreage was private land located within Forest Service administrative boundaries. These acquisitions helped prevent further urbanization of private land within the national forests. Some acquisitions were for unique habitats such as Tecate cypress and coastal beaches, increasing the biodiversity found on National Forest System lands.

Some national forest habitats are attractive for human uses, particularly streams, riparian areas, forests, woodlands, meadows and grasslands. Recreation is currently the predominant use of the national forests. For year-round use, these urban national forests rank among the top in the nation. Visitor demand on the four southern California national forests is expected to increase as human populations increase throughout southern California. See the Recreation section of the Affected Environment for more information.

Most concentrated recreation use occurs in areas that are accessible by vehicle, are relatively flat (less than 15 percent slope), and have vegetation that does not provide a barrier to human movement (that is, vegetation that is not mature chaparral). A Geographic Information System (GIS) model was created using these parameters for comparison with wildlife habitat distribution. Actual use of dispersed recreation areas depends on availability of space to park, so this model predicted a greater area subject to dispersed recreation use than actually occurs. The habitat types with the greatest percentage of area mapped as suitable for dispersed recreation are listed in table 185: Percent of Specific Habitat Types within Lands Suitable for Dispersed Recreation Vehicle Camping.

Table 185. Percent of Specific Habitat Types within Lands Suitable for Dispersed Recreation Vehicle Camping*

Habitat Type	Total Acres	Acres of Dispersed Recreation Potential	Percent Dispersed Recreation Potential
Alpine	147	74	50.4
Pebble Plain	2,290	1,136	49.6
Mixed Conifer Forest	102,862	15,570	15.1
Carbonate Soils	32,609	4,133	12.7
Montane Meadows	69,919	8,302	11.9
Desert Montane	383,124	38,553	10.1
Oak Woodland	19,644	1,855	9.4
Desert Floor	7,297	470	6.4
Lower Montane Forest	76,098	4,121	5.4

* Note: Near Road, Less Than 15 Percent Slope, Not Chaparral

Only 2 percent of National Forest System lands in southern California are potentially available for dispersed vehicle camping as described above, ranging from 0.4 percent in the San Gabriel Mountains to 7.0 percent in the San Bernardino Mountains. However, 87 percent of the accessible area is located in just three mountain ranges: about 3,000 acres in the San Diego Ranges, about 22,000 acres in the San Bernardino Mountains, and almost 31,000 acres in the southern Los Padres ranges. Most of the dispersed recreation capability is found in a limited number of Places, including Laguna and Palomar (Cleveland National Forest); Big Bear, Big Bear Backcountry, Arrowhead, and Desert Rim (San Bernardino National Forest); and Mount Pinos, Mutau-Hungry Valley, Highway 33 Corridor, and Figueroa-Santa Ynez (Los Padres National Forest). Use is disproportionately concentrated in specific areas; recreation activities may have substantial impacts on the species and habitats found there (Boyle and Samson 2005, Knight and Gutzwiller 1995). The *Southern California Mountains and Foothills Assessment* (Stephenson and Calcarone 1999) identified many of the ongoing impacts and popular recreation areas that also contained many rare species.

In addition to allowing access for recreation, roads contribute to habitat fragmentation by reducing habitat patch size, creating habitat isolation, and introducing habitat edge or corridor effects. Vehicle use on or adjacent to roads also has direct (mortality) and indirect (behavioral, physiological) effects on many animals and plants. The ecological effects of roads have been summarized in various literature reviews (Brooks and Lair 2005, Forman and Alexander 1998, Spellerberg 1998, USDA Forest Service 2001, Watson 2005). The national forests all have substantial acreage in large roadless areas. Benefits to biological diversity of maintaining large areas without roads include:

- Increasing habitat protection;
- Protecting areas from additional landscape fragmentation and further loss of connectivity;
- Maintaining and/or enhancing native plant and animal communities and reducing opportunities for the spread of invasive nonnative species;
- Increasing the protection of a diversity of habitats from low to high elevations;
- Conserving habitat for threatened, endangered, proposed, candidate, and sensitive species; and
- Providing important habitat for populations of wide ranging animals that need large areas with low human activity levels (USDA Forest Service 2000f).

The average road density is less than 2 miles of road per square mile of land area on all of the four southern California national forests (table 117: Road Density With Road Miles By Forest Roads (NFSR, Temporary And Unclassified), And State And County Roads). The road density figures are relative, as some roads on National Forest System lands are actually gated for safety, resource protection or administrative-only uses. Most National Forest System roads are low level of maintenance (Maintenance Level [ML] 1 and 2) and normally receive very low daily or annual use. Some roads such as state and county highways are not Forest Service responsibility. The national forests of southern California are no longer adding road mileage to their systems but are instead working to maintain existing roads, correct environmental impacts of roads, and prevent the proliferation of unclassified roads. Twenty-three percent of the roads included under "Forest Roads" in table 117 are actually unclassified (not designated National Forest System Roads [NFSR]) (18 percent) or temporary (13 percent) (see table 285: Miles of NFSR level 1-5, temporary, and unclassified roads by forest).

Table 117. Road Density With Road Miles By Forest Roads (NFSR, Temporary And Unclassified), And State And County Roads.

	ANF	CNF	LPNF	SBNF	Total
Forest acres*	655,387	434,480	1,762,679	671,686	3,526,234
Square Miles	1,024	679	2,754	1,050	5,507
Forest Road Miles	1,185	762	1,684	1,905	5,536
Forest Road Density (mi/sq. mi)	1.1	1.2	0.6	1.8	1.0
State/County Miles	261	225	343	299	1,128
State/County Highway Road Density (mi/sq. mi)	0.3	0.3	0.1	0.3	0.2
Total Miles	1,446	987	2,027	2,204	6,664
Total Road Density (mi/sq. mi)	1.4	1.5	0.7	2.1	1.2

* Official acres as of September 2002 - not GIS acres

Table 285. Miles of NFSR level 1-5, temporary, and unclassified roads by forest

Category	ANF	CNF	LPNF	SBNF	Totals
NFSR Levels 1-5	915	418	1177	1270	3780
Temporary	164	178	182	219	742
Unclassified	106	166	325	416	1,013

NFSR: National Forest System Road

Raw road density figures by individual national forest do not completely describe road influence on habitat fragmentation. A model that defines roaded areas as those areas where road density is greater than 0.5 miles per square mile indicates that 53 percent of the Angeles, 53 percent of the Cleveland, 31 percent of the Los Padres and 62 percent of the San Bernardino National Forests can be considered roaded. Road access is not uniformly distributed across habitats. Some vegetation types that occur predominantly in flat, open country include very high densities of roads, such as the montane desert, pebble plain, and conifer forest habitats on the San Bernardino National Forest, where the combination of system and unauthorized roads sometimes exceed 10 miles of road per square mile (Loe personal observation). This density of roads can virtually eliminate effective habitat for mule deer, for example (Thomas 1979). The effects of roads on biological diversity can be substantial (Gucinsky and others 2001, Stephenson and Calcarone 1999). Riparian areas also tend to have higher densities of roads than average. On the other hand, most chaparral occurs on very steep slopes and is not accessible by road. For a more detailed discussion of roads, see the Roads section in the Affected Environment portion of this chapter.

Roads also facilitate introduction and establishment of invasive nonnative plants by creating open, chronically disturbed habitat. Invasive nonnative plants can be transported along these road corridors by equipment and vehicles, and they often become established on exposed cut-and-fill slopes of roads more easily than native species. Approximately 1.5 percent of National Forest System land acreage consists of roads (see table 186: Percentage of National Forest System lands that consists of roads). For a more detailed discussion of invasive nonnative plants see the Invasive Nonnative Species section of this chapter.

Table 186. Percentage of National Forest System lands that consists of roads

	ANF	CNF	LPNF	SBNF	Total
Percent land area disturbed by all road categories and ownership on the National Forests	1.86	2.34	0.83	2.52	1.53

Each national forest also has a system of designated off-highway vehicle (OHV) routes (roads and trails); the Angeles and Cleveland National Forests also have a few designated OHV open use areas. OHV use on designated National Forest System roads and trails has effects on biodiversity similar to those of roads. In relatively flat, open habitat OHV users may stray off of designated routes and create unauthorized roads or trails. Unauthorized route proliferation is generally concentrated in the same Places identified above as having the greatest land area available for dispersed recreation. Most plant and animal species identified as being at risk from motor vehicle use (see Species-at-Risk section below) occur in these more open, accessible habitats.

The conservation of biodiversity requires a dual strategy that addresses both the habitat needs of individual species and the needs of entire biotic communities. The fine-filter, species-level approach is important for assuring the viability of sensitive or rare species, threatened or endangered species, and other species of conservation concern. This approach is complemented by landscape-level strategies that are focused on conserving vegetation communities or ecosystems, especially those habitats that are rare or declining. Considering ecosystems as a whole is the coarse-filter approach.

Terrestrial Species - Plants and Animals

Some terrestrial species are habitat generalists and may use a variety of habitat types. They may be found on all four southern California national forests or may inhabit only one or two. Other species are habitat specialists and occur in single vegetation types or limited variations of that type, often on only one national forest. Many invertebrate species are tied to a specific host plant or group of plants that are important to their life cycle. Some butterfly species are only found in locations where the plants on which they feed and breed are found. Other animals depend on specific physical features of the environment for habitat; some examples are described below.

Dead trees (also known as snags or down logs) provide a portion of the life-support system for many species of plants, invertebrates, birds, and mammals. The number and size of available snags affect not only the presence or absence of snag-dependent wildlife, but also population levels (Thomas and others 1979a). Dead and down woody materials in various stages of decay serve many important ecological functions, one of which is habitat for wildlife. Dying and dead wood provides one of the two or three greatest resources for animal species in a natural forest; if fallen and slightly decayed trees are removed, the system may lose more than a fifth of its fauna (Maser and others 1979a). Species dependent upon snags and down dead wood are vulnerable to habitat loss from wildland fire, fuels reduction activities, and unauthorized firewood removal.

A severe drought and associated insect outbreaks have caused the death of numerous conifers, some hardwood trees, and even chaparral shrubs across hundreds of thousands of acres of the southern

California national forests (see Vegetation Condition and Forest Health). Although all of the national forests have some tree mortality, the hardest hit has been the San Bernardino National Forest. Close to 500,000 acres of national forest habitat are estimated to have been affected by the drought and bark beetles. Habitat for some plant and animal species (particularly those dependent on dense conifer forest) has been heavily altered or temporarily lost. On the other hand, plant and animal species requiring high light levels or a more open forest condition are likely to increase in abundance as a result of mortality in overstory trees. Snag and down wood habitat will increase in abundance for years in areas affected by tree mortality, unless consumed by wildfire or removed through fuels management activities.

Areas with large numbers of standing dead trees present an increased risk of catastrophic fire, especially while dead needles or leaves remain on the trees. Wildfires burned more than 700,000 acres during late October to early November 2003 in southern California. Approximately 198,000 of those acres were National Forest System lands. Most of this acreage consisted of chaparral and coastal sage scrub, with only about 5 percent being forest or woodland. The fires reduced habitat for species dependent on mature vegetation but created extensive temporary habitat for early seral plants and animals, especially those adapted to post-fire chaparral such as mule deer, bighorn sheep and quail.

Cliffs, caves and abandoned mines provide habitat for numerous species. For example, eagles, hawks and falcons nest on cliffs, while bats live in caves, mines, and crevices within cliffs. All four southern California national forests have some cliffs, caves and abandoned mines. Cliffs provide physical protection for wildlife and concentrate a variety of reptiles, birds and mammals into relatively small but stable environment (Maser and others 1979b). Cliffs are vulnerable to rock climbers and geological hazards. A cave is a natural underground chamber that is open to the surface, while a mine is a man-made underground feature that may contain multiple chambers. The national forests have only a few caves, and most of these are small; abandoned mines provide additional cave-like habitat. Species that inhabit caves and abandoned mines are vulnerable to human exploration, chamber collapse, vandalism, fire, and smoke.

Aquatic Species

Aquatic and riparian habitats are among the most productive and diverse environments within a watershed. Stream channel and flood plain geomorphology (as well as riparian vegetation) serve to shape the structure of aquatic habitats. Riparian vegetation also stabilizes stream banks (Sedell and Beschta 1991), provides shade and organic matter, minimizes erosion, helps prevent downcutting, and captures nutrients, chemicals, and sediment—all of which help maintain conditions for aquatic species. See the Watershed section in the Affected Environment for more information about streams, lakes, reservoirs, and riparian areas.

Freshwater aquatic habitats are uncommon in coastal southern California, and most have been modified by altered stream flow regimes. Essentially all the large rivers are to some extent dammed or diverted (Stephenson and Calcarone 1999), thereby altering the extent and character of riverine habitats. Deep-water reservoirs formed by dams are a new and entirely different type of aquatic habitat that did not exist prior to European settlement in the region. The aquatic fauna found in these reservoirs tends to be dominated by nonnative species.

The pattern of low stream flow in summer (reflective of southern California's Mediterranean climate) often causes the lower and uppermost portions of streams to dry up. However, streams that flow through rock canyons often have perennial flow because deep pools are fed by groundwater recharge, thereby resulting in wet middle portions. Seventy-four percent of the miles of streams above 3,000 feet elevation are on public lands (Stephenson and Calcarone 1999). Below this elevation, ownership by public lands decreases to approximately 50 percent, and it is closer to 17 percent at elevations of 1,000 feet and below.

Table 187. Threatened, Endangered and Sensitive Aquatic and Semi-Aquatic Species on the Southern California National Forests

Low Elevation Streams (less than 3,000 feet)	High Elevation Streams (greater than 3,000 feet)
• Arroyo toad • California red-legged frog • Coast range newt • Arroyo chub • Santa Ana sucker • Santa Ana speckled dace • Southern and south-central steelhead trout • Unarmored three-spine stickleback • California red-sided garter snake • Southern Pacific pond turtle	• Mountain yellow-legged frog • Shay Creek unarmored three-spine stickleback

The middle and lower portions of these streams (typically found at elevations below 3,000 feet) support a higher number of aquatic and riparian species compared to the upper stream segments. Perhaps because habitat loss has been so extensive there, low-elevation streams also have a much higher number of associated threatened, endangered and sensitive animal species (see table 187: Threatened, Endangered and Sensitive Aquatic and Semi-Aquatic Species on the Southern California National Forests; Stephenson and Calcarone 1999). Because of this break in habitat connectivity in many of the aquatic ecosystems in southern California, these degraded systems need to be restored and protected for aquatic species to be maintained.

Aquatic and riparian-dependent species that inhabit the planning area vary from fish, frogs and macroinvertebrates (aquatic insects) to newts, toads, turtles and snakes, some of which may live in only certain streams on particular national forests (see table 369: Animal Species Evaluated for Viability Concerns (Species of Concern), page **166**). There are few species of native fish in southern California streams, and essentially all of them are considered rare and at risk (Moyle 2002, Stephenson and Calcarone 1999). Fish species range from the very small, short-lived native fish that may reside in only a handful of locations (Santa Ana speckled dace, for example) to the large, anadromous fish (such as steelhead trout) that spend part of their lives in the ocean and part of their lives in freshwater streams on the Los Padres and Cleveland National Forests. Frogs and toads inhabit streams and riparian areas across the planning area, such as the California red-legged frogs that are found on the Los Padres and the Angeles National Forests, the mountain yellow-legged frogs found on the Angeles and the San Bernardino National Forests, and the arroyo toads that are found on all four southern California national forests.

Based on a composite data set compiled from national forest, EPA Environmental Monitoring and Assessment Program (EMAP) and the California State Bioassessment Program (CSBP) sources, Ode and others (in press) developed a multi-metric Index of Biotic Integrity (Benthic-IBI) for coastal southern California. Aquatic insect data from 51 stream sites across the planning area defined a reference condition for streams on the four southern California national forests as 30 percent having very good water quality, 37 percent having good water quality, 30 percent having poor water quality, and 2 percent having very poor water quality. Aquatic insects are very sensitive to their physical and chemical environment and respond quickly to changes therein. Fish and aquatic invertebrates that are sensitive to disturbance generally prefer habitats with low amounts of fine sediments and high amounts of cover and structural diversity. Large woody material from forested riparian areas physically and biologically substantially influences aquatic habitats (Gregory and others 2003, Harmon and others 1986, Maser and Sedell 1994) by creating structure and influencing food availability and is important to most stream habitats in forested areas, regardless of stream size. Large woody material is generally only a regular component of streams in the planning area where conifers or hardwood trees are growing adjacent to the streams.

Aquatic species evolved under natural conditions that are not uncommon in the planning area, such as drought, wildfire and flooding. However, because of the extent of habitat loss, alteration, and isolation that has occurred through time across the greater southern California area, many of these aquatic species populations have declined and are treated as species-at-risk in this EIS (see the species accounts for more detail on species-at-risk `http://www.fs.fed.us/r5/scfpr/read/).`

Given the significance and rarity of hydrologically intact low-elevation streams, those occurring on National Forest System lands are given special attention. Of particular importance are the sections of these streams that are in a relatively unmodified state. These are the areas where historical disturbance regimes and the natural range of variability may still be possible to maintain. The hydrologically unregulated sections of streams are the best remaining examples of intact low-elevation aquatic ecosystems in the central and southern California coastal region (Stephenson and Calcarone 1999).

Next to alteration of streamflow, the biggest threat to the health of native aquatic ecosystems is the spread of invasive nonnative species (see Invasive Nonnative Species section). Some invasive nonnative plants such as arundo and tamarisk are spreading, displacing native vegetation and causing a decline in surface water availability in some streams because of the excessive amounts of water these plants use. In addition, bullfrogs and an assortment of introduced fish species prey on native aquatic species and also compete with them for the limited available habitat. Collectively, these nonnative species are causing a serious decline in the capability of aquatic habitats to support native species (Moyle 2002, Stephenson and Calcarone 1999).

Lakes in southern California range from natural to human made (see Watershed, page 196 section of this chapter for more details about streams, lakes, reservoirs and riparian areas). One large natural, ephemeral lake is Baldwin Lake in the eastern San Bernardino Mountains; when full, its shallow waters provide habitat for a rare fish, the Shay Creek unarmored three-spine stickleback. The watershed that feeds Baldwin Lake also provides the primary water supply for the community of Big Bear.

The large human-made lakes referred to as reservoirs are essentially distinct ecosystems, with an aquatic fauna that bears little resemblance to what naturally occurred in the streams that formed them. Almost all support warm-water fisheries and are stocked with various species of bass, trout, catfish and sunfish. Stocking of these reservoirs facilitates the introduction of a wide variety of invasive nonnative fish species into the surrounding streams as well. These introduced fish have attracted bird species that were formerly very rare in the mountains of southern California, such as the bald eagle and osprey (Stephenson and Calcarone 1999).

Species-at-Risk

To better understand how Forest Service activities and uses affect the diverse and sometimes imperiled flora and fauna known or suspected to occur on the national forests of southern California, all vascular plant and vertebrate species were reviewed in a technical assessment (Stephenson and Calcarone 1999). From the initial list generated by Stephenson and Calcarone (1999) and further reviewed by Forest Service biologists and botanists, 482 species were identified to be of potential conservation concern that could be vulnerable to impacts associated with the uses and activities that occur on the national forests of southern California (see table 369: Animal Species Evaluated for Viability Concerns (Species of Concern), page **166**, and table 360: Plant Species Evaluated for Viability Concerns (Species of Concern), page **137**. The methods used to select species for analysis and the analysis processes are described in more detail in Appendix B, Species Viability Evaluation Process.

Species accounts (with a description and information about distribution, abundance, ecological processes, factors influencing ecological processes and management considerations) were created for these 482 species of potential conservation concern, using information from various sources. All current federally listed and Forest Service sensitive species were included among the 482 taxa. Forest Service biologists and botanists then evaluated each of these species to determine its level of threat from Forest Service activities and uses. Threat categories were defined as follows:

- Not found in the plan area.
- Potential habitat only in the plan area; no records of species occurrence.
- Common or widespread in plan area with no substantial threats to persistence or distribution from Forest Service activities and uses.
- Uncommon, narrow endemic, disjunct, or peripheral in the plan area with no substantial threats to persistence or distribution from Forest Service activities and uses.
- Uncommon, narrow endemic, disjunct, or peripheral in the plan area with substantial threats to persistence or distribution from Forest Service activities and uses.
- Common or widespread in plan area with substantial threats to persistence or distribution from Forest Service activities and uses.

Of the 482 species reviewed, 93 plant and 56 animal species were found to be in threat categories 5 or 6, indicating that they potentially face substantial threats to persistence or distribution from Forest Service activities and uses (see table 114: Number of Plant Species of Concern in Each Threat Category*;* table 113: Number of Animal Species of Concern in Each Threat Category; and table 190: Percent of Potential Species of Conservation Concern Determined to be At Risk on National Forest System lands). These 93 plant and 56 animal species are referred to as "species-at-risk" in subsequent discussions and are a primary focus of the environmental consequences section for biological diversity (for lists of these species see table 367: Plant Species-At-Risk, page **160**, and table 370: Animal Species-At-Risk, page **173**).

Table 113. Number of Animal Species of Concern in Each Threat Category

See Table 467, Key to Codes Frequently Used in Biodiversity Tables, page **131**

Federal or State Status	Number of Animal Species	Threat Category					
		1	2	3	4	5	6
Endangered	*25	4	3	0	7	10	1
Threatened	11	0	1	0	4	6	0
Proposed	0	0	0	0	0	0	0
Candidate	**2	2	0	0	0	0	0
Sensitive	34	2	4	6	13	8	1
State	35	1	4	8	12	9	1
Other	89	0	7	19	43	19	1
Total	196	9	19	33	79	52	4

* California tiger salamander, Mohave tui chub and San Diego fairy shrimp are not present on the national forests.
* * Coachella Valley ground squirrel is not present on the national forests. Western yellow-billed cuckoo is included within Candidate status.

Threat Categories:
1) Not found in the plan area.
2) Potential habitat only in the plan area; no records of species occurrence.
3) Common or widespread in plan area with no substantial threats to persistence or distribution from Forest Service activities.
4) Uncommon, narrow endemic, disjunct, or peripheral in the plan area with no substantial threats to persistence or distribution from Forest Service activities.
5) Uncommon, narrow endemic, disjunct, or peripheral in the plan area with substantial threats to persistence or distribution from Forest Service activities.
6) Common or widespread in plan area with substantial threats to persistence or distribution from Forest Service.

Table 114. Number of Plant Species of Concern in Each Threat Category

See Table 467, Key to Codes Frequently Used in Biodiversity Tables, page **131**

Federal Status	Number of Plant Species	Threat Category					
		1	2	3	4	5	6
Endangered	18	1	6	0	0	11	0
Threatened	10	0	1	0	3	6	0
Candidate	2	1	0	0	0	1	0
Sensitive	136	3	9	4	67	53	0
Watch List	67	0	16	3	32	16	0
Other	53	6	5	10	26	6	0
Total	286	11	37	17	128	93	0

Threat Categories:
1.Not found in the plan area.
2.Potential habitat only in the plan area; no records of species occurrence.
3.Common or widespread in plan area with no substantial threats to persistence or distribution from Forest Service activities.
4.Uncommon, narrow endemic, disjunct, or peripheral in the plan area with no substantial threats to persistence or distribution from Forest Service activities.
5.Uncommon, narrow endemic, disjunct, or peripheral in the plan area with substantial threats to persistence or distribution from Forest Service activities.
6.Common or widespread in plan area with substantial threats to persistence or distribution from Forest Service activities.

Table 190. Percent of Potential Species of Conservation Concern Determined to be At Risk on National Forest System lands

Taxa	Number of Species of Concern	Number of Species-at-Risk	Percent Species-at-Risk
Amphibians	14	5	36
Birds	72	22	31
Fish	12	8	67
Invertebrates	30	10	33
Mammals	46	7	15
Reptiles	23	4	17
Total Animals	197	56	28
Plants	286	93	32

Central and southern coastal California support a large number of plant and animal species federally listed as endangered, threatened, proposed or candidate for listing under the Endangered Species Act of 1973, as amended. The recovery of those species and the ecosystems upon which they depend is the responsibility of all federal agencies, with lead responsibility given to the U.S. Fish and Wildlife Service (terrestrial/fresh water species) and National Marine Fisheries Service (NOAA Fisheries) (most marine species). There are 62 threatened and endangered species, 3 candidate species, and 170 sensitive species known or with the potential to occur on the four southern California national forests of southern California (as of June 2005). Some of these species are found on all four southern California national forests in a variety of habitat types, including streams and rivers. Many of the threatened and endangered species are present on only one or two national forests, with others only suspected to occur on National Forest System lands. Lists of these special status species are found in table 361:(Federally Listed Plant Species - Endangered, Threatened, Proposed or Candidate), page **148**, table 362: (Federally Listed Animal Species - Endangered, Threatened, Proposed or Candidate), page **150**, table 363: (Forest Service Pacific Southwest Region Sensitive Animal Species, page **152**, and table 364: (Forest Service Pacific Southwest Region Sensitive Plant Species) page **154**. The U.S. Fish and Wildlife Service has designated critical habitat for some species and has proposed critical habitat for others. The National Marine Fisheries Service (NOAA Fisheries) has proposed critical habitat for steelhead trout.

A number of federally listed threatened and endangered species were found to have no substantial threats to their persistence or distribution from Forest Service activities and uses (see table 115: Threatened and Endangered Plant Species with No Substantial Threats from Forest Service Activities and table 116: Threatened and Endangered Animal Species with No Substantial Threats from Forest Service Activities). Explanations for these determinations and scientific names for animal species can be found in the species accounts in the Reading Room (`http://www.fs.fed.us/r5/scfpr/read/`).

Table 115. Threatened and Endangered Plant Species with No Substantial Threats from Forest Service Activities

Scientific Name	Rationale
Arenaria paludicola	Species has not been found in the planning area – potential habitat only.
Astragalus brauntonii	Species has not been found in the planning area – potential habitat only.
Astragalus lentiginosus var. *coachellae*	Species has not been found in the planning area – potential habitat only.
Astragalus tricarinatus	Species has not been found in the planning area – potential habitat only.
Baccharis vanessae	Only population is located in wilderness with no activities in the vicinity.
Brodiaea filifolia	Species has not been found in planning area. Only population is apparently a stable hybrid between this species and *Brodiaea orcuttii*. No substantial threats to hybrid population identified.
Caulanthus californicus	Protocol surveys determined species is not present in the planning area. No designated critical habitat for *Caulanthus californicus* in the forest plan area.
Ceanothus ophiochilus	The primary threat to populations of this species on National Forest System land is a short-interval reburn of the stands, all of which burned in 2000. Fires in this area typically start off-Forest, outside of Forest Service control. Forest Service efforts to prevent another fire will help conserve the species.
Dudleya cymosa ssp. *ovatifolia*	Existing populations on National Forest System land are not substantially threatened by occasional recreation in habitat. Species occurs on steep talus slopes where people generally don't go.
Eriastrum densifolium ssp. *sanctorum*	Species has not been found in the planning area – potential habitat only. No threats to off-Forest habitat from Forest Service activities.
Nasturtium gambelii	Species has not been found in the planning area – potential habitat only.

Table 116. Threatened and Endangered Animal Species with No Substantial Threats from Forest Service Activities

Common Name	Rationale
Conservancy fairy shrimp	Known site is fenced to exclude impacts.
Longhorn fairy shrimp	Not known to occur on National Forest System lands.
San Diego fairy shrimp	Not known to occur on National Forest System lands.
Vernal pool fairy shrimp	The major threat is destruction of habitat. Vernal pools present on the Los Padres National Forest are not subject to loss by agricultural or urban development.
Smith's blue butterfly	Ongoing Forest Service activities have little potential to affect the host plants for this butterfly or, as a result, larvae or adults themselves.
Mohave tui chub	Not present on the national forests. A hybridized form, not recognized as a federally listed species, is located on the San Bernardino National Forest.
Tidewater goby	Populations are not known to extend onto National Forest System lands.
Shay Creek unarmored	Known to occur on National Forest System lands in only one area; species

Common Name	Rationale
three-spine stickleback	will be minimally influenced by management actions taken on NFS lands. However, the San Bernardino National Forest can continue to play a strong role in collaborating with other agencies in regards to overall water management within the Big Bear basin to benefit this species.
California tiger salamander	Not known to occur on National Forest System lands and low potential for habitat.
Blunt-nosed leopard lizard	Because of the limited occurrence on the Los Padres National Forest, conservation of the full species will be minimally influenced by management actions taken on National Forest System lands.
Desert tortoise	There are very few individual tortoises on or near the National Forest System lands. Experts consider the habitat on and adjacent to the Forest to be marginally suitable and unimportant to the species as a whole.
California brown pelican	Coastal areas are only used as occasional pelican roosting sites during part of the year; management of those lands has little effect on the conservation of this species.
California least tern	No known breeding reported on National Forest System lands. Several years of surveys and communication with species experts indicate that the California least tern is highly unlikely to nest on beach property of Los Padres National Forest.
Marbled murrelet	Survey information and range distribution information is limited, yet not known to nest on the national forests of southern California. Potential habitat on National Forest System lands is mostly unroaded or wilderness.
Coachella Valley round-tailed ground squirrel	No known population on National Forest System lands and low potential for habitat.
Giant kangaroo rat	Not known to occur on National Forest System lands and very limited potential habitat.
San Joaquin kit fox	Only limited potential foraging habitat on the Los Padres National Forest.
Southern sea otter	Primarily a marine species with limited use of coastal lands. Beach management has little effect on species conservation.
Steller's sea lion	Use of coastal land limited to occasional haul outs on beach. Beach management has little effect on species conservation.
Stephens' kangaroo rat	Known to occur on National Forest System lands from one area; known and potential habitat not threatened by management activities.

A number of corrective actions have been taken in recent years to reduce impacts from Forest Service activities on threatened and endangered species. Some campgrounds are closed seasonally to protect arroyo toads and California red-legged frogs that breed in streams running through the campgrounds, for example. Bridges have been constructed over streams to keep vehicles from killings listed frogs and toads. Barricades, barriers, and informational signs have been installed to keep vehicles and non-motorized recreationists out of sensitive habitat. Species and habitat conservation and management strategies have been developed and implemented on the national forests. Other protective actions are described in individual species accounts in the Reading Room (`http://www.fs.fed.us/r5/scfpr/read/`).

Game Species

Hunting and fishing are popular activities on the national forests. The recreational aspects of hunting and fishing are discussed in the Recreation sections of this chapter.

Game birds on the southern California national forests include mourning dove, chukar, three species of quail, turkey, band-tailed pigeon, and numerous species of waterfowl. Big game species include mule deer, Nelson's bighorn sheep, tule elk, wild pig, and black bear. Wild pigs and tule elk are found only on the Los Padres National Forest. Game fish on the southern California national forests include rainbow and brown trout, crappie, bluegill, and several species of bass and catfish. The trout inhabit streams and reservoirs; the warmwater fish are most abundant in reservoirs but do go up the warmer sections of the inlet streams. A number of perennial streams support self-sustaining populations of rainbow and brown trout. Many of the streams and reservoirs in the planning area that are accessible via roads are regularly stocked with hatchery rainbow trout.

Populations of most game species are largely dependent upon weather. In a series of good moisture years (average or above average rainfall), populations typically increase. In extended drought periods, populations frequently decline. In an effort to maintain healthy populations of game animals, a variety of habitat maintenance, restoration, and improvement projects have been implemented in the past throughout the planning area. These projects are often conducted with the assistance of partnerships with the California Department of Fish and Game and with hunting, fishing, and conservation groups. Project work that has been done to improve habitat for game species on the national forests include actions such as prescribed burning; streambank, riparian and meadow vegetation restoration and enhancement; securing in-stream flows through collaboration with other agencies; reservoir habitat enhancement; removal of roads from wetlands and riparian areas; restricting livestock from riparian areas and live water; controlling unauthorized vehicle use; water source development; and native tree and shrub planting. A major focus on the national forests during the current planning cycle has been restoring riparian areas, which has provided benefits to most of the game species.

Species accounts were also written for the mule deer, black bear, Nelson's bighorn sheep, tule elk, chukar, band-tailed pigeon, mourning dove, California quail, mountain quail and rainbow trout (see Reading Room (`http://www.fs.fed.us/r5/scfpr/read/`)). These accounts provide much more detail on the species habitat requirements and conservation considerations. The mule deer is a management indicator species and is discussed further in the next section.

Management Indicator Species

Management indicator species (MIS) are selected because their population changes are believed to indicate the effects of management activities (36 CFR [Code of Federal Regulations] 219.19(a)(1), 1982) and to serve as a focus for monitoring (36 CFR 219(a)(6), 1982). The regulation (1982 Planning Rule) required the selection of vertebrate and/or invertebrate species as MIS but did not preclude the selection of other life forms. Vascular plants are included as MIS because these species are often wide-ranging and responsive to landscape-level stressors. The 2005 Planning Rule, which was finalized after these revised forest plans were substantially completed, allows the use of habitat data and analysis for MIS monitoring in the implementation of forest plans revised under the 1982 Planning Rule, unless population monitoring or population surveys are specifically required by the forest plan (36 CFR 219.14(f), 2005). This provides realistic flexibility for monitoring MIS at the programmatic or province (multiple national forests) level. In the end, species were chosen that represent important management concerns where plan and project design and implementation could be evaluated and compared.

For a summary of the selection process and the rationale for species selection, see Appendix B, Management Indicator Species Selection Process.

Mule Deer

The mule deer was selected as an MIS for forest health related to vegetation management, roads and associated recreation management. Trends in mule deer populations can be monitored through cooperation with the California Department of Fish and Game in their on-going surveys. Observed changes in mule deer abundance are not due entirely to the effects of Forest Service activities and uses. This lack of a precise cause-and-effect relationship is due to the complex interrelationships among deer herd size, hunting pressure, human developments and roads, and vegetation management practices on private and public wildlands. However, the Forest Service recognizes that mule deer population trends in the national forests depend in large part on Forest Service vegetation and road management activities. Because maintaining suitable mule deer habitat is an important management objective for the national forests of southern California, it is important for the Forest Service to engage in inter-agency monitoring efforts of deer population abundance and habitat condition. In addition, mule deer can be used to evaluate the effects of the different strategies in the forest plan alternatives for vegetation and road management.

Mule deer populations across California and in southern California have declined from high levels in the early 1960s because of many factors. A sustained low survival rate of fawns is suspected as a major factor in the deer population decline. Factors thought to be contributing to the low survival rate of fawns include changes in the amount and distribution of vegetation and age classes, private land development adjacent to and within the national forests, recreational use in key areas, lack of frequent small fires, and an increase in mountain lion predation (Updike pers. comm.). The recent drought, which affected vegetation and water sources over the past several years in a large part of the planning area, may have contributed to further decline (Loe personal observation).

Since the current forest plans were completed, the national forests have been working to improve and restore habitat for mule deer using prescribed burning in chaparral, fuels treatment around bigcone Douglas-fir stands, maintenance and installation of wildlife water developments, planting of oaks, closure of unauthorized roads, control of unrestricted vehicle use, restoration of meadows and riparian areas, and removal of conflicting uses from meadows and riparian areas. Some habitat has been acquired and exchanged for the benefit of mule deer and other wildlife.

Recreational target shooting and poaching continue to be a problem for mule deer, especially in areas with high road densities, such as the San Bernardino National Forest (Loe personal observation). Mule deer that are poached year round and shot at from roads during hunting seasons begin to avoid roads (Kilgo and others 1998, Sage and others 1983, Thomas and others 1979b). Deer learn to avoid areas where they are most susceptible to predators or adverse human interactions (such as being shot at). With modern high powered rifles, this avoidance distance can easily be 300 to 400 yards from roadways if there is not dense hiding cover. This avoidance means that roads in or adjacent to riparian areas (fawning areas) and key winter areas are a problem (Thomas and others 1979b). Since completion of the last forest plans, there has been an increase in the control of recreational target shooting, which has benefited mule deer and other species sensitive to human disturbance. The greatest gains have come where road densities have also been reduced.

The California Department of Fish and Game has responsibility for managing mule deer populations in California. The Department has two general goals for deer management:

- Restore and maintain healthy deer herds in a wild state;
- Provide for high quality and diversified use of the deer in California.

These goals are met by maintaining or working toward attainment of specific objectives stated in deer herd management plans. Each deer herd plan identifies objective levels, which usually include the number of deer in the herd, proportion of bucks in the deer herd (buck ratio), survival rate of fawns and percent hunter success. The Forest Service cooperates with the Department in the preparation of these plans.

The four southern California national forests support most of the mule deer in the southern part of the state. These populations provide important hunting and wildlife viewing opportunities. The national forests do not conduct their own individual population surveys but rather cooperate with the California Department of Fish and Game in their survey efforts. Based on Department surveys, population levels are estimated by deer hunting zones using the KILLVARY population model (Updike pers. comm.). Population sizes for southern California are estimated to be:

- A Zone (includes Los Padres National Forest and all other central coast lands) - 155,190;
- D-11 (San Gabriel Mountains, Angeles National Forest) - 2,180;
- D-13 (Mount Pinos, Santa Barbara/Ventura Deer Herds, Los Padres National Forest) - 6,960;
- D-14 (San Bernardino Mountains, San Bernardino National Forest) - 1,740;
- D-15 (Santa Ana Mountains, Cleveland National Forest) - 950;
- D-16 (San Diego Mountains, Cleveland National Forest) - 2,330; and
- D-19 (San Jacinto/Santa Rosa Mountains, San Bernardino National Forest) - 440.

The majority of the habitat restoration and improvement currently conducted on the national forests is a by-product of threatened, endangered and sensitive species work. Some habitat restoration and improvement work is conducted with cooperative funding from the California Department of Fish and Game (Hill Bill funds) and through volunteer efforts.

Most chaparral is burned in large, high-intensity wildfires that reduce the amount of cover below desirable levels. These fires result in large amounts of early successional forage for a few years after the fire. When the vegetation matures, the forage quality declines until the area burns again, generally in another large, high-intensity fire. The cycle then repeats itself. A continuing mule deer habitat management goal is to conduct mosaic burning that keeps a continual supply of high-quality forage in close proximity to cover in mule deer home ranges. Some prescribed burning has been conducted since the last forest plans were developed, but the amount of burning has been far less than planned because of low budgets and narrow burn windows. The Healthy Forests Restoration Act of 2003 has increased the funding available for fuels management; however, the current emphasis is on fuels treatment immediately adjacent to communities. Human disturbance near communities reduces the benefits that mule deer might otherwise gain from this prescribed burning. The emphasis on community protection fuel treatments has also deferred some of the chaparral prescribed burning opportunities for wildlife.

Mule deer habitat quality in forest vegetation types has continued to decline because of lack of fire in most areas. Lack of fire has resulted in stand densification in many cases, which results in decline of shrub and herbaceous species that deer use as food. Stand densification also has favored white fir and incense cedar at the expense of black oak, which is an extremely valuable mast crop (acorn) producer (California Department of Fish and Game 2002b). This has serious long-term consequences for deer and other mast-dependent species. The recent increased emphasis on fuels management resulting from the Healthy Forests Restoration Act of 2003 should result in more fuels treatment in the forested areas, which would benefit mule deer herds, especially when it is conducted away from communities.

Riparian areas (including meadows), which are critical for fawning, are affected by disturbance associated with high levels of recreation use. These areas are sought out by both mule deer and recreationists. Some locations across the national forests have had vehicle access reduced by road closure and seasonal campground closures, which has benefited mule deer.

Road and motorized trail densities have continued to increase, primarily because of unauthorized vehicle use in some areas, since the last forest plans were written. Some unauthorized roads have been closed in critical areas since the last plans were written, but unauthorized roads are still a major problem in some key fawning areas and key winter ranges.

Urban development within and adjacent to the national forests continues to adversely affect mule deer numbers, which are generally low adjacent to communities due to the amount of human and dog use. Feral dogs and domesticated dogs that are allowed to run loose chase mule deer and kill fawns. The national forests are currently working to acquire or make land exchanges for important habitat and recreation areas before they are developed. The level of purchasing activity from year to year depends on funding levels.

Mountain Lion

The mountain lion was selected as an MIS to detect the effects of forest activities and uses on landscape-level habitat fragmentation and habitat linkages. The mountain lion (or cougar) is the largest carnivore in the planning area and requires large core habitat areas, abundant prey, and habitat connectivity between sub-populations. An interagency, inter-forest monitoring program of mountain lion populations and use patterns, habitat, and landscape linkages can be used to estimate the effects of forest management on mountain lion abundance and patterns of use and serve as an indicator of the connectivity of biological communities at the landscape level.

Mountain lion population health largely depends on the abundance of prey. Mule deer make up most of the mountain lion's diet. Mountain lion density is always low, because they have very large home ranges and limited social interactions (Beier 1996). Populations of mountain lions in southern California are becoming fragmented at an increasing rate due to freeways and urbanization (Beier 1993). Based on the review of studies and contacts with mountain lion experts, it appears that long-term viability of mountain lions in southern California could be at stake because of existing and planned development and freeway construction on and off National Forest System land (Beier 1993, Beier and Barrett 1993). Maintenance and restoration of corridors between large wildlands is essential to conserving cougars in southern California (Dickson and others 2005). Factors that adversely affect mule deer also adversely affect mountain lions. Mountain lions prefer areas with solitude, as do mule deer, so disturbances in riparian areas and key deer summer and winter ranges also affect mountain lions. Extensive vehicle access increases the potential for disturbance, poaching, and animal mortality from vehicles. Another threat to the species is the widening of the existing highway system and new highways, both within and outside the national forests, which can create barriers to movement.

The greatest concern for the long-term health of mountain lion populations on the national forests of southern California is loss of landscape connectivity between mountain ranges and large blocks of open space on private land (Dickson and others 2005). The national forests have been cooperating in the Missing Linkages Project spearheaded by South Coast Wildlands Project. This effort attempts to identify and gain government agency and public recognition and support for maintaining critical landscape linkages. All four southern California national forests are participating in the effort (for explanation of this program, see Appendix B, Landscape Linkage Identification Process). Viable populations of mountain lions could be maintained if the national forests and other land management agencies in southern California work together to provide healthy mule deer herds; corridors/linkages for lion movement between sub-populations; and sufficient large, backcountry type areas where human density, roading, and mountain lion mortality are held to a minimum. Maintaining landscape linkages for mountain lions will help provide habitat connectivity for other large mammals as well.

Mountain lion research is currently being conducted by the National Park Service in the Santa Monica Mountains and adjacent mountain ranges to determine movements and landscape connectivity. The Forest Service and California Department of Fish and Game are conducting a study in the San Gabriel Mountains to look into the bighorn sheep decline and relation to mountain lion predation. Scientists from the U.S. Geological Survey are planning to radio-collar additional mountain lions in the San Gabriel Mountains in support of these projects. Personnel from the University of California at Davis and the California State Parks are investigating mountain lion, mule deer, and Peninsular bighorn sheep interactions and movements in Anza Borrego and Cuyamaca Rancho State Parks. The U.S. Geological

Survey is collaborating with the California Department of Fish and Game to work on the rest of coastal southern California, including the Western Riverside Multiple Species Habitat Conservation Plan area, the Santa Ana Mountains, Chino and Whittier Hills, and the San Jacinto-Palomar Mountains area. These research projects should yield data that will help identify trends in mountain lion populations on and near National Forest System lands. Forest Service cooperation in or support for these and similar studies will help assure that resulting data are made available for monitoring this MIS. Monitoring the on-going condition of the primary landscape linkages between the mountain ranges in cooperation with all of the linkage partners will provide information on the effectiveness of Forest Service implementation.

Arroyo Toad

The arroyo toad was selected as an MIS for low-elevation riparian and aquatic ecosystems. Long-term trends in population abundance, stream occupancy, and habitat condition are expected to reflect the effectiveness of management actions in protecting low-elevation riparian and aquatic habitat from disturbance and habitat degradation. Short-term fluctuations in arroyo toad populations may not indicate the effects of management actions, because toad populations are strongly influenced by weather patterns. However, we believe that long-term trends in arroyo toad abundance and habitat will reflect whether management activities and strategies have been successful in improving habitat conditions for the toads and other aquatic and riparian-dependent species that are susceptible to high levels of human disturbance. Monitoring will also indicate the effectiveness in achieving recovery objectives for this listed species. Detailed information on the status of the arroyo toad can be found in the species account (http://www.fs.fed.us/r5/scfpr/read/). Habitat improvement projects for arroyo toad and the aquatic and riparian habitats they occupy have included riparian habitat restoration, control of nonnative species, prescribed burning to protect riparian areas and reduce the effects of wildfire, relocation of roads and recreation facilities, and Burned Area Emergency Rehabilitation and restoration after wildfires.

Song Sparrow

The song sparrow was selected as a MIS for riparian areas because its abundance is expected to be responsive to management actions and to indicate trends in the status of the riparian biological community, particularly birds. Song sparrows are well represented on all four southern California national forests; they were recorded at 197 out of 206 stations during the 1988-1996 riparian bird count surveys. This species is one of a few that were numerous enough to estimate trends with good confidence. Negative trends in song sparrow abundance were determined from this monitoring (USDA Forest Service 1998).

As the human population continues to grow and the demand for water and recreation opportunities increases, the pressures on riparian habitat will also increase. Song sparrow abundance is negatively correlated with the use of riparian understories for grazing and recreation (Marshall 1948a) and positively correlated with the abundance of herbaceous vegetation (Ballard and Geupel 1998). Abundance trends for song sparrow and habitat condition assessments will help indicate whether national forest management is maintaining healthy riparian ecosystems in the face of the increasing recreation demand. Habitat improvement projects for song sparrows and the habitat they occupy are similar to those described above for arroyo toad.

Blue Oak, Engelmann Oak, and Valley Oak

These oaks were selected as MIS for the oak woodland/savanna vegetation type. Lack of oak regeneration has been identified as a problem in this vegetation type, attributed to wildlife and livestock grazing of seedlings, competition from nonnative annual grasses, and unnatural abundance of some acorn-eating animals such as gophers and ground squirrels (Borchert and others 1989, Pavlik and others 1991). Monitoring abundance of these oak species, particularly saplings, will indicate whether Forest Service management has been successful in creating conditions favorable for oak regeneration and, consequently, in maintaining this habitat type. A discussion of the current status of this vegetation type is found in the vegetation management section (see Vegetation Condition and Forest Health).

There are about 33,469 acres of blue oak (*Quercus douglasii*) woodland on the Los Padres National Forest, with a small amount (205 acres) found on the Angeles National Forest.

Engelmann oak (*Q. engelmannii*) inhabits the smallest natural range of any oak species in California (Bolsinger 1987) and is located next to the fastest growing urban landscape in the country (Stephenson and Calcarone 1999). The California Native Plant Society (2001) considers the species to be endangered in a portion of its range, but widely enough distributed that it is not in danger of extinction at this time. Engelmann oak occurs in limited areas on the Cleveland National Forest, with 1,749 acres mapped.

Seedling regeneration and recruitment of valley oak (*Q. lobata*) is low and may jeopardize the long-term viability of valley oak woodlands. Many stands are reported to lack trees younger than 75 to 125 years (Pavlik and others 1991). Factors that may contribute to the scarcity of regeneration and lack of recruitment include consumption of acorns by insects, birds and rodents; wildlife and livestock browsing of seedlings; lowering of the water table caused by groundwater pumping; and competition from nonnative grasses (Griffin 1980, Stephenson and Calcarone 1999). Nonnative annual grasses compete more vigorously than native perennial grasses for available soil moisture, thereby depleting soil moisture more rapidly. In experiments, oak seedlings grown with native perennial grass were larger and had lower mortality than seedlings grown with nonnative annual wild oats (*Avena fatua*) (Danielsen and Halvorson 1991). The primary activity that has benefited these species has been land acquisition of private land that could be developed.

Bigcone Douglas-fir

Bigcone Douglas-fir was selected as the MIS for the bigcone Douglas-fir vegetation type. Altered fire regimes have affected the abundance and distribution of this tree and the vegetation series of which it is the dominant constituent element (Minnich 1980, 1999). The bigcone Douglas-fir habitat type will be a focus of vegetation management projects, and bigcone Douglas-fir trees themselves are an obvious and appropriate indicator of the successful restoration and maintenance of this plant community. Bigcone Douglas-fir forests provide habitat for the California spotted owl, a Forest Service sensitive species, as well as many other animals. Further discussion of the current status of this vegetation type is found in the section on Vegetation Condition and Forest Health, page 83. Habitat improvement for this species has included planting, prescribed burning, and brush cutting to protect the stands from high intensity crown fires.

Coulter Pine

Coulter pine is a serotinous conifer that usually occurs in a matrix of chaparral but can also form woodlands with canyon live oak. This species was selected as an MIS for these habitat types. Fire management is crucial to the maintenance of Coulter pine-dominated vegetation. Fire kills Coulter pine trees but stimulates their closed cones, held on the trees for years, to open up and release seeds. Long fire return intervals and drought-related mortality in some Coulter pine-chaparral stands have resulted in the death of overstory trees without subsequent fire to release seeds, creating concern for the ecological health of this ecosystem. Some Coulter pine stands are large enough to map at the scale of a forest inventory. The Angeles National Forest has 4,367 acres mapped; the Cleveland National Forest has 2,590 acres; the Los Padres National Forest has 46,942 acres; and the San Bernardino National Forest has 11,781 acres. Further discussion of the current status of this species and its vegetation communities is found in the section on Vegetation Condition and Forest Health, page 83. Prescribed burning for resource objectives and fuels objectives has been conducted in Coulter pine habitat.

California Spotted Owl

The California spotted owl was chosen as the MIS for mature, large diameter, high canopy closure conditions of montane conifer forest. A territorial species with large acreage requirements (at least 300 acres of mature forest per pair), the California spotted owl is an indicator of mature conifer forest with a dense, multi-layered canopy (Stephenson and Calcarone 1999). Monitoring the California spotted owl and its habitat will indicate the effectiveness of management activities in achieving maintenance and restoration of this type of montane conifer forest habitat.

The greatest threat to the California spotted owl is the loss of habitat and subsequent population loss due to large stand-replacement wildfires. Due to a disruption of natural fire cycles, many of the conifer forests occupied by spotted owls have become overstocked with trees and are now primed for catastrophic fire, including those of southern California (Arno and Allison-Bunnel 2002, Minnich and others 1995, Stephenson and Calcarone 1999, Weatherspoon and others 1992). In addition, California spotted owls are subject to loss of habitat from fuels management for community protection, community development and associated infrastructure on and off the national forests, human disturbance, and habitat loss from a variety of uses and activities.

The total California spotted owl population in southern California is relatively small because of the limited amount of forested habitat, and sub-populations are naturally isolated. The period of drought in the early 1990s, recent large fires, the recent five-year severe drought, and accompanying tree mortality in the San Bernardino, San Jacinto, San Gabriel and Santa Rosa mountains and the San Diego ranges have had a substantial negative effect on habitat conditions for the California spotted owl (LaHaye pers. comm, Loe personal observation). There is a continuing threat of additional catastrophic fire as a result of stand densification and drought-related vegetation mortality. Experts have been concerned about the viability of the southern California spotted owl population for many years (La Haye and others 1994, Verner and others 1992), and this concern has only increased with the damaging drought, recent wildfires, and rapid development in the mountains. The cumulative effects of these factors further reduce and isolate California spotted owl populations. More information on the California spotted owl can be found in the species account and conservation strategy in the Reading Room (`http://www.fs.fed.us/r5/scfpr/read/`). Habitat improvement for this species has included thinning and prescribed burning in densified stands around spotted owl nesting areas and planting of conifers and oaks.

Black Oak

Black oak was also selected as an MIS for montane forest habitats. In contrast to the California spotted owl, black oak is a gap-phase species that requires occasional openings in the forest canopy in order to regenerate. Its acorns are also an important food source for many forest animal species (California Department of Fish and Game 2002b). Abundance of black oak, especially saplings, will indicate progress toward reducing forest stand densities and creating regeneration opportunities for light-requiring species. There are about 10,404 acres of black oak woodland and forest mapped on the national forests of southern California (1,096 on the Angeles National Forest; 1,621 on the Cleveland National Forest; 194 acres on the Los Padres National Forest; and 7,493 on the San Bernardino National Forest). The species occurs as a component of ponderosa pine and mixed conifer forests on many more acres as well. Thinning to favor black oak has been conducted on the forest as well as planting.

White Fir

White fir is a shade-tolerant conifer species. The abundance of small diameter white fir has increased with the success of fire suppression in montane conifer forests (Stephenson and Calcarone 1999); thus, it acts as an indicator of forest stand densification and too long an interval between fires. Stand densification due to fire suppression has left montane conifer forests vulnerable to stand-replacing fires, and the recent drought and insect outbreaks have intensified the risk. In some areas primarily pines have been dying; in others there has been mortality of white fir as well. Reduced abundance of small-diameter white fir and well-distributed large diameter white fir in montane mixed conifer forests will indicate a return to more historical, and presumably more natural, stand conditions.

Some habitat improvement work in the montane conifer forest vegetation type has been conducted in recent year, which involved thinning of overly dense understories using prescribed fire and mechanical means. Taken together, population trends of California spotted owl, black oak and white fir will indicate progress toward achieving montane conifer forests that contain large patches of mature trees with reduced stem densities, interspersed with canopy gaps providing opportunities for regeneration of light-requiring species, including ponderosa pine, Jeffrey pine, and black oak.

In summary, 12 species were selected as MIS for the revised forest plans (see table 433: Management Indicator Species Selection and Monitoring Information, page **177**). They are used to help assess the effects of alternatives in this EIS and will facilitate monitoring effects of implementing the selected alternative. These 12 species are the Forest Service's best effort to meet the intent of the 1982 planning regulations, under which this forest plan revision was undertaken. As described above, factors other than national forest management also influence some of these species, such as predation, invasive nonnative species, weather and sport harvest.

Monitoring of habitat conditions, management indicator species, and species-at-risk will help the Forest Service meet its responsibility to prevent damage to resources and habitats occurring on National Forest System lands.

Note: Text continues on page 192, after the Biodiversity and Invasive Species Tables.

Biodiversity and Invasive Species Tables

Table 467. Key to Codes Frequently Used in Biodiversity Tables

Codes used are defined in greater detail in Appendix B, Species Viability

Code Categories (not found in all tables):

- National Forests and Forest Distribution/Mountain Range
- Risk Category Code (Risk or Threat Category)
- Forest Occurrence Codes
- State of California Status (CA)
- Federal Status (Fed.)
- CNPS R-E-D Code
- CNPS List
- Habitat Group Codes (HabGrp)
- NatureServe Rank and Definition
- Viability Outcome Codes

National Forests and Forest Distribution / Mountain Range

A	Angeles
ANF	Angeles National Forest
C	Cleveland
CAS	Castaic
CNF	Cleveland National Forest
L	Los Padres
LPNF	Los Padres National Forest
NLP	Northern Los Padres
NSL	Northern Santa Lucia
S	San Bernardino
SA	Santa Ana
SB	San Bernardino
SBNF	San Bernardino National Forest
SD	San Diego
SG	San Gabriel
SJ	San Jacinto
SLP	Southern Los Padres
SSL	Southern Santa Lucia

Risk Category Code (Risk or Threat Category)

1	Not in Plan area.
2	Potential habitat only in Plan area.
3	Common or widespread in Plan area with no substantial threats from FS activities.
4	Uncommon, rare, or disjunct in Plan area with no substantial threats from FS activities.
5	Uncommon, rare, or disjunct in Plan area with substantial threats from FS activities.
6	Common or widespread in Plan area with substantial threats from FS activities.

Forest Occurrence Codes

y	occurs; breeds or probably breeds
h	historically occurred and bred
p	potentially occurs and breeds
h/p	historic and potentially still occurs
t	transient, migrates through forest
w	winters on forest

State of California Status (CA)

CE	State Listed Endangered
CT	State Listed Threatened
SSC	Species of Special Concern
CR	State Listed Rare

Federal Status (Fed.)

FE	Federally Listed Endangered
FT	Federally Listed Threatened
PE	Federally Proposed Endangered
PT	Federally Proposed Threatened
SC	"Species of Concern" List (former C2s)
S	Forest Service Sensitive List

CNPS R-E-D Code

R – Rarity	
1	Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time,
2	Distributed in a limited number of occurrences, occasionally more if each occurrence is small,
3	Distributed in one to several highly restricted occurrences, or present in such small numbers that it is seldom reported
E – Endangerment	
1	Not endangered
2	Endangered in a portion of its range
3	Endangered throughout its range
D – Distribution	
1	More or less widespread outside California
2	Rare outside California
3	Endemic to California

CNPS List

List 1A	Plants Presumed Extinct in California
List 1B	Plants Rare, Threatened, or Endangered in California and Elsewhere
List 2	Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
List 3	Plants About Which We Need More Information - A Review List
List 4	Plants of Limited Distribution - A Watch List

Habitat Group Codes (HabGrp)

1		General riparian
	1.1	low elevation riparian (<4,000 ft.)
	1.2	high elevation riparian (>4,000 ft.)
	1.3	aquatic riparian
2		Oak/walnut woodland and savanna
3		Scrub and chaparral
	3.1	coastal sage scrub
	3.2	chaparral
4		Mixed Hardwood/Conifer
5		Montane Conifer Forest
6		Monterey coastal marine
7		alpine and sub-alpine
8		Desert montane
9		Gabbro/clay
10		Limestone/carbonate
11		Pebble plains
12		Serpentine
13		Montane meadow
	13.1	wet meadows
	13.2	dry meadows
14		Lakes and reservoirs
15		Vernal pools
16		Habitat generalist
17		Low Elevation Valley Floor
	17.1	cismontane valleys
	17.2	western San Joaquin Valley
	17.3	alluvial fan scrub
18		Desert Floor
19		Grassland

NatureServe Website Version 1.8 (1 July 2003).

Global ranks are assigned by NatureServe scientists or by a designated lead office in the Natural Heritage Network. Global Heritage Status Rank Definitions Global (G), Subspecies (T), State (S)

Rank and Definition

G1, T1, S1	Critically Imperiled—because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 5 or fewer occurrences or very few remaining individuals (<1,000) or acres (<2,000) or linear miles (<10).
G2, T2, S2	Imperiled—because of rarity or because of some factor(s) making it very vulnerable to extinction or elimination. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000) or acres (2,000 to 10,000) or linear miles (10 to 50).
G3, T3, S3	Vulnerable—either because very rare and local throughout its range, found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction or elimination. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
G4, T4, S4	Apparently Secure—Uncommon but not rare (although it may be rare in parts of its range, particularly on the periphery), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. Typically more than 100 occurrences and more than 10,000 individuals.
G5, T5, S5	Secure—Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
G?	Unranked—Global rank not yet assessed.
HYB	Hybrid—Element not ranked because it represents an interspecific hybrid and not a species.

Viability Outcome Codes

For Plants and Invertebrates (with host plants) on National Forest System lands:	
A.	Habitat is sufficient quality, distribution, and abundance to allow the species population to remain stable or stabilize, well distributed across historic range on NFS land.
B.	Habitat is of sufficient quality, distribution, and abundance to allow the species population to remain stable or stabilize, but with significant gaps in the historic species distribution on NFS land. These gaps cause some limitations in interactions among populations.
C.	Habitat only allows continued species existence in isolated patches relative to the historic distribution, with strong limitations on interactions among or within local populations on NFS land.
D.	Habitat conditions likely result in the loss of populations (occurrences) such that the potential for extirpation from NFS lands is high.
E.	Small population size in plants that are inherently rare and not naturally well distributed may result in the loss of populations (occurrences) from stochastic events such that the potential for extirpation from NFS lands is high. Potential for extirpation is unrelated to uses and activities on NFS land.

For Animals on National Forest System lands:	
A.	Suitable habitat is well distributed and abundant across NFS lands.
B.	Suitable habitat is either well distributed or abundant across NFS lands; however, there are temporary gaps where suitable habitat is absent or only present in low abundance. Disjunct areas of suitable habitat are typically large enough and close enough to permit dispersal and interaction among subpopulations.
C.	Suitable habitat is often distributed as patches or exists at low abundance, or both across NFS lands. Gaps, where suitable habitat is either absent or present in low abundance, are large enough to isolate some subpopulations, limiting opportunity for species interactions. In most of the species range there are opportunities for dispersal and interaction among subpopulations; however, some subpopulations are so disjunct or of such low density that they are essentially isolated.
D.	Suitable habitat is highly isolated or exists at very low abundance, or both across NFS lands. While some subpopulations associated with these habitats may be self-sustaining, there is limited or no opportunity for population interaction, resulting in potential for local or regional extirpation, and low likelihood of recolonization. There has likely been a reduction in overall species range from historical conditions, except for some rare, local endemics that may have persisted in this condition since the historical period.
E.	Suitable habitat is highly isolated and exists at very low abundance across NFS lands. Populations have declined irrespective of habitat conditions or have little or no interaction. This results in strong potential for local or regional extirpation, and no likelihood of recolonization.
For all land within range of species (based in part on the geographic distribution within which the species is projected to persist):	
A.	The combination of environmental (habitat) and population conditions allows the species population to remain stable or stabilize, well distributed across historic range.
B.	The combination of environmental (habitat) and population conditions allows the species population to remain stable or stabilize, but with significant gaps in the historic species distribution. These gaps cause some limitations in interactions among populations.
C.	The combination of environmental (habitat) and population conditions only allows continued species existence in isolated patches relative to the historic distribution, with strong limitations on interactions among or within local populations.
D.	The combination of environmental (habitat) and population conditions likely result in the loss of populations (occurrences).

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)

See Table 467, Key to Codes Frequently Used in Biodiversity Tables, on page 131

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)								
Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Abies bracteata	L/NSL	W	1B	3-1-3	G2	2.3	5	4
Abronia nana ssp. *covillei*	S/SB	S	4	1-2-1	G1	1.1	10	4
Abronia villosa var. *aurita*	S/pSD, pSA, SJ, pSB	-	1B	2-2-3	G5T3	3.1	3	4
Acanthomintha ilicifolia	C/SD	FT/CE	1B	2-3-2	G1	1.1	9	5
Acanthoscyphus parishii var. *abramsii*	L/SLP	S	1B	2-2-3	G4?T2	2.2	3.2	5
Acanthoscyphus parishii var. *cienegensis*	S/SB	S	1B	3-1-3	G4?T1	1.3	5	4
Acanthoscyphus parishii var. *goodmaniana*	S/SB	FE	1B	3-3-3	G4?T1	1.1	10	5
Agrostis hooveri	L/SSL	W	1B	2-3-3	G3	2.2	3	4
Allium hickmanii	L/NSL	W	1B	2-3-2	G2	2.2	19	5
Allium howellii var. *clokeyi*	L/CAS, SLP	W	1B	2-1-3	G3T3	2.3	8	3
Allium marvinii	pS/SB	-	1B	3-3-3	G1	1.1	3	2
Allium munzii	C/SA	FE/CT	1B	3-3-3	G1	1.1	9	5
Allium parishii	S/SA, SB	W	4	1-1-2	G3	3.3	10	2
Androsace elongata ssp. *acuta*	C,S,L/SD, SJ, SB, SLP	W	4	1-2-2	G?T3?	3.2	16	5
Antennaria marginata	C,S/SB	W	2	3-1-1	G4?	1.3	11	4
Arabis breweri var. *pecuniaria*	S/SJ,SG	S	1B	3-2-3	G4?T1	1.2	7	4
Arabis dispar	S/SB	W	2	2-1-1	G3	2.3	8	5
Arabis johnstonii	S/SJ	S	1B	3-2-3	G2	2.2	3.2	5
Arabis parishii	S/SB	S	1B	2-2-3	G2	2.1	11	5
Arabis shockleyi	S/SB	S	2	3-2-1	G3	2.2	10	4
Arctostaphylos cruzensis	L/NSL	S	1B	2-2-3	G2	2.2	6	5
Arctostaphylos edmundsii	L/NSL	S/CR	1B	3-2-3	G2	2.2	6	4
Arctostaphylos hooveri	L/SLP,SSL	-	4	1-1-3	G3	3.3?	3.2	3
Arctostaphylos luciana	A,L/SSL	S	1B	2-2-3	G2	2.2	3.2	4
Arctostaphylos obispoensis	L/SLP,SSL	-	4	1-1-3	G3	3?	3.2	3
Arctostaphylos otayensis	pC/SD	-	1B	3-2-3	G2	2.1	9	2

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Arctostaphylos peninsularis ssp. *peninsularis*	pC/SD,SJ	S	2	3-1-1	G2T2	2?	3.2	1
Arctostaphylos pilosula	L/SSL	S	1B	3-2-3	G2	2.2	3.2	4
Arctostaphylos rainbowensis	C/SD	S	1B	3-3-3	G2	2.1	3.2	4
Arctostaphylos refugioensis	L/SLP	S	1B	2-2-3	G2	2?	3.2	4
Arenaria lanuginosa ssp. *saxosa*	S/SB	-	2	3-1-1	G5T5	1.3	7	5
Arenaria macradenia var. *kuschei*	A/SA	S	1B	3-3-3	G5?T2?	1.1	3.2	5
Arenaria paludicola	pS/SB	FE/CE	1B	3-3-2	G1	1.1	1.1	2
Arenaria ursina	S/SB	FT	1B	2-2-3	G2	2.1	11	5
Artemisia palmeri	/SD	-	4	1-2-1	G3	3.2	1.1	1
Astragalus albens	S/SB	FE	1B	3-3-3	G1	1.1	10	5
Astragalus bicristatus	S,pA/SJ,SB,SG	S	4	1-1-3	G3	3.3	5	4
Astragalus brauntonii	pC,pA/SA,SG,SLP	FE	1B	3-3-3	G2	2.1	3	2
Astragalus deanei	C/SD	S	1B	3-3-3	G2	2.1	1.1	4
Astragalus douglasii var. *perstrictus*	C/SD	S	1B	2-2-2	G5T2	2.2	2	4
Astragalus lentiginosus var. *antonius*	pS,A/SG	S	1B	3-1-3	G5T1	1?	5	4
Astragalus lentiginosus var. *coachellae*	pS/SJ	FE	1B	2-2-3	G5T2	2.1	18	2
Astragalus lentiginosus var. *sierrae*	S/SB	S	1B	2-2-3	G5T1	1?	8	5
Astragalus leucolobus	pC,S,A,pL/SJ,SB,SG	W	1B	2-2-3	G2	2.2	8	3
Astragalus oocarpus	C/SD	S	1B	3-2-3	G2	2.2	3.2	5
Astragalus pachypus var. *jaegeri*	C,pS/SD,SJ	S	1B	3-3-3	G?T1	1.1	3	5
Astragalus tricarinatus	pS/SJ	FE	1B	3-2-3	G1	1.2	18	2
Atriplex parishii	pS/SJ,SB	S	1B	3-3-2	G1G2	1.1	17	2
Baccharis plummerae ssp. *glabrata*	pL/NSL	W	1B	3-2-3	G3T1	1.2	3	2
Baccharis vanessae	C/SD	FT/CE	1B	2-3-3	G1	1.1	3	4
Berberis nevinii	C/SD,pSA,pS,A/SB,SG	FE/CE	1B	3-3-3	G2	2.2	3	5
Bloomeria humilis	pL/NSL	W	1B	3-2-3	G1	1.1	3	2
Botrychium crenulatum	S,pA/SB	S	2	2-2-1	G3	2.2	13	5

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Boykinia rotundifolia	pC,S,A,pL/SD,SA,SJ,SB,SG,SLP	W	n/a	-	-	-	1	4
Brodiaea filifolia	pC,pS,pA/SD,SJ,SB	FT/CE	1B	3-3-3	G2	2.1	9	2
Brodiaea orcuttii	C/SD,SA,SJ,SB	S	1B	1-3-2	G3	3.1	9	4
Calochortus clavatus var. *gracilis*	A/SG	-	1B	3-2-3	G4T1	1.1?	3.2	5
Calochortus dunnii	C/SD	S/CR	1B	2-2-3	G2	2.1	9	5
Calochortus obispoensis	L/SLP,NSL	S	1B	2-2-3	G2	2.2	12	5
Calochortus palmeri var. *munzii*	S/SJ	S	1B	3-2-3	G2T1	1.2	13	5
Calochortus palmeri var. *palmeri*	S,A,L/SB,SG,CAS,SLP	S	1B	2-2-3	G2T2	2.1	13	5
Calochortus plummerae	S,A,pL/SA,SJ,SB,SG	S	1B	2-2-3	G3	3.2	3.2	4
Calochortus simulans	pL/SLP,SSL	W	1B	2-1-3	G3	2.3	16	5
Calochortus striatus	pS,pA/SB	S	1B	2-2-2	G2	2.2	18	2
Calochortus weedii var. *intermedius*	C/SD,SA	S	1B	2-2-3	G3T2	2.2	3.1	4
Calochortus weedii var. *vestus*	L/SLP,NSL	S	1B	2-2-3	G3T2	2.2	3	3
Calycadenia villosa	L/NSL	S	1B	2-3-3	G2	2.1	19	4
Calyptridium pygmaeum	S/SB	-	n/a	-	-	-	5	4
Calystegia peirsonii	A/SG	-	4	1-2-3	G3	3.2	16	4
Calystegia subacaulis ssp. *episcopalis*	pL/SSL	W	1B	3-2-3	G3T1	1.2	3	2
Camissonia hardhamiae	L/SLP,SSL	W	1B	3-2-3	G1Q	1.2	3	5
Canbya candida	pS,A/SB	S	4	1-2-3	G3	3.2	8	5
Carex obispoensis	L/SLP,NSL	S	1B	2-2-3	G2	2.2	16	5
Carlquistia muiri	L/NSL	S	1B	2-1-3	G2	2.3	21	4
Castilleja cinerea	S/SB	FT	1B	2-2-3	G2	2.2	11	5
Castilleja gleasonii	A/SG	S/CR	1B	3-2-3	G2Q	2.2	5	5
Castilleja lasiorhyncha	pC,S/SB	S	1B	2-2-3	G2	2.2	13	5
Castilleja montigena	S/SB	W	4	1-1-3	G3	3.3	5	4
Castilleja plagiotoma	S,A,pL/SA,SB	W	4	1-1-3	G3	3.3	11	5
Caulanthus amplexicaulis var. *barbarae*	L/SLP	S	1B	3-1-3	G3?T1	1.2	12	5
Caulanthus californicus	/pSLP	FE/CE	1B	3-3-3	G1	1.1	8	1

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)								
Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Caulanthus lemmonii	L/SLP,SSL,NSL	W	1B	2-2-3	G4T2	2.2	16	5
Caulanthus simulans	C,S/SD	S	4	1-2-3	G3	3.2	8	4
Ceanothus cyaneus	C/SD	S	1B	3-2-2	G2	2.2	3.2	4
Ceanothus ophiochilus	C/SB	FT/CE	1B	3-3-3	G1	1.1	3.2	4
Centromadia pungens ssp. *laevis*	pC/SD,SA,SB	-	1B	2-2-3	G5T2	2.1	17	2
Chaenactis parishii	C,S/SD,SJ,SB	-	1B	2-1-2	G3	2.3	3.2	4
Chlorogalum pomeridianum var. *minus*	L/SLP	-	1B	2-2-3	G5T1	1.2	12	3
Chlorogalum purpureum var. *reductum*	L/SSL	FT/CR	1B	3-3-3	G1T1	1.1	12	5
Chorizanthe blakleyi	L/SLP	S	1B	2-1-3	G3	2.3	3.2	5
Chorizanthe breweri	L/SLP,NSL	S	1B	3-1-3	G2	2.2	12	4
Chorizanthe parryi var. *fernandina*	pSLPS	FC/CE	1B	3-3-3	G2T1	S1.1	17	1
Chorizanthe parryi var. *parryi*	S/SA	S	3	?-2-3	G2T2?	2.1	17	2
Chorizanthe polygonoides var. *longispina*	C,S/SD,SB	S	1B	2-2-2	G5T3	2.2	3.2	4
Chorizanthe procumbens	C,pS,pA/SD,SB	-	n/a	-	-	-	9	3
Chorizanthe rectispina	L/SSL	S	1B	3-1-3	G1	1.2	3	4
Chorizanthe xanti var. *leucotheca*	S/SJ,SB,SG	W	1B	2-2-3	G4T3	S1S2.2	8	4
Clarkia delicata	C/SD	S	1B	2-2-2	G2	2.2	9	4
Clarkia jolonensis	L/NSL	W	1B	3-2-3	G2	2.2	3	5
Claytonia lanceolata var. *peirsonii*	S,A/SG	S	1B	3-3-3	G5T1Q	1.1	7	5
Cupressus forbesii	C/SD,SA	S	1B	3-3-2	G2	1.1	3.2	4
Cupressus sargentii	L/SLP,NSL	-	n/a	-	-	-	3.2	3
Cupressus stephensonii	C/SD	S	1B	3-3-3	G1	1.2	3.2	5
Deinadra floribunda	pC/SD	S	1B	2-2-2	G3	2.2	1.1	2
Deinadra mohavensis	C,S,pA/SD,SJ,SB	S/CE	1B	2-1-3	G2	2.3	1	4
Delphinium hesperium ssp. *cuyamacae*	C,S/SD,SJ	S/CR	1B	2-2-3	G4T2	2.1	13	5
Delphinium hutchinsoniae	L/NSL	S	1B	3-2-3	G2	2.1	6	5
Delphinium inopinum		S	4	1-1-3	G3	3.3	8	1
Delphinium parryi ssp. *purpureum*	L/SLP	-	4	1-1-3	G4T3	3.3	16	4
Delphinium umbraculorum	L/SLP,SSL,NSL	W	1B	2-1-3	G3	S2S3.3	2	3

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Dieteria asteroides var. *lagunensis*	C,pS/SD	S/CR	2	3-3-1	G5T2T3	1.1	13	5
Dieteria canescens var. *ziegleri*	S/SJ	S	1B	3-2-3	G5T1	1.1	5	5
Dodecahema leptoceras	C,S/SD,SJ,SB,SG	FE/CE	1B	3-3-3	G1	1.1	17	5
Downingia concolor var. *brevior*	pC/SD	CE	1B	3-3-3	G4T1	1.1	13	2
Draba corrugata var. *saxosa*	S/SJ	-	1B	2-1-3	G2T2	2.3	7	4
Dudleya abramsii ssp. *affinis*	S/SB	S	1B	2-2-3	G3T2	2.2	8	5
Dudleya cymosa ssp. *crebrifolia*	A/SG	W	1B	3-2-3	G5T1	1.2	3.2	4
Dudleya cymosa ssp. *ovatifolia*	C,pA/SA	FT	1B	3-2-3	G5T2Q	2.2	3	4
Dudleya densiflora	A/SG	S	1B	3-3-3	G1	1.1	1.1	5
Dudleya multicaulis	C,A/SD,SA,SG	S	1B	1-2-3	G2	2.1	3.1	4
Dudleya viscida	C/SD	S	1B	2-2-3	G2	2.2	3.1	4
Eriastrum densifolium ssp. *sanctorum*	S/SB	FE/CE	1B	3-3-3	G4T1	1.1	17	2
Eriastrum hooveri	L/SLP	S	4	1-2-3	G3	3.2	16	4
Eriastrum luteum	pL/SSL	W	1B	2-2-3	G2	2.2	2	2
Ericameria cuneata var. *macrocephala*	C/SD	-	1B	2-1-3	G5T2?	2.3	8	4
Ericameria palmeri var. *palmeri*	/SD	-	2	3-2-1	G4T2T3	1.1	1.1	1
Erigeron breweri var. *jacinteus*	S/SJ,SB,SG	W	4	1-1-3	G4G5T3	3.3	5	4
Erigeron parishii	S/SA, SB	FT	1B	2-3-3	G2	2.1	10	5
Erigeron uncialis var. *uncialis*	pS/SB	S	2	3-2-1	G?T3?	1	10	1
Eriogonum butterworthianum	L/NSL	S/CR	1B	3-1-3	G1	1.3	3.2	4
Eriogonum evanidum	pC,S/SD,SJ,SB	W	1B	3-2-2	G3	H	8	5
Eriogonum kennedyi var. *alpigenum*	S,pA,L/SB,SLP	S	1B	2-1-3	G4T2	2.3	7	4
Eriogonum kennedyi var. *austromontanum*	S/SB	FT	1B	2-2-3	G4T2	2.2	11	5
Eriogonum microthecum var. *corymbosoides*	S,pA/SB	W	n/a	-	-	-	10	4
Eriogonum microthecum var. *johnstonii*	S,A/SB,SG	S	1B	3-1-3	G5T1	1.2	7	4
Eriogonum ovalifolium var. *vineum*	S/SB	FE	1B	3-3-3	G5T1	1.1	10	5
Eriogonum umbellatum var. *minus*	S,A/SB,SG	W	4	1-1-3	G5T3	3.3	7	4
Eriophyllum lanatum var. *hallii*	L/SLP	S	1B	3-3-3	G5T1	1.1	19	4

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Eriophyllum lanatum var. *obovatum*	S/SB	W	4	1-1-3	G5T3	3.3	5	4
Fritillaria falcata	L/NSL	S	1B	3-2-3	G2	2.2	12	4
Fritillaria liliacea	pL/NSL	W	1B	2-2-3	G2	2.2	16	2
Fritillaria ojaiensis	L/SLP,SSL,NSL	S	1B	3-2-3	G1	1.2	16	4
Fritillaria viridea	L/NSL	S	1B	2-2-3	G3	3.2	12	4
Galium angustifolium ssp. *gabrielense*	pS,A/SG	W	4	1-1-3	G5T2	2.3	3.2	4
Galium angustifolium ssp. *jacinticum*	S/SJ	S	1B	3-1-3	G5T1	1.3	5	5
Galium californicum ssp. *luciense*	L/NSL	S	1B	3-1-3	G5T2	2.3	6	4
Galium californicum ssp. *primum*	S/SJ	S	1B	3-2-3	G5T1	1.1	5	5
Galium clementis	L/NSL	W	1B	2-1-3	G2	2.3	5	4
Galium grande	A/SG	S	1B	3-1-3	G1	1.2	4	5
Galium hardhamiae	L/NSL	S	1B	2-1-3	G2	2.3	12	4
Galium jepsonii	pS,A/SG	W	4	1-1-3	G3	3.3	5	4
Galium johnstonii	pC,S,A/SJ,SB,SG	W	4	1-1-3	G3	3.3	5	4
Gentiana fremontii	S/SB	-	2	3-1-1	G4	2.3	7	5
Geraea viscida	C/SD	-	2	2-1-1	G3	2.3?	8	4
Gilia leptantha ssp. *leptantha*	S/SB	-	1B	2-1-3	G4T2	2.3	5	4
Githopsis diffusa ssp. *filicaulis*	pC/SD,SB	S	3	?-3-3	G51Q	1.1	2	2
Grindelia hirsutula var. *hallii*	C/SD	-	1B	2-2-3	G5T2	2.1	13	4
Helianthus nuttallii ssp. parishii	pS,pA/SB	W	1A		G5TH	H	1.1	2
Heuchera abramsii	pS,A/SG	W	4	1-1-3	G3	3.3	7	4
Heuchera brevistaminea	C/SD	-	1B	3-1-3	G2	2.3	8	4
Heuchera elegans	S/SG	W	4	1-1-3	G3	3.3	5	4
Heuchera hirsutissima	S/SJ	S	1B	3-1-3	G2	2.3	7	4
Heuchera parishii	S/SJ,SB	S	1B	2-1-3	G2	2.3	5	4
Holocarpha virgata ssp. *elongata*	C/SD	-	4	1-2-3	G5T3	3.2	3.1	4
Horkelia cuneata ssp. *puberula*	pS,L/SLP,SSL	W	1B	2-3-3	G4T2	2.1	3	2
Horkelia cuneata ssp. *sericea*	pL/SLP,SSL,NSL	W	1B	3-3-3	G4T1	1.1	3	2
Horkelia truncata	C/SD	S	1B	3-1-2	G3	2.3	9	4

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Horkelia wilderae	S/SB	S	1B	3-3-3	G1	1.1	5	4
Horkelia yadonii	L/SLP,NSL	-	4	1-2-3	G3	3.2	13	5
Hulsea californica	C/SD	-	1B	2-1-3	G2	2.1	5	4
Hulsea vestita ssp. *callicarpha*	C,S/SD,SJ	W	4	1-2-3	G5T3	3.2	5	4
Hulsea vestita ssp. *gabrielensis*	pS,A/SG,SLP	W	4	1-1-3	G5T3	3.3	5	4
Hulsea vestita ssp. *parryi*	S/SB	W	4	1-1-3	G5T3	3.3	5	4
Hulsea vestita ssp. *pygmaea*	S/SB	-	1B	2-1-3	G5T2	2.3	7	4
Ivesia argyrocoma	S/SB	S	1B	2-2-2	G2	2.2	11	5
Ivesia callida	S/SJ	S	1B	3-1-3	G1	1.3	5	4
Juglans californica	S,A,L/SD,SA,SB,SG	-	4	1-2-3	G3	3.2	2	4
Juncus duranii	S/SJ,SB,SG	W	4	1-1-3	G3	3.3	13	5
Layia heterotricha	L/SLP	S	1B	3-3-3	G1	1.1	19	3
Layia jonesii	pL/SSL,NSL	W	1B	3-2-3	G4	1.1	3	2
Lepechinia cardiophylla	C/SD,SA	S	1B	3-2-3	G2	2.2	3.2	4
Lepechinia fragrans	pS,A/SG/SLP	W	4	1-2-3	G3	3.2	3.2	5
Lepechinia ganderi	C/SD,SA	-	1B	3-1-2	G2	2.2	16	1
Lepidium flavum var. *felipense*	/SD	-	1B	3-2-3	G5T1	1.2	8	1
Lepidium virginicum var. *robinsonii*	C/SD	-	1B	3-2-3	G5T2?	H	3.1	3
Leptosiphon floribundus ssp. *hallii*	S/SJ	S	1B	3-1-3	G4T1	1.3	8	5
Lessingia glandulifera var. *tomentosa*	pC/SD	S	1B	2-1-3	G4?T2	2.3	3.2	2
Lewisia brachycalyx	pC,S/SD,SB	-	2	2-2-1	G5	3.2	13	4
Lilium humboldtii ssp. *ocellatum*	C,S,A,L/SD,SA,SJ,SB,SG,CAS, SLP	W	4	1-2-3	G4T3	3.2	1	5
Lilium parryi	C,S,A/SJ,SB,SG	S	1B	2-2-3	G3	2.1	13	4
Limnanthes gracilis ssp. *parishii*	C/SD,SJ	S/CE	1B	2-2-3	G3T2	2.2	13	5
Linanthus concinnus	pS,A/SB	S	1B	3-2-3	G2	2?	5	5
Linanthus jaegeri	S/SJ	S	1B	2-2-3	G2	2.2	7	4
Linanthus killipii	S/SB	S	1B	2-2-3	G2	2.1	11	5
Linanthus orcuttii	C,pA/SD	S	1B	2-1-2	G4	2.3	5	4

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Lonicera subspicata var. *subspicata*	pL/SLP	W	1B	2-2-3	G5T2	2.2	3	2
Lupinus ludovicianus	L/SSL	S	1B	3-2-3	G2	2.2	19	5
Malacothamnus aboriginum	C,pL/SD	-	1B	2-2-3	G3	3.2	3.2	1
Malacothamnus davidsonii	A,pL/SG,pSLP	W	1B	2-2-3	G1	1.1	3.1	4
Malacothamnus palmeri var. *involucratus*	pL/SSL	W	1B	2-2-3	G4T2Q	2.2	3	2
Malacothamnus palmeri var. *lucianus*	L/NSL	S	1B	3-2-3	G4T1Q	1.2	3.2	5
Malacothamnus palmeri var. *palmeri*	pL/SSL	W	1B	2-2-3	G4T2Q	2.2	3	2
Malacothrix saxatilis var. *arachnoidea*	L/NSL	S	1B	3-2-3	G5T2	2.2	3.2	4
Malaxis monophyllos var. *brachypoda*	S,pA/SJ,SB	S	2	3-3-1	G?T4	1.1	13	5
Marina orcuttii var. *orcuttii*	S/SJ	S	1B	3-1-2	G?T1T2	1.3	8	5
Matelea parvifolia	S/SJ,pSB	-	2	3-1-1	G5?	2.2	18	5
Microseris douglasii ssp. *platycharpha*	/SD	-	4	1-2-2	G4T3	3.2	19	4
Mimulus clevelandii	C/SD	-	4	1-2-2	G3G4	3.2	5	4
Mimulus diffusus	/SD	-	4	1-1-1	G4Q	3.3	3.2	3
Mimulus exiguus	S/SB	S	1B	2-2-2	G2	2.2	13	5
Mimulus purpureus	S/SB	S	1B	2-2-2	G2	2.2	11	5
Monardella cinerea	S,pA/SG	W	4	1-1-3	G3	3.3	5	4
Monardella hypoleuca ssp. *lanata*	C/SD	S	1B	2-2-2	G4T2	2.2	9	4
Monardella linoides ssp. *oblonga*	L/SLP	S	1B	3-1-3	G5T2	2.2	5	3
Monardella macrantha ssp. *hallii*	C,S,A/SD,SA,SJ,SB,SG	S	1B	2-1-3	G5T3	3.3	16	4
Monardella nana ssp. *leptosiphon*	C,S/SD,SJ	S	1B	3-2-2	G4G5T2	2.2	5	4
Monardella palmeri	L/SSL	W	1B	2-2-3	G3	2.2	3	4
Monardella viridis ssp. *saxicola*	C,S,A/SG	S	4	1-2-3	G3T3	3.2	3.2	4
Muhlenbergia californica	S,A/SJ,SB,SG	W	4	1-1-3	G3	3.3	1	4
Muilla coronata	S/SA, SB	W	4	1-2-2	G3Q	3.2?	8	2
Nasturtium gambelii	pC,pS/SD,SB	FE/CT	1B	3-2-2	G1	1.1	1.1	2
Navarretia peninsularis	pC,S,pA,L/SD,SB,SLP	S	1B	2-2-2	G3?	2.2	13	4
Nolina cismontana	C/SD,SA	S	1B	3-2-3	G1	1.1	3.1	4
Nolina interrata	/SD	CE	1B	3-3-2	G1	1.2	9	1

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)								
Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Opuntia basilaris var. *brachyclada*	pC,S,A/SD,SJ,SB	S	1B	3-2-3	G5T1	1.2	8	4
Oreonana vestita	S,A/SB,SG	W	1B	2-1-3	G3	3.3	7	4
Orobanche valida ssp. *valida*	A,L/SG,SLP	S	1B	3-2-3	G3T1	1.2	3.2	4
Oxytropis oreophila var. *oreophila*	S/SB	-	2	3-1-1	G4T4	2.3	7	4
Packera bernardina	S/SB	S	1B	2-2-3	-	-	13	5
Packera ganderi	C/SD	S/CR	1B	3-2-3	-	-	9	5
Packera ionophylla	S,A/SB,SG	W	4	1-1-3	-	-	5	4
Parnassia cirrata var. *cirrata*	S/SB,SG	-	1B	2-1-3	G2	2.3	5	5
Pedicularis dudleyi	L/SB,NSL	S/CR	1B	3-2-3	G2	2.2	12	4
Penstemon californicus	pC,S/SJ	S	1B	3-2-2	G3?	2.2	8	5
Pentachaeta exilis ssp. *aeolica*	L/SB,NSL	S	1B	3-2-3	G5T1	1.2	2	5
Perideridia gairdneri ssp. *gairdneri*	pC,pA,L/NSL	-	4	1-2-3	G5T3	3.2	6	3
Perideridia parishii ssp. *parishii*	S/SB	-	2	2-2-1	G4T3T4	2.2?	13	4
Phacelia exilis	S/SB	W	4	1-1-3	G3Q	3.3	5	5
Phacelia mohavensis	S/SB,SG	W	4	1-1-3	G3Q	3.3	8	5
Phacelia suaveolens ssp. *keckii*	C/SD,SA	S	1B	3-1-3	G4T1	1.3	3.2	4
Phlox dolichantha	S/SB	S	1B	2-2-3	G2	2.2	5	5
Physaria kingii ssp. *bernardina*	S/SB	FE	1B	3-3-3	G5T1	1.1	10	5
Pinus attenuata	S,L/SA,pSB,SSL,NSL	-	n/a	-	-	-	3.2	3
Piperia leptopetala	pA,C,pL,S/pCAS,pNSL,SB,SD	W	4	1-1-3	G3	3.3	5	5
Plagiobothrys uncinatus	L/SB,SLP	S	1B	2-2-3	G2	2.2	3.2	4
Poa atropurpurea	C,S/SD,SB	FE	1B	2-2-3	G2	2.2	13	5
Podistera nevadensis	S/SB	W	4	1-1-3	G3	3.3	7	5
Polygala cornuta var. *fishiae*		-	2	2-1-1	G5T4	3.3	3.2	3
Populus tremuloides	S/SB	-	n/a	-	-	-	7	4
Potentilla glanulosa ssp. *ewanii*	A/SG, S/SB	-	1B	3-1-3	G5T1	1.3	1.3	4
Potentilla rimicola	S/SJ	S	2	3-1-1	G2G4	1.3	7	4
Pyrrocoma uniflora var. *gossypina*	S/SB	S	1B	2-2-3	G5T2	2.2	13	5
Quercus dumosa	L/SD,SB,SLP	S	1B	2-3-2	G2	1.1	3	2

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)								
Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Quercus engelmannii	C,A/SD,SJ,SG	-	4	1-2-2	G3	3.2	2	4
Quercus lobata	L/SG,SLP,NSL	-	n/a	-	-	-	2	4
Ribes canthariforme	C,pS/SD	S	1B	3-1-3	G1	1.3	3.2	4
Romneya coulteri	/SD,SA	-	4	1-2-3	G3	3.2	3	4
Rupertia rigida	C,S/SD,SJ,SB	W	4	1-1-2	G1	1.2	7	4
Sanicula maritima	L/SSL,NSL	S/CR	1B	3-2-2	G2	2.2	12	5
Satureja chandleri	C/SD,SA,SJ	S	1B	2-2-2	G4	3.2?	9	4
Scutellaria bolanderi ssp. *austromontana*	C,S/SD,SJ,SB	S	1B	2-2-3	G4T2	2.2?	1	4
Sedum niveum	S/SJ,SB	S	4	1-2-2	G3	3.2	5	5
Sibaropsis hammittii	C/SA	S	1B	3-2-3	G2	2.2	9	5
Sidalcea hickmanii ssp. *anomala*	L/SSL	S/CR	1B	3-2-3	G3T1	1.2	12	4
Sidalcea hickmanii ssp. *hickmanii*	L/NSL	S	1B	2-1-3	G3T2	2.3	3.2	5
Sidalcea hickmanii ssp. *parishii*	S,pA,L/SB,SLP,SSL	FC/S/CR	1B	3-2-3	G3T1	1.2	3.2	5
Sidalcea pedata	S/SB	FE/CE	1B	3-3-3	G1	1.1	13	5
Sidotheca caryophylloides	S,pA,pL/SA,SB	W	4	1-1-3	G3	3.3	5	4
Sidotheca emarginata	S/SJ	S	1B	2-1-3	G2	2.3	3.2	5
Streptanthus albidus ssp. *peramoenus*	pL/SSL,NSL	W	1B	2-2-3	G2T2	2.2	3	4
Streptanthus bernardinus	C,S/SD,SJ,SB,SG	S	4	1-1-3	G3	3.3	5	4
Streptanthus campestris	C,S,L/SD,SA,SJ,SB,SG,SLP	S	1B	2-1-2	G2	2.3	8	4
Stylocline masonii	A,L/SA	-	1B	3-3-3	G1	1.1	8	2
Swertia neglecta	S,A,L/SB,SG,SLP	S	4	1-1-3	G3	3.3	8	3
Symphyotrichum greatae	pS,A/SG	-	1B	2-1-3	G2	2.3	3.2	4
Syntrichopappus lemmonii	S,pA,pL/SA,SB	W	4	1-1-3	G3	3.3	8	4
Taraxacum californicum	S/SB	FE	1B	3-2-3	G2	2.1	13	5
Tetracoccus dioicus	C/SD	S	1B	3-2-2	G3	2.2	9	2
Thelypodium stenopetalum	S/SB	FE/CE	1B	3-3-3	G1	1.1	13	5
Thelypteris puberula var. *sonorensis*	S,pA,L/SB,SLP	W	2	2-2-1	G5T3T4	2.2?	1.1	4
Thermopsis californica var. *semota*	C/SD	S	1B	2-2-3	G3QT2Q	2.1	13	4
Thermopsis macrophylla	L/SB	S/CR	1B	3-1-3	G1	1.2	3.2	5

Table 360. Plant Species Evaluated for Viability Concerns (Species of Concern)

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	S	Hab Grp	FS Threat Cat
Triteleia ixioides ssp. *cookii*	pL/SSL	W	1B	2-1-3	G5T2	2.3	2	4
Tropidocarpum capparideum	pL/NSL	W	1A	-	GH	H	19	2
Viola aurea	pC,pS,pA/SD,SB,SG	W	2	2-2-1	G3G4	S2S3.3	8	2
Viola pinetorum ssp. *grisea*	pS/SB	S	1B	3-1-3	G4G5T1	1.3	7	2

286 species.
FC Federal candidate
W Watch list Status on Federal lands is based on the current Region 5 southern California forests Sensitive Species list and individual forests Watch lists as of July 2005.

Table 361. Federally Listed Plant Species - Endangered, Threatened, Proposed or Candidate

See Table 467, Key to Codes Frequently Used in Biodiversity Tables, on page 131

SCIENTIFIC NAME	COMMON NAME	FED Cat	ANF	CNF	LPNF	SBNF	Critical Habitat on Forest	Rec Plan
Acanthomintha ilicifolia	San Diego thorn-mint	FT		Y				
Acanthoscyphus parishii var. *goodmaniana*	Cushenbury puncturebract	FE				Y	Y - D	
Allium munzii	Munz's onion	FE		Y			Y - D	
Arenaria paludicola	Marsh sandwort*	FE				P		Y
Arenaria ursina	Bear Valley sandwort	FT				Y		
Astragalus albens	Cushenbury milk-vetch	FE				Y	Y - D	
Astragalus brauntonii	Brauton's milk-vetch*	FE	M	M				Y
Astragalus lentiginosus var. *coachellae*	Coachella Valley milk-vetch*	FE				M		
Astragalus tricarinatus	Triple-ribbed milk-vetch*	FE				M		
Baccharis vanessae	Encinitas baccharis	FT		Y				
Berberis nevinii	Nevin's barberry	FE	Y	Y		M		
Brodiaea filifolia	Thread-leaved brodiaea	FT	M	Y		M		
Castilleja cinerea	Ashy-grey paintbrush	FT				Y		
Caulanthus californicus	California jewelflower	FE			S-NF			Y
Ceanothus ophiochilus	Vail Lake ceanothus	FT		Y				
Chlorogalum purpureum var. *reductum*	Camatta Canyon amole	FT			Y		Y - D	
Chorizanthe parryi var. *fernandina*	San Fernando Valley spineflower*	FC			P			
Dodecahema leptoceras	Slender-horned spineflower	FE	M	Y		Y		
Dudleya cymosa ssp. *ovatifolia*	Santa Monica Mountains dudleya	FT		Y				Y
Eriastrum densifolium ssp. *sanctorum*	Santa Ana River woolystar*	FE				P		
Erigeron parishii	Parish's daisy	FT				Y	Y - D	
Eriogonum kennedyi var. *austromontanum*	Southern mountain buckwheat	FT				Y		
Eriogonum ovalifolium var. *vineum*	Cushenbury buckwheat	FE				Y	Y - D	
Nasturtium gambelii	Gambel's watercress*	FE				P		Y
Physaria kingii ssp. *bernardina*	San Bernardino Mountains bladderpod	FE				Y	Y - D	
Poa atropurpurea	San Bernardino bluegrass	FE		Y		Y		
Sidalcea hickmanii ssp. *parishii*	Parish's checkerbloom	FC			Y	Y		

SCIENTIFIC NAME	COMMON NAME	FED Cat	ANF	CNF	LPNF	SBNF	Critical Habitat on Forest	Rec Plan
Sidalcea pedata	Bird-foot checkerbloom	FE				Y		Y
Taraxacum californicum	California taraxacum	FE	M			Y		Y
Thelypodium stenopetalum	Slender-petaled thelypodium	FE				Y		

* Probably not found on NFS lands
FT = Threatened
FE = Endangered
FC = Candidate
Y = Found on NFS lands
H = Historic occurrences, none recent
M = Modeled habitat present
P = Possibly present, no records
S-NF = Surveyed, not found,
D = Designated
Prop = Proposed
Rec Plan = Recovery Plan

Table 362. Federally Listed Animal Species - Endangered, Threatened, Proposed or Candidate

See Table 467, Key to Codes Frequently Used in Biodiversity Tables, on page 131

Species Name	Common Name	Taxon	>Fed	ANF	CNF	LPNF	SBNF	Critical Hab.	CH On Forest	Rec Plan
Euphilotes enoptes smithi	Smith's blue butterfly	Invertebrate	FE			Y				Y
Euphydryas editha quino	Quino checkerspot	Invertebrate	FE		Y		Y	D	Y	Y
Pyrgus ruralis lagunae	Laguna Mountains skipper	Invertebrate	FE		Y					
Branchinecta conservatio	Conservancy fairy shrimp	Invertebrate	FE			Y		D	Y	
Branchinecta longiantenna	Longhorn fairy shrimp	Invertebrate	FE			P		Prop	N	
Branchinecta lynchi	Vernal pool fairy shrimp	Invertebrate	FT		P	Y		D	Y	
Catostomus santaanae	Santa Ana sucker	Fish	FT	Y		Y/ intro	H/ M	D	Y	
Eucyclogobius newberryi	Tidewater goby	Fish	FE			M		D	N	
Gasterosteus aculeatus williamsoni	Shay Creek stickleback	Fish	FE				y			
Gasterosteus aculeatus williamsoni	Unarmored 3-spine stickleback	Fish	FE	Y		H				Y
Oncorhynchus mykiss	Southern steelhead (southern esu)	Fish	FE	H	Y		H	Prop	Y	
Oncorhynchus mykiss	Southern steelhead (south-central esu)	Fish	FT			Y		Prop	Y	
Bufo californicus	Arroyo toad	Amphibian	FE	Y	Y	Y	Y	Prop	Y	Y
Rana muscosa	Mountain yellow-legged frog	Amphibian	FE	Y	H		Y			
Rana aurora draytonii	California red-legged frog	Amphibian	FT	Y	H/M	Y	H/M	D	Y	Y
Gopherus agassizi	Desert tortoise	Reptile	FT	Y			Y	D	N	Y
Gambelia silus	Blunt-nosed leopard lizard	Reptile	FE			M				Y
Pelecanus occidentalis californicus	California brown pelican	Bird	FE			Y				Y
Sterna antillarum browni	California least tern	Bird	FE			M				Y
Charadrius alexandrinus	Snowy plover	Bird	FT			Y		D	N	Y
Brachyramphus marmoratus	Marbled murrelet	Bird	FT			M		D	N	Y
Gymnogyps californianus	California condor	Bird	FE	H/M	H	Y	Y	D	Y	Y
Haliaeetus leucocephalus	Bald eagle	Bird	FT	W	W	Y/W	Y/W			Y
Empidonax traillii extimus	Southwestern willow flycatcher	Bird	FE	Y	Y	Y	Y	Prop	N	Y

Species Name	Common Name	Taxon	>Fed	ANF	CNF	LPNF	SBNF	Critical Hab.	CH On Forest	Rec Plan
Polioptila californica californica	California gnatcatcher	Bird	FT		Y		M	Prop	Y	
Vireo bellii pusillus	Least Bell's vireo	Bird	FE	M	Y	Y	Y	D	Y	Y
Coccyzus americanus	Yellow-billed cuckoo	Bird	FC							
Dipodomys ingens	Giant kangaroo rat	Mammal	FE			P				Y
Dipodomys merriami parvus	San Bernardino kangaroo rat	Mammal	FE				Y	D	Y	
Dipodomys stephensi	Stephen's kangaroo rat	Mammal	FE		Y					
Vulpes macrotis mutica	San Joaquin kit fox	Mammal	FE			Y				Y
Enhydra lutris nereis	Southern sea otter	Mammal	FT			Y				Y
Eumetopias jubatus	Stellar's sea lion	Mammal	FT			Y		D	Y	Y
Ovis anadensis cremnobates	Peninsular bighorn sheep	Mammal	FE				Y	D	Y	Y

An additional four species have federal status in the planning area; however U.S Fish and Wildlife Service response to U.S. Forest Service species list requests do not include these species due to low potential on National Forest System lands:

Ambystoma californiense, California tiger salamander FE, FC
Branchinecta sandiegonensis, San Diego fairy shrimp FE
Gilia bicolor mohavensis, Mojave tui chub FE
Spermophilus tereticaudus chlorus, Coachella Valley round-tailed ground squirrel FC

FT = Threatened
FE = Endangered
FC = Candidate
Y = found on NFS lands
W = on NFS lands in winter only
H = historic occurrences, none recent
M = modeled habitat present
P = possibly present, no records
Critical Hab., CH = critical habitat:
D = designated
Prop = proposed
V = vacated
Y =CH on NFS land
N = no CH on NFS lands
Rec Plan = Recovery Plan

Table 363. Forest Service Pacific Southwest Region Sensitive Animal Species

See Table 467, Key to Codes Frequently Used in Biodiversity Tables, on page 131

Scientific Name	Common Name	ANF	CNF	LPF	SBNF
Birds (6)					
Accipiter gentilis	Northern goshawk	X		X	X
Buteo swainsoni	Swainson's hawk	X		X	
Campylorhynchus brunneicapillus sandiegensis	San Diego cactus wren		X		X
Empidonax traillii	Willow flycatcher (migrant)	X	X	X	X
Falco peregrinus anatus	American peregrine falcon	X	X	X	X
Strix occidentalis occidentalis	California spotted owl	X	X	X	X
Mammals (10)					
Antrozous pallidus	Pallid bat	X	X	X	X
Corynorhinus townsendii	Townsend's big-eared bat	X	X	X	X
Glaucomys sabrinus californicus	San Bernardino flying squirrel				X
Lasiurus blossevillii	Western red bat	X	X	X	X
Macrotus californicus	California leaf-nosed bat		X		X
Ovis canadensis nelsoni	San Gabriel Mountains bighorn sheep	X			X
Perognathus alticolus alticolus	San Bernardino white-eared pocket mouse	X			X
Perognathus alticolus inexpectatus	Tehachapi pocket mouse	X		X	
Perognathus longimembris brevinasus	Los Angeles pocket mouse	X	X		X
Tamias speciosus callipeplus	Mt. Pinos lodgepole chipmunk			X	
Amphibians (5)					
Ensatina eschscholtzii croceater	Yellow-blotched salamander	X		X	X
Ensatina eschscholtzii klauberi	Large-blotched salamander		X		X
Batrachoseps gabrieli	San Gabriel Mountain slender salamander	X			X
Batrachoseps stebbinsi	Tehachapi slender salamander			X	
Rana boylii	Foothill yellow-legged frog			X	

Scientific Name	Common Name	ANF	CNF	LPF	SBNF
Reptiles (10)					
Actinemys marmorata pallida	Southern Pacific pond turtle	X	X	X	X
Phrynosoma coronatum blainvillii	San Diego horned lizard	X	X	X	X
Anniella pulchra	California legless lizard	X	X	X	X
Diadophis punctatus modestus	San Bernardino ringneck snake	X			X
Diadophis punctatus similus	San Diego ringneck snake		X		X
Charina bottae umbratica	Southern rubber boa	X		X	X
Lichanura trivirgata roseofusca	Coastal rosy boa	X	X		X
Lampropeltis zonata parvirubra	San Bernardino mountain kingsnake	X			X
Lampropeltis zonata pulchra	San Diego mountain kingsnake		X		X
Thamnophis hammondii	Two-striped garter snake	X	X	X	X
Inland and Anadromous Fishes (3)					
Gasterosteus aculeatus microcephalus	Partially armored 3-spine stickleback				X
Gila orcutti	Arroyo chub	X	X	X	X
Rhinichthys osculus ssp	Santa Ana speckled dace	X	X	X	X
Total Sensitive Animals = 34	**Total Number of Sensitive Animals per Forest**	**24**	**20**	**20**	**30**

Table 364. Forest Service Pacific Southwest Region Sensitive Plant Species

See Table 467, Key to Codes Frequently Used in Biodiversity Tables, on page 131

Table 364. Forest Service Pacific Southwest Region Sensitive Plant Species					
Scientific Name	**Common Name**	**ANF**	**CNF**	**LPNF**	**SBNF**
Abronia nana ssp. *covillei*	Coville's dwarf sand verbena				X
Acanthoscyphus parishii var. *abramsii*	Abrams' flowery puncturebract			X	
Acanthoscyphus parishii var. *cienegensis*	Cienega Seca flowery puncturebract				X
Arabis breweri var. *pecuniaria*	San Bernardino rockcress				X
Arabis johnstonii	Johnston's rockcress				X
Arabis parishii	Dwarf rockcress				X
Arabis shockleyi	Shockley's rockcress				X
Arctostaphylos cruzensis	Arroyo de la Cruz manzanita			X	
Arctostaphylos edmundsii	Little Sur manzanita			X	
Arctostaphylos luciana	Santa Lucia manzanita			X	
Arctostaphylos peninsularis var. *peninsularis**	Peninsular manzanita				*
Arctostaphylos pilosula	Santa Margarita manzanita			X	
Arctostaphylos rainbowensis	Rainbow manzanita		X		
Arctostaphylos refugioensis	Refugio manzanita			X	
Arenaria macradenia var. *kuschei*	Mojave sandwort	X			
Astragalus bicristatus	Two-crested milkvetch	X			X
Astragalus deanei	Deane's milk-vetch		X		
Astragalus douglasii var. *perstrictus*	Jacumba milk-vetch		X		
Astragalus lentiginosus var. *antonius*	Freckled milk-vetch	X			X
Astragalus lentiginosus var. *sierrae*	Sierra milk-vetch				X
Astragalus oocarpus	Descanso milk-vetch		X		
Astragalus pachypus var. *jaegeri*	Jaeger's milk-vetch		X		
Atriplex parishii	Parish's saltbush				X

Table 364. Forest Service Pacific Southwest Region Sensitive Plant Species

Scientific Name	Common Name	ANF	CNF	LPNF	SBNF
Botrychium crenulatum	Scalloped moonwort	X			X
Brodiaea orcuttii	Orcutt's brodiaea		X		
Calochortus dunnii	Dunn's mariposa lily		X		
Calochortus obispoensis	San Luis mariposa lily			X	
Calochortus palmeri var. *munzii*	Munz's mariposa lily				X
Calochortus palmeri var. *palmeri*	Palmer's mariposa lily	X		X	X
Calochortus plummerae	Plummer's mariposa lily	X			X
Calochortus striatus	Alkali mariposa lily	X			X
Calochortus weedii var. *intermedius*	Intermediate mariposa lily		X		
Calochortus weedii var. *vestus*	Late-flowered mariposa lily			X	
Calycadenia villosa	Dwarf western rosinweed			X	
Canbya candida	White pygmypoppy	X			X
Carex obispoensis	San Luis Obispo sedge			X	
Carlquistia muirii	Muir's raillardella			X	
Castilleja gleasonii	Frosted Indian paintbrush	X			
Castilleja lasiorhyncha	San Bernardino Mountains owl's clover		X		X
Caulanthus amplexicaulis var. *barbarae*	Clasping-leaf wild cabbage			X	
Caulanthus simulans	Payson's wild cabbage		X		X
Ceanothus cyaneus	San Diego buckbrush		X		
Chorizanthe blakleyi	Blakeley's spineflower			X	
Chorizanthe breweri	San Luis Obispo spineflower			X	
Chorizanthe parryi var. *parryi*	Parry's spineflower				X
Chorizanthe polygonoides var. *longispina*	Knotweed spineflower		X		X
Chorizanthe rectispina	Prickly spineflower			X	

Table 364. Forest Service Pacific Southwest Region Sensitive Plant Species

Scientific Name	Common Name	ANF	CNF	LPNF	SBNF
Clarkia delicata	Campo clarkia		X		
Claytonia lanceolata var. *peirsonii*	Western spring beauty	X			X
Cupressus forbesii	Tecate cypress		X		
Cupressus stephensonii	Cuyamaca cypress		X		
Deinandra floribunda	Tecate tarplant		X		
Deinandra mohavensis	Mojave tarplant		X		X
Delphinium hesperium ssp. *cuyamacae*	Cuyamaca larkspur		X		X
Delphinium hutchinsoniae	Monterey larkspur			X	
Delphinium inopinum	Unexpected larkspur			X	
Dieteria asteroides var. *lagunensis*	Laguna Mountains aster		X		
Dieteria canescens var. *ziegleri*	Ziegler's aster				X
Dudleya abramsii ssp. *affinis*	Abrams' liveforever				X
Dudleya densiflora	San Gabriel Mountains dudleya	X			
Dudleya multicaulis	Many-stemmed dudleya	X	X		
Dudleya viscida	Sticky dudleya		X		
Eriastrum hooveri	Hoover's eriastrum			X	
Erigeron uncialis var. *uncialis***	Lone fleabane				**
Eriogonum butterworthianum	Butterworth's buckwheat			X	
Eriogonum kennedyi var. *alpigenum*	Southern alpine buckwheat	X		X	X
Eriogonum microthecum var. *johnstonii*	Johnston's buckwheat	X			X
Eriophyllum lanatum var. hallii	Fort Teton wooly sunflower			X	
Fritillaria falcata	Talus fritillary			X	
Fritillaria ojaiensis	Ojai fritillary			X	
Fritillaria viridea	San Benito fritillary			X	
Galium angustifolium ssp. *jacinticum*	Jacinto bedstraw				X
Galium californicum ssp. *luciense*	Cone Peak bedstraw			X	
Galium californicum ssp. *primum*	California bedstraw				X

Table 364. Forest Service Pacific Southwest Region Sensitive Plant Species					
Scientific Name	**Common Name**	**ANF**	**CNF**	**LPNF**	**SBNF**
Galium grande	San Gabrie lbedstraw	X			
Galium hardhamiae	Hardham's bedstraw			X	
Githopsis diffusa ssp. *filicaulis*	San Gabriel bluecap		X		
Heuchera hirsutissima	Shaggy-haired alumroot				X
Heuchera parishii	Parish's alumroot				X
Horkelia truncata	Ramona horkelia		X		
Horkelia wilderae	Barton Flats horkelia				X
Ivesia argyrocoma	Silver-haired ivesia				X
Ivesia callida	Tahquitz ivesia				X
Layia heterotricha	Pale-yellow layia			X	
Lepechinia cardiophylla	Santa Ana pitcher sage		X		
Leptosiphon floribundus ssp. *hallii*	Santa Rosa Mountains linanthus				X
Lessingia glandulifera var. *tomentosa*	Warner Springs lessingia		X		
Lilium parryi	Lemon lily	X	X		X
Limnanthes gracilis var. *parishii*	Parish's meadowfoam		X		
Linanthus concinnus	San Gabriel linanthus	X			X
Linanthus jaegeri	San Jacinto prickly phlox				X
Linanthus killipii	Baldwin Lake linanthus				X
Linanthus orcuttii	Orcutt's linanthus		X		
Lupinus ludovicianus	San Luis Obispo lupine			X	
Malacothamnus palmeri var. *lucianus*	Arroyo Seco bushmallow			X	
Malacothrix saxatilis var. *arachnoidea*	Carmel Valley malacothrix			X	
Malaxis monophyllos ssp. *brachypoda*	White adder's-mouth orchid				X
Marina orcuttii var. *orcuttii*	California marina				X
Mimulus exiguus	San Bernardino Mountains monkeyflower				X
Mimulus purpureus	Purple monkeyflower				X
Monardella hypoleuca ssp. *lanata*	Felt-leaved monardella		X		
Monardella linoides ssp. *oblonga*	Flax-like monardella			X	
Monardella macrantha ssp. *hallii*	Hall's monardella	X		X	X
Monardella nana ssp. *leptosiphon*	San Felipe monardella		X		X

Table 364. Forest Service Pacific Southwest Region Sensitive Plant Species

Scientific Name	Common Name	ANF	CNF	LPNF	SBNF
Monardella viridis ssp. *saxicola*	Rock monardella	X			X
Navarretia peninsularis	Baja pincushion plant	X	X	X	X
Nolina cismontana	California beargrass		X		
Opuntia basilaris var. *brachyclada*	Short-joint beavertail	X			X
Orobanche valida ssp. *valida*	Rock Creek broomrape	X		X	
Packera bernardina	San Bernardino ragwort				X
Packera ganderi	Gander's ragwort		X		
Pedicularis dudleyi	Dudley's lousewort			X	
Penstemon californicus	California penstemon		X		X
Pentachaeta exilis ssp. *aeolica*	Meager pygmydaisy			X	
Phacelia suaveolens ssp. *keckii*	Santiago Peak phacelia		X		
Phlox dolichantha	Big Bear Valley phlox				X
Plagiobothrys uncinatus	Hooked popcornflower			X	
Potentilla rimicola	Cliff cinquefoil				X
Pyrrocoma uniflora var. *gossypina*	Bear Valley pyrrocoma				X
Quercus dumosa	California scrub oak			X	
Ribes canthariforme	Moreno current		X		
Sanicula maritima	Adobe sanicle			X	
Satureja chandleri	San Miguel savory		X		
Scutellaria bolanderi ssp. *austromontana*	Southern skullcap		X		X
Sedum niveum	Davidson's stonecrop				X
Sibaropsis hammittii	Hammit's clay-cress		X		
Sidalcea hickmanii ssp. *anomala*	Cuesta Pass checkerbloom			X	
Sidalcea hickmanii ssp. *hickmanii*	Hickman's checkerbloom			X	
Sidalcea hickmanii ssp. *parishii****	Parish’s checkerbloom			X	X
Sidotheca emarginata	White-margined starry puncturebract				X
Streptanthus bernardinus	Laguna Mountains jewel-flower		X		X
Streptanthus campestris	Southern jewelflower		X	X	X
Swertia neglecta	Pine green-gentian	X		X	X

Table 364. Forest Service Pacific Southwest Region Sensitive Plant Species

Scientific Name	Common Name	ANF	CNF	LPNF	SBNF
Tetracoccus dioicus	Parry's tetracoccus		X		
Thermopsis californica var. *semota*	Velvety false lupine		X		
Thermopsis macrophylla	Santa Ynez false lupine			X	
Viola pinetorum ssp. *grisea*	Grey-leaved violet				X
Forest Sensitive Plant Species = 137	**Total # Sensitive Species per Forest**	**23**	**43**	**46**	**63**

X = found or likely to be found on particular national forest.
* Taxon now believed not to occur in California, but still included in table as is currently SBNF sensitive species.
**Taxon found not to occur on the San Bernardino National Forest, was erroneous record, but included in table as is SBNF sensitive species.
*** Also treated as a federal candidate species.
Updated 1998; recently listed federal species are no longer sensitive and recently delisted federal species become sensitive. List modified June 2005 based on current sensitive plant lists and name changes in botanical literature.

Table 367. Plant Species-At-Risk

See Table 467, Key to Codes Frequently Used in Biodiversity Tables, on page 131

Table 367. Plant Species-At-Risk							
Scientific Name	**Forest Distribution/ Mountain Range(s)**	**Status**	**CNPS LIST**	**R-E-D**	**G**	**Hab Grp**	**Threats**
Acanthomintha ilicifolia	C/SD	FT/CE	1B	2-3-2	G1	9	Dispersed recreation, unauthorized grazing, invasive species, WUI defense zones
Acanthoscyphus parishii var. *abramsii*	L/SLP	S	1B	2-2-3	G4?T2	3.2	Incomplete knowledge, small population size, vegetation management
Acanthoscyphus parishii var. *goodmaniana*	S/SB	FE	1B	3-3-3	G4?T1	10	Access, mining, recreation
Allium hickmanii	L/NSL	W	1B	2-3-2	G2	19	Incomplete knowledge, grazing
Allium munzii	C/SA	FE/CT	1B	3-3-3	G1	9	Recreation, invasive species
Androsace elongata ssp. *acuta*	C,S,L/SD, SJ, SB, SLP	W	4	1-2-2	G?T3?	16	Grazing, vegetation management
Arabis dispar	S/SB	W	2	2-1-1	G3	8	Access, recreation, vegetation management
Arabis johnstonii	S/SJ	S	1B	3-2-3	G2	3.2	Grazing
Arabis parishii	S/SB	S	1B	2-2-3	G2	11	Access, recreation, mining, WUI defense zones
Arctostaphylos cruzensis	L/NSL	S	1B	2-2-3	G2	6	Small population size, vegetation management
Arenaria lanuginosa ssp. *saxosa*	S/SB	-	2	3-1-1	G5T5	7	Recreation, altered hydrology
Arenaria macradena var. *kuschei*	A/SA	S	1B	3- 3-3	G5?T2?	3.2	Road maintenance, unauthorized OHV use, fuelbreak maintenance, recreation trampling
Arenaria ursina	S/SB	FT	1B	2-2-3	G2	11	Access, recreation, mining, WUI defense zones
Astragalus albens	S/SB	FE	1B	3-3-3	G1	10	Access, recreation, mining
Astragalus lentiginosus var. *sierrae*	S/SB	S	1B	2-2-3	G5T1	8	Access, recreation, mining

Table 367. Plant Species-At-Risk

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	Hab Grp	Threats
Astragalus oocarpus	C/SD	S	1B	3-2-3	G2	3.2	Small population size, access
Astragalus pachypus var. *jaegeri*	C,pS/SD,SJ	S	1B	3-3-3	G?T1	3	Small population size, recreation
Berberis nevinii	C/SD,pSA,pS,A/SB,SG	FE/CE	1B	3-3-3	G2	3	Incomplete knowledge, small population size, recreation, vegetation management
Botrychium crenulatum	S,pA/SB	S	2	2-2-1	G3	13.1	Altered hydrology, recreation
Calochortus clavatus var. *gracilis*	A/SG	-	1B	3-2-3	G4T1	3.2	WUI fuel treatments, incomplete knowledge
Calochortus dunnii	C/SD	S/CR	1B	2-2-3	G2	9	Recreation
Calochortus obispoensis	L/SLP,NSL	S	1B	2-2-3	G2	12	Recreation, vegetation management
Calochortus palmeri var. *munzii*	S/SJ	S	1B	3-2-3	G2T1	13	Access, recreation, collection
Calochortus palmeri var. *palmeri*	S,A,L/SJ,SB,SG,CAS,SLP	S	1B	2-2-3	G2T2	13	Access, recreation, collection
Calochortus simulans	L/SLP,SSL	W	1B	2-1-3	G3	16	Grazing, recreation, roads and OHV trail nearby
Camissonia hardhamiae	L/SLP,SSL	W	1B	3-2-3	G1Q	3	Small population size, incomplete knowledge, recreation, grazing
Canbya candida	pS,A/SB	S	4	1-2-3	G3	8	Small population size, limited knowledge, recreation
Carex obispoensis	L/SLP,NSL	S	1B	2-2-3	G2	16	Special uses, recreation
Castilleja cinerea	S/SB	FT	1B	2-2-3	G2	11	Access, recreation, mining, WUI defense zones
Castilleja gleasonii	A/SG	S/CR	1B	3-2- 3	G2Q	5	Recreation, motorized vehicle use
Castilleja lasiorhyncha	pC,S/SB	S	1B	2-2-3	G2	13	Access, recreation, altered hydrology
Castilleja plagiotoma	S,A,pL/SA,SB	W	4	1-1-3	G3	11	Access, recreation, vegetation management
Caulanthus amplexicaulis var. *barbarae*	L/SLP	S	1B	3-1-3	G3?T1	12	Small population size, access, mining
Caulanthus lemmonii	L/SLP,SSL,NSL	W	1B	2-2-3	G4T2	16	Incomplete knowledge, recreation, grazing

Table 367. Plant Species-At-Risk

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	Hab Grp	Threats
Chlorogalum purpureum var. *reductum*	L/SSL	FT/CR	1B	3-3-3	G1T1	12	Access, recreation
Chorizanthe blakleyi	L/SLP	S	1B	2-1-3	G3	3.2	Small population size, access
Clarkia jolonensis	L/NSL	W	1B	3-2-3	G2	3	Incomplete knowledge, grazing
Claytonia lanceolata var. *peirsonii*	S,A/SG	S	1B	3-3-3	G5T1Q	7	Access, recreation, grazing, mining
Cupressus stephensonii	C/SD	S	1B	3-3-3	G1	3.2	small population size, too frequent fire
Delphinium hesperium ssp. *cuyamaceae*	C, S/SD, SJ	S/CR	1B	2- 2- 3	G4T2	13	Habitat degradation from fuel treatments, dispersed recreation
Delphinium hutchinsoniae	L/NSL	S	1B	3-2-3	G2	6	Small population size, recreation
Dieteria asteroides var. *lagunensis*	C,pS/SD	S/CR	2	3-3-1	G5T2T3	13	Recreation, grazing, timber management, WUI fuel treatments
Dieteria canescens var. *ziegleri*	S/SJ	S	1B	3-2-3	G5T1	5	Small population size, access, recreation
Dodecahema leptoceras	C,S/SD,SJ,SB,SG	FE/CE	1B	3-3-3	G1	17.3	Unauthorized shooting, dispersed recreation
Dudleya abramsii ssp. *affinis*	S/SB	S	1B	2-2-3	G3T2	8	Access, recreation, mining
Dudleya densiflora	A/SG	S	1B	3-3-3	G1	1.1	Small population size, access
Erigeron parishii	S/SA, SB	FT	1B	2-3-3	G2	10	Mining
Eriogonum evanidum	pC,S/SD,SJ,SB	W	1B	3-2-2	G3	8	Dispersed recreation, mining, incomplete knowledge
Eriogonum kennedyi var. *austromontanum*	S/SB	FT	1B	2-2-3	G4T2	11	Access, recreation, mining
Eriogonum ovalifolium var. *vineum*	S/SB	FE	1B	3-3-3	G5T1	10	Access, mining
Galium angustifolium ssp. *jacinticum*	S/SJ	S	1B	3-1-3	G5T1	5	Small population size, recreation
Galium californicum ssp. *primum*	S/SJ	S	1B	3-2-3	G5T1	5	Access, recreation, vegetation management
Galium grande	A/SG	S	1B	3-1- 3	G1	4	Road and trail use and maintenance, WUI fuel treatments

Table 367. Plant Species-At-Risk

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	Hab Grp	Threats
Gentiana fremontii	S/SB	-	2	3-1-1	G4	7	Recreation, vegetation management
Horkelia yadonii	L/SLP,NSL	-	4	1-2-3	G3	13	Dispersed recreation
Ivesia argyrocoma	S/SB	S	1B	2-2-2	G2	11	Access, recreation, mining, WUI fuel treatments
Juncus duranii	S/SJ,SB,SG	W	4	1-1-3	G3	13.1	Altered hydrology, recreation, access, grazing
Lepechinia fragrans	pS,A/SG/SLP	W	4	1- 2- 3	G3	3.2	WUI fuel treatments, type conversion, road and trail use and maintenance
Leptosiphon floribundus ssp. *hallii*	S/SJ	S	1B	3-1-3	G4T1	8	Access, recreation
Lilium humboldtii ssp. *ocellatum*	C,S,A,L/SD,SA,SJ,SB,SG,CAS,SLP	W	4	1-2-3	G4T3	1	Recreation, grazing
Limnanthes gracilis ssp. *parishii*	C/SD,SJ	S/CE	1B	2-2-3	G3T2	13.1 and 15	Recreation, grazing
Linanthus concinnus	pS,A/SB	S	1B	3-2-3	G2	5	Access, recreation
Linanthus killipii	S/SB	S	1B	2-2-3	G2	11	Access, recreation, mining
Lupinus ludovicianus	L/SSL	S	1B	3-2-3	G2	19	Incomplete knowledge, small population size, vegetation management
Malacothamnus palmeri var. *lucianus*	L/NSL	S	1B	3-2-3	G4T1Q	3.2	Small population size, access, vegetation management
Malaxis monophyllos var. *brachypoda*	S,pA/SJ,SB	S	2	3-3-1	G?T4	13.1	Recreation
Marina orcutti var. *orcuttii*	S/SJ	S	1B	3-1-2	G?T1T2	8	Recreation, access, small population size, limited knowledge
Matelea parvifolia	S/SJ,pSB	-	2	3-1-1	G5?	18	Access, recreation
Mimulus exiguus	S/SB	S	1B	2-2-2	G2	13	Access, recreation, altered hydrology
Mimulus purpureus	S/SB	S	1B	2-2-2	G2	11	Access, recreation, vegetation management
Packera bernardina	S/SB	S	1B	2-2-3	-	13.2	Access, recreation, mining

Table 367. Plant Species-At-Risk

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	Hab Grp	Threats
Packera ganderi	C/SD	S/CR	1B	3-2-3	-	9	Recreation
Parnassia cirrata var. *cirrata*	S/SB,SG	-	1B	2-1-3	G2	5	Recreation
Penstemon californicus	pC,S/SJ	S	1B	3-2-2	G3?	8	Access, recreation, vegetation management
Pentachaeta exilis ssp. *aeolica*	L/SB,NSL	S	1B	3-2-3	G5T1	2	Incomplete knowledge, small population size, access
Phacelia exilis	S/SB	W	4	1-1-3	G3Q	5	Access, recreation, grazing, vegetation management
Phacelia mohavensis	S/SB,SG	W	4	1-1-3	G3Q	8	Access, recreation, altered hydrology
Phlox dolichantha	S/SB	S	1B	2-2-3	G2	5	Access, recreation, WUI defense zones
Physaria kingii ssp. *bernardina*	S/SB	FE	1B	3-3-3	G5T1	10	Recreation, mining, WUI defense zone maintenance and dispersed use of zone
Piperia leptopetala	pA,C,pL,S/pCAS,pNSL,SB,SD	W	4	1-1-3	G3	5	Vegetation management
Poa atropurpurea	C,S/SD,SB	FE	1B	2-2-3	G2	13.1	Altered hydrology, recreation
Podistera nevadensis	S/SB	W	4	1-1-3	G3	7	Limited knowledge, small population size, recreation, fuel treatments
Pyrrocoma uniflora var. *gossypina*	S/SB	S	1B	2-2-3	G5T2	13.2	Access, recreation, mining
Sanicula maritima	L/SSL,NSL	S/CR	1B	3-2-2	G2	12	Small population size, recreation
Sedum niveum	S/SJ,SB	S	4	1-2-2	G3	5	Access, recreation, vegetation management
Sibaropsis hammittii	C/SA	S	1B	3-2-3	G2	9	Recreation, grazing
Sidalcea hickmanii ssp. *hickmanii*	L/NSL	S	1B	2-1-3	G3T2	3.2	Small population size, access, vegetation management
Sidalcea hickmanii ssp. *parishii*	S,pA,L/SB,SLP,SSL	FC/S/CR	1B	3-2-3	G3T1	3.2	Small population size, access, vegetation management
Sidalcea pedata	S/SB	FE/CE	1B	3-3-3	G1	13.1	Altered hydrology, recreation
Sidotheca emarginata	S/SJ	S	1B	2-1-3	G2	3.2	Grazing

Table 367. Plant Species-At-Risk

Scientific Name	Forest Distribution/ Mountain Range(s)	Status	CNPS LIST	R-E-D	G	Hab Grp	Threats
Taraxacum californicum	S/SB	FE	1B	3-2-3	G2	13.1	Altered hydrology, recreation
Thelypodium stenopetalum	S/SB	FE/CE	1B	3-3-3	G1	13	Altered hydrology, recreation
Thermopsis macrophylla	L/SB	S/CR	1B	3-1-3	G1	3.2	Small population size, access, vegetation management

FC= Federal Candidate

Table 369. Animal Species Evaluated for Viability Concerns (Species of Concern)

Please see Table 467, Key to Codes Frequently Used in Biodiversity Tables, page **131**

Table 369. Animal Species Evaluated for Viability Concerns (Species of Concern)												
Common Name	**Taxon**	**ANF**	**CNF**	**LPNF**	**SBNF**	**Fed Status**	**CA Status**	**Global rank**	**Subspecies rank**	**State rank**	**Hab Grp**	**FS Threat Cat**
Arboreal salamander	Amphib	y	y	y	y			G5		S4	2	4
Arroyo toad	Amphib	y	y	y	y	FE	SSC	G2/3		S2/3	1.3	6
California (Pacific) giant salamander	Amphib			y				G3		S5	1.3	4
California red-legged frog	Amphib	y	h/p	y	h/p	FT	SSC	G4	T2/3	S2/3	1.3	5
California tiger salamander	Amphib					FE - C	SSC	G2/3		S2/3	17.1	1
Coast range newt	Amphib	y	y	y	p		SSC	G5	T?	S3	1.3	5
Foothill yellow-legged frog	Amphib	h		y		S	SSC	G3		S2/3	1.3	4
Large-blotched ensatina salamander	Amphib		y		y	S	SSC	G5	T2/3	S2/3	4	4
Monterey ensatina salamander	Amphib	y	y	y	y			G5	T4	S?	2	3
Mountain yellow-legged frog	Amphib	y	h		y	FE	SSC	G2/3		S2	1.3	5
San Gabriel Mtn. slender salamander	Amphib	y			y	S		G1		S1	4	4
Tehachapi slender salamander	Amphib	p		p		S	CT	G2		S2	4	2
Western spadefoot	Amphib	p	y	y	y		SSC	G3		S3?	17	5
Yellow-blotched ensatina salamander	Amphib	p		y	y	S	SSC	G5	T2/3	S2/3	4	4
American dipper	Bird	y	h/p	y	y			G5		S5	1.2	5
American peregrine falcon	Bird	y	y	y	y	S	CE	G4	T3	S2	16.1	4
American pipit (water pipit)	Bird	w	w	w	y/w			G5		S2	7	4
Bald eagle	Bird	w	w	w	y	FT	CE	G4		S2	14	5
Band-tailed pigeon	Bird	y	y	y	y			G4		S?	4	3
Bell's sage sparrow	Bird	y	y	y	y		SSC	G5	T2/4	S2?	3	3
Bendire's thrasher	Bird				y		SSC	G4/5		S3	18	1
Black swift	Bird	y	p	p	y		SSC	G4		S2	1	5
Burrowing owl	Bird		p	p	p		SSC	G4		S2	19	4
California brown pelican	Bird			y		FE	CE	G4	T3	S1/2	6	4
California condor	Bird	h	h	y	y	FE	CE	G1		S1	16.1	5
Coastal California gnatcatcher	Bird		y		p	FT	SSC	G3		S2	3.1	5

Table 369. Animal Species Evaluated for Viability Concerns (Species of Concern)

Common Name	Taxon	ANF	CNF	LPNF	SBNF	Fed Status	CA Status	Global rank	Subspecies rank	State rank	Hab Grp	FS Threat Cat
California least tern	Bird			p		FE	CE	G4	T2/3	S2/3	6	2
California quail	Bird	y	y	y	y			G5		S5	16	3
California spotted owl	Bird	y	y	y	y	S	SSC	G3	T3	S3	4	6
Calliope hummingbird	Bird	y	p	y	y			G5		S4	13	5
Cassin's vireo (solitary)	Bird	y	y	y	y			G5		S?	4	4
Chukar	Bird	p	p	y	y			G5		S?	8	4
Common nighthawk	Bird	y			y			G5		S3	8	4
Common yellowthroat	Bird	y	y	y	y			G5		S3	1.1	5
Cooper's hawk	Bird	y	y	y	y		SSC	G5		S3	1	3
Flammulated owl	Bird	y	y	y	y			G4		S?	5.1	5
Golden eagle	Bird	y	y	y	y		SSC	G5		S3	16.1	5
Gray flycatcher	Bird	p			y			G5		S5	8	4
Gray vireo	Bird	y	y		y		SSC	G4		S2	8	4
Hepatic tanager	Bird				y		SSC	G5		S1	8	4
Hermit thrush	Bird	y	w	y	y			G5		S5	5.3	4
Lawrence's goldfinch	Bird	y	y	y	y			G3/4		S3	1.1	3
Le Conte's thrasher	Bird	p		p	y		SSC	G3		S3	18	2
Least Bell's vireo	Bird	p	y	y	p	FE	CE	G5	T2/3	S2	1.1	5
Lincoln's sparrow	Bird	y	w	y	y			G5		S?	13	5
Loggerhead shrike	Bird	y	y	y	y		SSC	G4		S4	19	4
Long-eared owl	Bird	y	y	y	y		SSC	G5		S3	2	5
MacGillivray's warbler	Bird	y	t	p	y			G5		S?	13.1	5
Marbled murrelet	Bird			y		FT	CE	G3		S1	4	2
Mount Pinos blue grouse	Bird			h/p				G4	TU	S?	5.3	4
Mountain quail	Bird	y	y	y	y			G5		S?	16	3
Mourning dove	Bird	y	y	y	y			G5		S?	16	3
Nashville warbler	Bird	y	y	y	y			G5		S?	4	4
Northern goshawk	Bird	y	t	y	y	S	SSC	G5		S3	5	4
Northern pygmy owl	Bird	y	y	y	y			G5		S?	4	4

Table 369. Animal Species Evaluated for Viability Concerns (Species of Concern)

Common Name	Taxon	ANF	CNF	LPNF	SBNF	Fed Status	CA Status	Global rank	Subspecies rank	State rank	Hab Grp	FS Threat Cat
Northern saw-whet owl	Bird	y	y	y	y			G5		S?	5	4
Olive-sided flycatcher	Bird	y	y	y	y			G4		S4	5.2	3
Osprey	Bird	y	y	y	y		SSC	G5		S3	14	2
Pinyon jay	Bird	p		y	y			G5		S5	8	4
Plumbeus vireo (solitary)	Bird	y			y			G5		S?	8	4
Prairie falcon	Bird	y	y	y	y		SSC	G5		S3	16.1	5
Purple martin	Bird	y	y	y	y		SSC	G5		S3	4	5
San Diego cactus wren	Bird	y	p		h/p	S	SSC	G5	T2?Q	S2?	3.1	2
Sharp-shinned hawk	Bird	y	y	y	y		SSC	G5		S3	5	4
Southern California rufous-crowned sparrow	Bird	y	y	y	y		SSC	G5	T2/4	S2/3	3.1	3
Southern white-headed woodpecker	Bird	y	y	y	y			G5	T2/4	S2/3	5	3
Southwestern willow flycatcher	Bird	y	y	y	y	FE		G5	T1/2	S1	1.1	5
Summer tanager	Bird	y	t		t		SSC	G5		S2	18	4
Swainson's hawk	Bird	p	t	p	t	S	CT	G4		S2	19	2
Swainson's thrush	Bird	y	y	y	y			G5		S4	1.1	5
Tree swallow	Bird	y	y	y	y			G5		S5	1	4
Turkey vulture	Bird	y	y	y	y			G5		S5	16	5
Vaux’s swift	Bird	t			t		SSC	G5		S3	4	2
Virginia's warbler	Bird	y	t	t	y		SSC	G5		S2/3	5	4
Warbling vireo	Bird	y	y	y	y			G5		S4	1	4
Western screech owl	Bird	y	y	y	y			G5		S?	2	3
Western snowy plover	Bird			y		FT	SSC	G4	T3	S2	6	5
Western yellow-billed cuckoo	Bird	p	p	p	p	FC-S	CE	G5	T3	S1	1.1	1
Wild turkey	Bird	y	y	y	y			G5		S?	4	3
Williamson's sapsucker	Bird	y		y	y			G5		S3	5.3	4
Wilson's warbler	Bird	y	y	y	y			G5		S?	1.2	5
Yellow warbler	Bird	y	y	y	y		SSC	G5	T3?	S2	1.1	3
Yellow-billed magpie	Bird			y				G5		S5	2	4
Yellow-breasted chat	Bird	y	y	y	y		SSC	G5		S3	1.1	5

Table 369. Animal Species Evaluated for Viability Concerns (Species of Concern)													
Common Name	Taxon	ANF	CNF	LPNF	SBNF	Fed Status	CA Status	Global rank	Subspecies rank	State rank	Hab Grp	FS Threat Cat
Zone-tailed hawk	Bird		y		y			G4		NR	8	4
Arroyo chub	Fish	y	y	y	y	S	SSC	G2		S2	1.3	5
Mohave tui chub (only hybrid population on forest)	Fish				y	FE	CE	G4	T1	S1	1.3	1
Pacific lamprey	Fish		h/p	y				G5		S?	1.3	5
Partially-armored threespine stickleback	Fish	y	y	y	y	S		G5			1.3	5
Rainbow trout	Fish	y	y	y	y			G5		S5	1.3	3
Santa Ana speckled dace	Fish	y	y	y	y	S	SSC	G5	T1	S1	1.3	5
Santa Ana sucker	Fish	y	h	y	h/p	FT	SSC	G1		S1	1.3	5
Southern steelhead (southern ESU)	Fish	h	y		h	FE	SSC	G5		S2	1.3	5
Southern steelhead (south-central ESU)	Fish			y		FT	SSC	G5		S2	1.3	5
Tidewater goby	Fish			p		FE	SSC	G3		S2/3	1.3	1
Unarmored threespine Shay Creek stickleback	Fish				y	FE		G5	T1	S1	1.3	4
Unarmored threespine stickleback	Fish	y				FE	CE	G5	T1	S1	1.3	5
Andrew's marble butterfly	Invert				y			G3/4	T1	S1	5	4
August checkerspot butterfly	Invert				y			G5	T3/4	?	5	4
Bicolor rainbeetle	Invert				y			?		?	5.1	4
Bright blue copper butterfly	Invert			y				G5	T1/2	?	8	2
California diplectronan caddisfly	Invert	y			y			G1/3		S1/3	1.3	5
Clemence's silverspot butterfly	Invert			y				G1/2	T1/2	S?	3	4
Conservancy fairy shrimp	Invert					FE		G1		S1	15	4
Dammer's blue butterfly	Invert				y			G5	?	?	8	4
Arrastre Creek blue butterfly (near *dammersi* ssp.) (in Dammer’s blue butterfly account)	Invert				y			G5	?	?	5	4
Baldwin Lake blue butterfly (near *dammersi* ssp.) (in Dammer’s blue butterfly account)	Invert				y			G5	?	?	11	5
Desert monkey grasshopper	Invert				y			G1/2		S1/2	8	5
Dorhn's elegant eucnemid beetle	Invert	y			y			GH		SH	5.1	4
Doudoroff's elfin butterfly	Invert			y				G4	T1/2	?	4	4
Erlich's checkerspot butterfly	Invert				y			G5	T1	?	11	5

Table 369. Animal Species Evaluated for Viability Concerns (Species of Concern)

Common Name	Taxon	ANF	CNF	LPNF	SBNF	Fed Status	CA Status	Global rank	Subspecies rank	State rank	Hab Grp	FS Threat Cat
Greenest tiger beetle	Invert				p			G5	T1	S1	1.1	2
Harbison’s dun skipper	Invert		y					G5	T1	S1	1	5
Hermes copper butterfly	Invert		y					G1/2		S1/2	3	5
Laguna Mountains skipper	Invert		y			FE		G5	T1	S1	13	5
Longhorn fairy shrimp	Invert			p		FE		G1		S1	15	1
Pratt's blue butterfly	Invert				y			G5	T1/2	?	3	4
Quino checkerspot butterfly	Invert	p	h/p		y	FE		G5	T1	S1	3	5
San Bernardino Mountains silk moth	Invert				y			G1/2		S1/2	8	4
San Diego fairy shrimp	Invert		p			FE		G1		S1	15	1
San Emigdio blue butterfly	Invert	p		y				G2/3		S2/3	8	4
San Gabriel Mountains elfin	Invert	y			y			G3/4	T1/2	S1/2	4	5
San Gabriel Mts. greenish blue	Invert	p						G5	T1	S1	13	2
Smith’s blue butterfly	Invert			y		FE		G5	T1/2	S1/2	3.1	4
Thorne’s hairstreak butterfly	Invert		p					G1		S1	9	2
Vernal blue butterfly	Invert				y			G2/3	T1	?	11	5
Vernal pool fairy shrimp	Invert		p	p		FT		G2/3		S2/3	15	4
American badger	Mammal	y	y	y	y		SSC	G5		S4	16	6
Black bear	Mammal	y		y	y			G5		S5	16	3
California chipmunk	Mammal				y			G4		S3/4	16	4
California leaf-nosed bat	Mammal		p		p	S	SSC	G4		S2/3	18	1
Coachella Valley round-tailed ground squirrel	Mammal				p	FC		G5	T1/2	S1/2	18	1
Fringed myotis	Mammal	y	y	y	y			G4/5		S4	5	4
Giant kangaroo rat	Mammal			p		FE	CE	G2		S2	17.2	2
Golden-mantled ground squirrel	Mammal				y			G5	T1	S1	5	4
Lodgepole chipmunk	Mammal	y			y			G5	T3?	S3?	5.3	4
Long-eared myotis	Mammal	y	y	y	y			G5		S4?	5	4
Long-legged myotis	Mammal	y	y	y	y			G5		S4?	5	4
Los Angeles pocket mouse	Mammal	p			p	S	SSC	G5	T1?	S1?	17.1	2
Mohave ground squirrel	Mammal	p			p		CT	G2?		S2?	18	2

Table 369. Animal Species Evaluated for Viability Concerns (Species of Concern)												
Common Name	Taxon	ANF	CNF	LPNF	SBNF	Fed Status	CA Status	Global rank	Subspecies rank	State rank	Hab Grp	FS Threat Cat
Monterey dusky-footed woodrat	Mammal			y			SSC	G5	T3?	S3?	4	4
Mount Pinos lodgepole chipmunk	Mammal			y		S		G4	T1/3	S1/3	5.3	4
Mountain lion	Mammal	y	y	y	y			G5		S5	16	6
Mule deer	Mammal	y	y	y	y			G5		S5	16	3
Nelson’s bighorn sheep	Mammal	y		y	y	S*		G4	T4	S3	16	5
Pallid bat	Mammal	y	y	y	y	S	SSC	G4	T4	S2/3	16.2	4
Peninsular bighorn sheep	Mammal				y	FE	CT	G4	T4	S1	8	5
Porcupine	Mammal	h/p			y			G5		S3/4	5	4
Ringtail	Mammal	y	y	y	y			G5		S3/4	1	3
San Bernardino dusky shrew	Mammal	y			y			G5	?	?	1.2	3
San Bernardino flying squirrel	Mammal				y	S	SSC	G5	T3?	S3?	5	5
San Bernardino kangaroo rat	Mammal	p			y	FE	SSC	G5	T1	S1	17.3	5
San Bernardino white-eared pocket mouse	Mammal	p			h/p	S	SSC	G1/2	TH	SH	5.1	4
San Diego black-tailed jackrabbit	Mammal	h/p	p		y		SSC	G5	T3	S3?	17.1	4
San Diego desert woodrat	Mammal	y	y	y	y		SSC	G5	T3?	S3?	8	4
San Diego pocket mouse	Mammal	y	y		y		SSC	G5	T3	S2/3	3	4
San Joaquin antelope squirrel	Mammal			p			CT	G2		S2	17.2	2
San Joaquin kit fox	Mammal			t		FE	CT	G4	T2/3	S2/3	17.2	2
Southern sea otter	Mammal			y		FT		G4	T2	S2	6	4
Spotted bat	Mammal	y	y	y	y		SSC	G4		S2/3	16.1	4
Stellar's sea lion	Mammal			y		FT		G3		S2	6	4
Stephens' kangaroo rat	Mammal		y		p	FE	CT	G2		S2	17.1	4
Tehachapi white-eared pocket mouse	Mammal	h/p		y		S	SSC	G1/2	T1/2	S1/2	8	4
Townsend's big-eared bat	Mammal	y	y	y	y	S	SSC	G4	T3/4	S2/3	16.2	5
Tule elk	Mammal			y				G5	T3	S?	15	4
Western mastiff bat	Mammal	y	y	y	y		SSC	G5		S3?	16.1	3
Western red bat	Mammal		y	y	p	S	SSC	G5		S?	1	4
Western small-footed myotis	Mammal	y	y	y	y			G5		S?	16.2	3
Western spotted skunk	Mammal	y	y	y	y			G5			16	4

Table 369. Animal Species Evaluated for Viability Concerns (Species of Concern)

Common Name	Taxon	ANF	CNF	LPNF	SBNF	Fed Status	CA Status	Global rank	Subspecies rank	State rank	Hab Grp	FS Threat Cat
Wild burro	Mammal				y						8	4
Wild horse	Mammal			y							2	4
Wild pig	Mammal	p		y	y			G5		S?	16	3
Yuma myotis	Mammal	y	y	y	y			G5		S4?	16.2	3
Belding's orange-throated whiptail	Reptile		y		y		SSC	G5	T2	S2	3.1	5
Black-tailed brush lizard	Reptile		p					G5		S3	8	2
Blunt-nosed leopard lizard	Reptile			p		FE	CE	G1		S1	17.2	4
California legless lizard	Reptile	y	y	y	y	S	SSC	G3/4	T2/4Q	S2/3	16	4
Coast horned lizard	Reptile	y		y		S	SSC	G4	T3/4	S3/4	3	3
Coast mountain kingsnake	Reptile	y		y				G4/5			5	3
Coast patch-nosed snake	Reptile	y	y	y	y		SSC	G5	G3	S2/3	3	3
Coastal rosy boa	Reptile	y	y		y	S		G4/5		S3/4	3	4
Coronado skink	Reptile		y		y		SSC	G5	T2/3Q	S1/2	16	3
Desert tortoise	Reptile	p			p	FT	CT	G4		S2	18	4
Mountain garter snake	Reptile				y			G5			5	5
Red diamond rattlesnake	Reptile		y		y		SSC	G4		S3	3	3
San Bernardino mountain kingsnake	Reptile	y			y	S	SSC	G4/5	T2/3	S2?	5	3
San Bernardino ringneck snake	Reptile	y	p		y	S		G5	T2/3	S2?	16	3
San Diego horned lizard	Reptile	y	y	y	y	S	SSC	G4		S3/4	16	3
San Diego mountain kingsnake	Reptile		y			S	SSC	G4/5	T1/2	S1/2	5	3
San Diego ringneck snake	Reptile		y		y	S		G5	T2/3	S2?	16	3
South coast red-sided garter snake	Reptile		p	p	p			G5	T1/2	S1/2	1.1	2
Southern Pacific pond turtle	Reptile	y	y	y	y	S	SSC	G3/4	T2/3Q	S2	1.1	5
Southern rubber boa	Reptile				y	S	CT	G5	T2/3	S2/3	5.1	5
Southern sagebrush lizard	Reptile	y	y	y	y			G5			5	4
Two-striped garter snake	Reptile	y	y	y	y	S	SSC	G2/3		S2	1.3	3
Western sagebrush lizard	Reptile			y				G5			4	4

Total 196

S*=Only the San Gabriel population of Nelson’s bighorn sheep is considered Sensitive

Table 370. Animal Species-At-Risk

Please see Table 467, Key to Codes Frequently Used in Biodiversity Tables, on page **131**

Table 370. Animal Species-At-Risk							
Species	**Forest Distribution**	**Taxon**	**Fed Status**	**Heritage Rank**	**Habitat Group**	**Threats**	**Threat Category**
Arroyo toad	A, C, L, S	Amphib	FE	G2/3 S2/3	1.3	Diversion or groundwater extraction, recreational collecting and damage to eggs, roads, crossings, campgrounds, nonnative plants, unauthorized OHV, grazing, suction dredging, prospecting	6
California red-legged frog	A, L	Amphib	FT	G4 T2/3 S2/3	1.3	Grazing, water diversion/extraction, campgrounds and roads, waterplay, disease spread from surveys	5
Coast range newt	A, C, L, Ps	Amphib		T5 T? S3	1.3	Groundwater extraction, water diversion or pollution, recreation and roads in riparian areas, water release	5
Mountain yellow-legged frog	A, S	Amphib	FE	G2/3 S3	1.3	Recreation use in streams, waterplay, roads and trails, water diversion or extraction, recreation facilities, small scale mining and prospecting	5
Western spadefoot	pA, C, L, S	Amphib		G3 S3?	17	Roads, lack of connectivity to valley open space, hydrologic changes	5
American dipper	A, pC, L, S	Bird		G5 S5	1.2	High levels of summer recreation use on major rivers	5
Bald eagle	S	Bird	FT	G4 S2	14	Recreational use, OHV use, wildfire	5
Black swift	A, pC, pL, S	Bird		G4 S2	1	Waterfall related recreation	5
California condor	A, L, S	Bird	FE	G1 S1	16.1	Communication and utility facilities, harassment at cliffs, lead, shooting	5
California spotted owl	A, C, L, S	Bird	S	G3 T3 S3	4	Wildfire, fuels treatment, ski area expansion	6
Calliope hummingbird	A, pC, L, S	Bird		G5 S4	13	Recreation and other meadow disturbance	5
Coastal California gnatcatcher	C, pL, pS	Bird	FT	G3 S2	3.1	Fire suppression, habitat fragmentation, grazing	5
Common yellowthroat	A, C, L, S	Bird		G5 S3	1.1	Dewatering, recreation use, grazing	5
Flammulated owl	A, C, L, S	Bird		G4 S?	5.1	Lack of natural fire return intervals in conifer stands	5

Table 370. Animal Species-At-Risk

Species	Forest Distribution	Taxon	Fed Status	Heritage Rank	Habitat Group	Threats	Threat Category
Golden eagle	A, C, L, S	Bird		G5 S3	16.1	Development of valleys, human use of cliffs for climbing, shooting, lead	5
Least Bell's vireo	pA, C, L, S	Bird	FE	G5 T2/3 S2	1.1	Grazing, special uses, recreation	5
Lincoln's sparrow	A, L, S	Bird		G5 S?	13	Wet meadow activities	5
Long-eared owl	A, C, L, S	Bird		G5 S3	2	Riparian and oak woodland degradation from activities and recreation use.	5
MacGillivray's warbler	A, C, pL, S	Bird		G5 S?	13.1	Wet meadow and riparian area activities	5
Prairie falcon	A, C, L, S	Bird		G5 S3	16.1	Cliff climbing recreation	5
Purple martin	A, C, L, S	Bird		G5 S3	4	Loss of bigcone Douglas-fir to wildfire, loss of large snags to fuelwood harvest and fuels management	5
Southwestern willow flycatcher	A, C, L, S	Bird	FE	G5 T1/2 S1	1.1	Intensive recreation use, wildfire, grazing, special uses, OHVs, roads, water diversion	5
Swainson's thrush	A, C, L, S	Bird		G5 S4	1.1	Intensive recreation use, wildfire, grazing, OHVs, roads, water diversion	5
Turkey vulture	A, C, L, S	Bird		G5 S5	16	Harassment at nesting locations climbing on cliffs, shooting, lead	5
Western snowy plover	pL	Bird	FT	G4 T3 S2	6	Dispersed recreation	5
Wilson's warbler	A, C, L, S	Bird		G5 S?	1.2	Intensive recreation use, wildfire, grazing, OHVs, roads, water diversion.	5
Yellow-breasted chat	A, C, L, S	Bird		G5 S3	1.1	Dewatering, recreation use, grazing	5
Arroyo chub	A, C, L, S	Fish	S	SG2 S2	1.3	Activities in or adjacent to streams, especially roads, SUP water uses (diversions, extraction), recreation facilities	5
Pacific lamprey	pC, L	Fish		G5 S?	1.3	Activities in or adjacent to streams, especially roads, SUP water uses (diversions, extraction)	5
Partially-armored three-spine stickleback	A, C, L, S	Fish	S	G5	1.3	Activities in or adjacent to streams, especially roads, SUP water uses (diversions, extraction)	5

Table 370. Animal Species-At-Risk

Species	Forest Distribution	Taxon	Fed Status	Heritage Rank	Habitat Group	Threats	Threat Category
Santa Ana speckled dace	A, C, L, S	Fish	S	G5 T1 S1	1.3	Activities in or adjacent to streams, especially roads, SUP water uses (diversions, extraction)	5
Santa Ana sucker	A, pC, L, pS	Fish	FT	G1 S1	1.3	Activities in or adjacent to streams, especially roads, SUP water uses (diversions, extraction), recreation facilities	5
Southern steelhead (southern ESU)	C	Fish	FE	G5 S2	1.3	Water use SUPs, diversions & FERC projects, roads/trails within 1/4 mi of streams, road stream crossings, recreation in riparian areas, fuel treatments, amount of OHV and dispersed and developed recreation within riparian area, grazing	5
Southern steelhead (south-central ESU)	L	Fish	FT	G5 S2	1.3	Water use SUPs, diversions & FERC projects, roads/trails within 1/4 mi of streams, road stream crossings, recreation in riparian areas, fuel treatments, amount of OHV and dispersed and developed recreation within riparian area, grazing	5
Unarmored three-spine stickleback	A, S	Fish	FE	G5 T1 S1	1.3	Low population	5
California diplectronan caddisfly	A, S	Invert		?	1.3	Water play activities	5
Baldwin Lake blue butterfly (near *dammersi* ssp.)	S	Invert		G5 T? S?	11	General threats to pebble plains (illegal OHV, recreation)	5
Desert monkey grasshopper	S	Invert		G1/3 S1/2	8	Too-frequent fire due to cheatgrass invasion; unauthorized off-road vehicle activity	5
Erlich's checkerspot butterfly	S	Invert		G5	11	Recreation activity in pebble plains	5
Harbison’s dun skipper	C	Invert		G5 T1 S1	1	Water withdrawal at low elevation springs and seeps, grazing (could affect larval host plant)	5
Hermes copper butterfly	C	Invert		G1/2 S1/2	3	Prescribed fire or fuel reduction projects in habitat (affecting host plant, *Rhamnus crocea*)	5
Laguna Mountains skipper	C	Invert	FE	G5 T1 S1	13	Grazing, recreation activity	5

Table 370. Animal Species-At-Risk

Species	Forest Distribution	Taxon	Fed Status	Heritage Rank	Habitat Group	Threats	Threat Category
Quino checkerspot butterfly	C, S	Invert	FE	G5 T1 S1	3	Ground disturbance that increases nonnative grass at expense of larval food plants	5
San Gabriel Mountains elfin	S	Invert		G1/2 S1/2	4	Main threat appears to be from butterfly collectors	5
Vernal blue butterfly	S	Invert		G5 T? S?	11	Plant collection; unauthorized insect collection; unauthorized OHV activity; unauthorized grazing	5
American badger	Pa, C, L, S	Mammal		G5 S4	16	Habitat fragmentation, lack of connectivity	6
Mountain lion	A, C, L, S	Mammal		G5 S5	16	Habitat fragmentation, road density, low prey density (mule deer and bighorn sheep)	6
Nelson’s bighorn sheep	A, L, S	Mammal	S	G4 T4 S3	16	Dispersed recreation, low population, vegetation management (lack of fire in chaparral)	5
Peninsular bighorn sheep	S	Mammal	FE	G4 T4 S1	8	Grazing, recreation use, lack of fire in chaparral/scrub	5
San Bernardino flying squirrel	S	Mammal	S	G5 T3? S3?	5	Fuels treatment	5
San Bernardino kangaroo rat	S	Mammal	FE	G5 T1 S1	17.3	Ability to enforce SUP requirements, new roads, flood control facilities	5
Townsend's big-eared bat	A, C, L, S	Mammal	S	G4 T3/4 S2/3	16.2	Activities, including dispersed recreation, around known mines or caves, cliffs, buildings	5
Belding's orange-throated whiptail	C, S	Reptile		G5 T2 S2	3.1	Fuels management in coastal sage scrub and conversion to annual grassland from fire	5
Mountain garter snake	S	Reptile		G5	5	Dewatering, human disturbance in meadows	5
Southern Pacific pond turtle	A, C, L, S	Reptile	S	G3/4 T2/3Q S2	1.1	Diversion or groundwater extraction, recreational collecting	5
Southern rubber boa	S	Reptile	S	G5 T2/3 S2/3	5.1	Fuels management and other ground disturbance, development, roads, motorized trails	5

Table 433. Management Indicator Species Selection and Monitoring Information

Issue	Habitat Type	MIS	Objectives	Monitoring Method	Measure
Vegetation diversity and age class mosaics; roads and recreation effects	All	Mule deer	Stable or increasing well-distributed populations	Herd composition in cooperation with CDFG; habitat condition	Trend in abundance and/or habitat condition
Landscape linkages; habitat fragmentation	All	Mountain lion	Functional landscape linkages; species well-distributed	Studies in cooperation with CDFG, USGS	Trend in distribution, movement and/or habitat conditions
Ground disturbance including trampling and compaction; spread of invasive nonnative species; mortality from collision; altered stream flow regimes	Aquatic and riparian habitats	Arroyo toad	Properly functioning streams; stable or increasing populations	Population abundance and/or habitat condition in selected locations	Trends in abundance, distribution, and/or habitat conditions
		Song sparrow	Stable or increasing populations; healthy riparian habitat	Riparian bird species point counts and/or habitat condition	Trend in abundance and/or habitat condition
Oak regeneration	Oak woodlands and savannas	Blue oak	Perpetuate habitat type	FIA data	Trend in sapling abundance
		Valley oak	Perpetuate habitat type	FIA data	Trend in sapling abundance
		Engelmann oak	Perpetuate habitat type	FIA data	Trend in sapling abundance
Drought/beetle-related mortality and lack of fire	Chaparral/ conifer ecotone	Coulter pine	Maintain Coulter pine habitat	FIA data; aerial photo-monitoring	Trend in age/size class distribution

Issue	Habitat Type	MIS	Objectives	Monitoring Method	Measure
Altered fire regimes (fire severity and/or fire return interval)	Chaparral/ conifer ecotone	Bigcone Douglas-fir	Maintain bigcone Douglas-fir stands	FIA data; photo-monitoring	Trend in extent of vegetation type
	Mixed conifer forests	California spotted owl	Maintain/increase numbers and distribution	FS Region 5, CDFG protocol	Occupied territories and/or habitat condition
		Black oak	Maintain or increase numbers	FIA data	Trend in abundance, size class distribution
		White fir	Pre-settlement age/size class distribution	FIA data	Trend in size class distribution

Mountain lion and mule deer monitoring needs to be conducted across land jurisdictions through interagency cooperation to be efficient and effective.
FIA: Forest Inventory and Analysis
CDFG: California Department of Fish and Game
USGS: United State Geological Survey

Table 463. Invasive Nonnative Plant Species

Please see Table 467, Key to Codes Frequently Used in Biodiversity Tables, page **131**

Table 463. Invasive Nonnative Plant Species									
Scientific Name	**Common Name**	**Habitat(s)**	**Distribution by Geographic Subdivison**	**CalEPPC pest listing**	**CDFA Pest Rating**	**ANF**	**CNF**	**LPNF**	**SBNF**
List A-1&2 Most Invasive									
Ammophila arenaria	European beach grass	Coastal dunes	SCo, CCo	A-1				A	
Ailanthus altissima	Tree of heaven	Riparian, grasslands, oak woodlands	CA-FP, SCo	A-2	C#	Y	Y * 10	Y	Y*
Arundo donax	Giant reed, arundo	Riparian	CCo, SCo, SnGb, D	A-1	C#	Y*	Y * 10	A	Y*
Atriplex semibaccata	Australian saltbush	SoCal, Coastal grasslands, scrub, coastal salt marshes	CA (except CaR, C&csSN)	A-2				Y	Y
Brassica tournefortii	African mustard	Washes, alkaline flats, disturbed areas in Sonoran Desert	SW, D	A-2					Y
Bromus madritensis ssp. rubens	Red brome	Scrub, desert scrub type conversions	CA	A-2		Y	Y 50000+	Y 400000	Y
Bromus tectorum	Cheat grass	Sagebrush, PJ, other	D	A-1		Y	Y 10000+	Y 1000000	Y*
Cardaria draba	White-top, hoary cress	Riparian, marshes of central coast, disturbed areas, grassland, scrub	CCo and others	A-2	B			Y 2000	
Carpobrotus edulis	Iceplant, sea fig	Coastal communities, dunes	SCo, CCo	A-1				Y	
Centaurea solstitialis	Yellow star thistle	Grasslands	CA-FP	A-1	C	Y	Y	Y	Y*
Conicosia pugioniformis	Narrow-leaved iceplant, roundleaf iceplant	Coastal dunes, sandy soils near coast, best documented in San Luis Obispo & Santa Barbara Co.	CCo	A-2					

Table 463. Invasive Nonnative Plant Species

Scientific Name	Common Name	Habitat(s)	Distribution by Geographic Subdivison	CalEPPC pest listing	CDFA Pest Rating	ANF	CNF	LPNF	SBNF
Cortaderia jubata	Andean pampas grass	Coastal habitats, disturbed sites	CCo,WTR, SCo	A-1	C#		Y 10	Y	
Cortaderia selloana	Pampas grass	Coastal dunes, scrub, Monterey pine forest, rip, grasslands, wetlands, serpentine	SCo, CCo	A-1				Y	Y*
Cotoneaster pannosus,C. lacteus	Cotoneaster	Coastal communities,Big Sur	CCo	A-2				Y	
Cynara cardunculus	Artichoke thistle	Coastal grasslands	CA-FP, esp. CCo, SCo	A-1	B		Y * 100	Y	
Cytisus scoparius	Scotch broom	Coastal scrub, oak woodlands	SCo, CW	A-1	C	Y		Y	
Ehrharta calycina	Veldt grass	Sandy soils, esp. dunes	CCo, SCoRO, WTR	A-2			A	Y	
Eichhornia crassipes	Water hyacinth	Waterways	SCo, PR	A-2					Y
Elaeagnus angustifolius	Russian olive	Interior riparian areas	DMoj	A-2			Y		Y
Eucalyptus globulus	Tasmanian blue gum	Riparian, grasslands	CCo, SCo	A-1			Y 100		Y
Ficus carica	Edible fig	Riparian woodlands	SCo	A-1			Y 25		Y
Foeniculum vulgare	Wild fennel	Grasslands	CA-FP, SCo	A-1			Y	Y	Y
Genista monspessulana =Cytisus monspessulana	French broom	Coastal scrub, oak woodlands, grasslands	CCo, SCoRO, WTR, PR	A-1	C			Y	
Lepidium latifolium	Perennial pepperweed,	Coastal inland marshes, riparian, wetlands, grasslands, potential to invade montane wetland	CA	A-1	B			Y	
Lupinus aboreus	Bush lupine	Native to SCo, invasive in Nco dunes	CCo, SCo	A2				Y-May be native on MRD	

Table 463. Invasive Nonnative Plant Species

Scientific Name	Common Name	Habitat(s)	Distribution by Geographic Subdivison	CalEPPC pest listing	CDFA Pest Rating	ANF	CNF	LPNF	SBNF
Myoporum laetum	Myoporum	Coastal riparian areas	SCo, CCo	A-1				Y	
Pennisetum setaceum	Fountain grass	Grasslands, dunes, desertcanyons, roadsides	CCo, SCo	A-1			Y	Y	A
Rubus discolor	Himalayan blackberry	Riparian marshes, oak woodlands	CA-FP	A-1			Y 500	Y	Y
Saponaria officinalis	Bouncing bet	Meadows, riparian	SCoRO, SCo, PR	A-2				Y	Y
Senecio mikanioides =Delairea odorata	Cape ivy, German ivy	Coastal, riparian, south side San Gab. Mts.	CCo, SCo, SW	A-1	C#	Y	Y	Y	
Taeniatherum caput-medusae	Medusa-head	Grasslands, poorly drained areas	SCo	A-1	C			Y	
Tamarix chinensis, T. gallica, T. parviflora T. ramosissima Note: T. chinensis and T. gallica are high potential, others are present	Tamarisk, salt cedar	Desert washes, riparian, seeps and springs	SCo,D, SCoRI, WTE	A-1	C#	Y	Y * 100	Y	Y*

Table 463. Invasive Nonnative Plant Species

Scientific Name	Common Name	Habitat(s)	Distribution by Geographic Subdivison	CalEPPC pest listing	CDFA Pest Rating	ANF	CNF	LPNF	SBNF
List B lesser invasives									
Ageratina adenophora	Eupatory	Coastal canyons, coastal scrub, slopes, Marin to San Diego County, San Gab. Mts.	CCo,	B					Y
Bassia hyssopifolia	Bassia	Alkaline habitats	CA	B					Y
Brassica nigra	Black mustard	Coastal, especially fogbelt grasslands, disturbed areas	CA-FP	B		Y	Y	Y	Y
Carduus pycnocephalus	Italian thistle	Grasslands, shrublands, oak woodlands	CW, SCo	B	C			Y	
Centaurea calcitrapa	Purple star thistle	Grasslands	CW, SW	B	B			Y	
Centaurea melitensis	Tocalote	Widespread, sometimes mis ID'd as C. solstitialis, perhaps a more serious invader than thought	CA-FP, D	B	C#		Y 5000+	Y	Y
Cirsium arvense	Canada thistle	Riparian areas	CA-FP	B	B		Y		
Cirsium vulgare	Bull thistle	Riparian, marshes, meadows	CA-FP	B	C#		Y	Y	Y
Conium maculatum	Poison hemlock	Riparian and oak understory, espanding in San Diego County	CA-FP	B			A?	Y	Y
Ehrharta erecta	Veldt grass	Wetlands, grasslands	CCo, SCo	B				Y	
Erechtites glomerata,E. minima	Australian fireweed	Coastal woodlands, scrub, NW forests especially redwoods	CCo, SCoRO	B				Y	
Festuca arundinacea	Tall fescue	Coastal scrub, grasslands NCo,CCo	CA-FP	B					Y
Hedera helix	English ivy	Coastal forests, riparian	CA-FP	B		Y	Y * 25		A Y?

Table 463. Invasive Nonnative Plant Species

Scientific Name	Common Name	Habitat(s)	Distribution by Geographic Subdivison	CalEPPC pest listing	CDFA Pest Rating	ANF	CNF	LPNF	SBNF
Holcus lanatus	Velvet grass	Coastal grasslands, wetlands in No. CA	CA exc. DSon	B				Y	Y
Olea europaea	Olive	Riparian in Santa Barbara, San Diego	CCo, SCo	B			Y* 100		A Y?
Phalaris aquatica	Harding grass	Coastal sites, moist soil	CCo, SCo	B			Y		Y
Potamogeton crispus	Curlyleaf pondweed	Ponds, lakes, streams	CCo, SCo, SnGb, SnBr, DMoj	B					Y
Ricinus communis	Castor bean	SoCal coastal riparian	SCo, CCo	B		Y	Y * 25		Y
Robinia pseudoacacia	Black locust	Riparian, canyons	CA-FP	B		Y	Y* 5	Y	Y
Schinus molle	Peruvian pepper tree	Riparian in San Diego	CW, PR	B			Y		Y
Schinus terebinthifolius	Brazilian pepper	Riparian areas	sSCo	B		Y			
Spartium junceum	Spanish broom	Coastal scrub, grasslands, wetlands, oak woodland, roadcuts	SCoRO, SCo, WTR	B	C#	Y	Y * 10	Y	Y*
Verbascum thapsus	Woolly mullein	Meadows, sagebrush, PJ woodlands	CA	B			Y		Y
Vinca major	Periwinkle	Riparian oak woodland,coastal hab.	CCo, sSCoRO, SCo	B		Y	Y * 25	Y	Y

Table 463. Invasive Nonnative Plant Species

Scientific Name	Common Name	Habitat(s)	Distribution by Geographic Subdivison	CalEPPC pest listing	CDFA Pest Rating	ANF	CNF	LPNF	SBNF
Red Alert: Potential to spread explosively									
Centaurea stoebe ssp. micranthos Formerly *C. maculosa*	Spotted knapweed	Riparian, grassland, wet meadows, forests,	nCW, sPR	Red alert	A	Y	A	A	Y
Hydrilla verticillata	Hydrilla	Noxious water weed	SCo, D	Red alert	A		A?		
Linaria genistifolia ssp. dalmatica	Dalmatian toad flax	Disturbed pastures, Big Bear Fire Station and Meadow	CA-FP		A		A?	Y*	Y*
Need more information									
Asphodelus fistulosus	Asphodel	SCo highways	SCo	Need info					A
Convolvulus arvensis Moved from Considered but not listed per M. Larder	Field bindweed	Disturbed sites, ag sites	Waterman Cyn						Y
Descurainia sophia	Tansy mustard	Mojave wildlands	CA	Need info				Y	Y
Dimorphotheca sinuata	African daisy, cape marigold	Invasive in W. Riverside, Ventura Co.	SCo, PR	Need info					Y
Echium candicans, E. pininana	Pride of Madeira Pride of Teneriffe	Riparian, grasslands, coastal sage scrub,	CcO, SCo	Need info			A?		
Euphorbia dendroides	spurge	Angeles National Forest	Not in Jepson			Y*			
Euphorbia lathyris	Gopher plant	Coastal scrub, marshes, dunes	CCo, SCo	Need info					Y
Gazania linearis	Gazania	Grassland, coastal scrub?	CCo, SCo	Need info			Y		
Hedera canariensis	Algerian ivy	Riparian in So. Cal	Not in Jepson	Need info		Y		Y	
Hirschfeldia incana	Mediterranean or Short pod mustard	w. and s. Mojave	CW, SCo, DMoj	Need info			Y	Y	

Table 463. Invasive Nonnative Plant Species									
Scientific Name	**Common Name**	**Habitat(s)**	**Distribution by Geographic Subdivison**	**CalEPPC pest listing**	**CDFA Pest Rating**	**ANF**	**CNF**	**LPNF**	**SBNF**
Hypochaeris radicata	Rough cat's ear	Coastal grasslands, wetlands	CW, SCo	Need info				Y	
Lathyrus latifolius and others	Perennial sweetpea	Invader in Big Bear, SBNF meadows, rip							Y*
Nicotiana glauca	Tree tobacco	Disturbed and in coastal scrub, chaparral	CW,SW, D	Need info		Y	Y 5000+	Y	Y
Oxalis pes-caprae	Bermuda buttercup	Disturbed habitats	CCo, SCoRO, SCo	Need info			Y	Y	A
Pennisetum clandestinum	Kikuyu grass	Disturbed sites, roadsides	CCo, SCo	Need info	C			Y	Y
Piptatherum miliaceum	Smilo grass	SoCal creeks, canyons	CW, SCo,	Need info				Y	A
Poa bulbosa		Conifer forest CNF at Garnet Peak, Coldbrook meadows on SBNF					Y 1000+	Y	Y
Prunus cerasifera	Cherry plum	Oak woodland, rip areas	CCo	Need info					N Y?
Pyracantha angustifolia	Pyracantha	Horticultural, spreads from seed from birds	CCo,SCo	Need info			Y		
Salsola tragus	Russian thistle, tumbleweed	w. Mojave desert, not limited to disturbed sites	CA	Need info	C	Y	Y	Y	Y
Salsola paulsenii may hybridize with *S. tragus)*	Barbwire Russian thistle, Tumbleweed	Limited to disturbed sites	WTR,DMoj		C				Y
Tribulus terrestris	Puncture vine	Dry disturbed areas, at 3000' w/interior live oak	CNF, Cameron Fire Station		C		Y		Y

Table 463. Invasive Nonnative Plant Species

Scientific Name	Common Name	Habitat(s)	Distribution by Geographic Subdivison	CalEPPC pest listing	CDFA Pest Rating	ANF	CNF	LPNF	SBNF
Annual Grasses that pose significant threats									
Avena barbata	Slender wild oat	Coastal slopes, coastal sage scrub, disturbed	CA-FP, DMoj				Y	Y	A Y?
Avena fatua	Wild oat	Coastal slopes, coastal sage scrub, disturbed	CA-FP, DMoj			Y	Y	Y	Y
Brachypodium distachyon	False brome	SoCal, common in Orange Co.	CW, SCo,				A?		
Bromus diandrus	Ripgut brome	Coastal dunes, coastal sage scrub, grasslands Add oak woodlands? See it with Q. kell. and Q. agrifolia	CA			Y	Y	Y	Y
Lolium multiflorum (also *Loilium perenne* and *Lolium temulentum* on SBNF)	Italian ryegrass	Wetlands, esp. vernal pools in San Diego Co. and disturbed sites	CA-FP			?	Y	Y	Y
Schismus barbatus	Mediterranean grass	Threat to Mojave and Colorado desert shrublands?	D				Y	Y	Y

Table 463. Invasive Nonnative Plant Species									
Scientific Name	Common Name	Habitat(s)	Distribution by Geographic Subdivison	CalEPPC pest listing	CDFA Pest Rating	ANF	CNF	LPNF	SBNF
Considered, but not listed									
Dipsacus sativus *D. fullonum*	Wild teasel. Fuller's teasel	Roadsides, disturbed sites	City Creek Fire Station on SBNF				Y		Y
Fumaria officinalis *F. parviflora*	Fumitory	Salt marshes, sandy disturbed sites	*F. parviflora* is in orchard in Banning near SBNF						A
Medicago polymorpha	California bur clover	Disturbed, grasslands and moist sites						Y	A
Melilotus officinalis *Melilotus alba*	Yellow sweet clover White sweet clover	Restricted to disturbed sites in CA	Both in Big Bear Valley of SBNF, LPNF			Y	Y Y	Y	Y * Y*
Nerium oleander	Oleander	Riparian areas in CV and San Bernardino Mts.	Waterman and Badger Cyns on SBNF			Y			Y
Picris echioides	Bristly ox-tongue	Disturbed sites	Lake Silverwood on SBNF				Y		Y
Silybum marianum	Milk thistle	Disturbed, overgrazed moist pasturelands, may interfere with restoration	Devil Cyn and mouth of Santa Ana River Cyn				Y	Y	A Y?
Xanthium spinosum	Spiny cocklebur	Native in Jepson and Munz, restricted to disturbed areas	Loma Linda and Mojave Desert				Y	Y	A

Table Key (Table 463 above)

California Exotic Pest Plan Council (CEPPC) List Categories

List A: Most Invasive Wildland Pest Plants; documented as aggressive invaders that displace natives and disrupt natural habitats. Includes two sub-lists; List A-1: Widespread pests that are invasive in more than 3 Jepson regions, and List A-2: Regional pests invasive in 3 or fewer Jepson regions

List B: Wildland Pest Plants of Lesser Invasiveness; invasive pest plants that spread less rapidly and cause a lesser degree of habitat disruption; may be widespread or regional.

Red Alert: Pest plants with potential to spread explosively; infestation currently small or localized. If found, alert Cal EPPC, County Agricultural Commissioner or California Department of Food and Agriculture.

Need More Information: Plants for which current information does not adequately describe nature of threat to wildlands, distribution or invasiveness. Further information is requested from knowledgeable observers.

Annual Grasses: A preliminary list of annual grasses, abundant and widespread in California, that pose significant threats to wildlands. Information is requested to support further definition of this category in next list edition.

Considered but Not Listed: Plants that, after review of status, do not appear to pose a significant threat to wildlands

California Dept. of Food and Agriculture Pest Ratings

All weeds on California’s 130 plus noxious weed list have a rating. The overall rating system is NOT based on how bad a weed is-all weeds are considered “bad”- but rather on overall distribution throughout the state. Ratings and formal definitions by the CDFA are:

A=rated weeds are normally limited in distribution throughout the state. Eradication, containment, rejection or other holding action at the state-county level. Quarantine interceptions to be rejected or threat at any point in the state.

B=rated weeds are more widespread. Eradication, containment, control or other holding action at the discretion of the commissioner. State endorsed holding action and eradication only when found in a nursery.

C=rated weeds are generally widespread throughout the state. Action to retard spread outside of nurseries at the discretion of the commissioner. Reject only when found in a cropseed for planting or at the discretion of the commissioner.

Q=rated species are treated as temporary “A” weeds. Denoting action outside nurseries at the state-county level pending determination of permanent rating.

D=rated weeds are organisms considered to be of little or no economic importance. No action. Anything not rated as “A”, “B”, “C”, or “”Q’ is given a “D” rating.

Forest Codes

ANF=Angeles National Forest; CNF=Cleveland National Forest; LPNF=Los Padres National Forest; SBNF=San Bernardino National Forest. Y= Present on forest (and estimated number of acres if provided). *= Forest is currently treating, in process of treating or has treated in past. A= adjacent or near Forest, reasonable to expect invasion on Forest lands within next 5 years. ?= plants are adjacent or near and highly likely to be present but not documented. #= plant added to CDFA noxious weed list 8/2003, pest rating not finalized but "C" rating expected. Numerical figures= approximate present acreage known, Numerical figures+=approximate present acreage and more

If highlighted text, eradication is planned, has occurred or is occurring at some location on Forest

Distributions by geographic subdivisions per the Jepson Manual

Ca=California, CA-FP=California Floristic Province, CCo=Central Coast, CW=Central Western California, D=Deserts, DSon=Sonoran Desert, PR=Peninsular Ranges, SCo=South Coast, SCoRI=Inner South Coast Ranges, SCoRo=Outer South Coast Ranges, SnGb=San Gabriel Mountains, SW=Southwestern California, WTR=Western Transverse Ranges GV=Great Central Valley-and SnJV-San Joaquin Valley, were not included even though a small portion of the LPNF occurs within this subdivison. Most of these subdivisions do not reflect what is on the LPNF. The LPNF has an active invasive plants program and on the ground knowledge was utilized instead.

This table was created using the California Exotic Pest Plant Council List: Exotic Pest Plants of Greatest Ecological Concern in California (CalEPPC 1999) as a template. From that list, only those plants within Jepson subdivisions of the Southern California National Forests Plan Revision planning area were included. The Southern California Mountains and Foothill Assessment (Stephenson and Calcarone 1999) boundary was used as the planning area boundary. Plants are listed, in order of most invasive categories as per Cal EPPC list (List A-1 and A-2 were combined) then alphabetically. "Potential pests" from list by Hrusa, Ertter, Sanders, Leppig, and Dean (Madrono 2002) not in Jepson within our planning area were included along with invasive plants on Forest Botanist's list of concern or that Forest's are currently eradicating. Ratings of plants designated as "noxious weeds" by the California Department of Food and Agriculture were added in a separate column. On 8/15/2003 the SBNF received information that the "noxious weed" list had been amended to include 11 species that we were tracking in this table and the ratings were added. A combination of Forest biologists and botanists, District biologists and personnel working in USFS invasive species programs provided information on known occurrences by Forest. The list was finalized on 08/16/2003. At this time, all species not known to occur or to be adjacent to Forests were removed from the table. The original table showing all species considered is available in the project file.

Table 464. Invasive Nonnative Animal Species

Please see Table 467, Key to Codes Frequently Used in Biodiversity Tables, on page **131**

Scientific Name	Common name	Threat Level	Native Species affected or other effects	ANF	CNF	LPNF	SBNF
Invertebrates							
Linepithema humile	Argentine ant	2	Native ants & species that eat ants, prey base for coast horned lizard & arroyo toad, plant seeds dispersed by native ants	Y	Y		Y
Procambarus clarkii	Lousiana crayfish	2	Native fish/amphibians	Y	Y		Y
Pacifastacus leniusculus	Pacific crayfish	3	Native fish/amphibians, insects,			Y	
Solenopsis invicta	Red imported fire ant	1	Small mammals, birds, humans	Y	Y		A
Apis mellifera scutellata	Africanized honey-bee	4	Native animals, humans	A	A		A
Apis melliferaspp.	European honey bee	3	Native bees	Y	Y		Y
Forficula auricularia	European earwig	3	Native vegetation	Y	Y		
Reptiles and amphibians							
Rana catesbeiana	Bullfrog	1	Native fish/amphibians	Y	Y	Y	Y
Xenopus laevis	African clawed frog	1	Native fish/amphibians	Y	A		
Chelydra serpentina	Snapping turtle	4	Native fish/amphibians	Y			Y
Chrysemys picta, C. scripta	Red-eared slider, painted turtle	4	Native fish/amphibians	Y	Y	Y	Y
Fish							
Lepomis spp.	Green sunfish, bluegill, pumpkinseed	1	Native fish/amphibians, insects	Y	Y	Y	Y
Micropterus spp.	Largemouth and smallmouth bass	1	Native fish/amphibians	Y	Y	Y	Y
Cyprinella lutrensis	Red shiner	1	Native fish/amphibians	Y			A
Carrasius auratus	Goldfish	2	Native fish/amphibians	Y	Y	Y	Y
Cyprinus carpio	Carp	2	Native fish/amphibians	Y		Y	Y
Pimephales promelas	Fathead minnow	2	Native fish/amphibians				Y

Table 464. Invasive Nonnative Animal Species

Scientific Name	Common name	Threat Level	Native Species affected or other effects	ANF	CNF	LPNF	SBNF
Ameiurus (Ictalurus)melas	Black bullhead catfish	1	Native fish/amphibians, insects	Y	Y	Y	Y
Ictalurus punctatus	Channel catfish	3	Native fish/amphibians	Y	Y		Y
Gambusia afinis	Mosquitofish	1	Native fish/amphibians, insects	Y	Y	Y	Y
Oncorhynchus mykiss	Rainbow trout (stocked)	1,3	Native fish/amphibians	Y	Y	Y	Y
Salmo trutta	German brown trout	1	Native fish/amphibians	Y			Y
Mammals							
Rattus rattus, R. norvehicus	Black rat, Norway rat	3	Woodrats, mice			Y	Y
Sus scrofa	European boar, feral pig	2	Disrupts habitat, eats many species		Y	Y	Y
Vulpes fulva	Red fox	1	Small ground dwelling native species				Y
Castor Canadensis	Beaver	1	Native vegetation			Y	Y
Felis domesticus	Feral cat	2	Native birds, reptiles	Y	Y	Y	Y
Canis familiaris	Feral dog	1	Big horn sheep, deer				
Equus cabullus	Feral horse	2	Big horn sheep			Y	A
Equus asinus	Feral burro	2	Deer				Y
Bos taurus	Feral cattle	1	Riparian habitats, desert tortoise	?	?	?	Y
Didelphus virginiana	Opossum	3,4	Native vegetation and animals		Y	Y	Y
Birds							
Molothrus ater	Brown-headed cowbird	1	Riparian dependent birds	Y	Y	Y	Y
Sternus vulgaris	European starling	1	Cavity nesting birds	Y	Y	Y	Y
Bibulus ibis	Cattle egret	3			A		Y
Meleagris gallopavo	Wild turkey	2	Native vegetation		Y	Y	Y
Passer domesticus	House sparrow	2	Native birds	Y	Y	Y	Y
Columba livia	Rock dove feral pigeon	2	Native birds	Y	Y	Y	Y

(Modified slightly from Dudley and Collins in Stephenson and Calcarone 1999)
Threat Level
1- serious, documented threat to sensitive species or ecosystems;
2-moderate threat to native species or ecosystems;
3-benign, low risk;
4-potential threat, but impacts not well documented.

Species with multiple threat levels are considered a threat in some areas, but not a problem in other areas.
If highlighted text, eradication is planned, has occurred or is occurring at some location on Forest;
A=Adjacent to forest, reasonable to expect to invade Forest ecosystems within next 5 years.

Invasive Nonnative Species

Invasive nonnative species are animal and plant species with an extraordinary capacity for multiplication and spread at the expense of native species. They are introduced into an area in which they did not evolve and in which they have few or no natural enemies to limit their reproduction and spread. These species can cause environmental harm by significantly changing ecosystem composition, structure or function, and they can cause economic harm or harm to human health (Clinton 1999, Executive Order 13112-Invasive Species). They are known to prey upon, consume, harm or displace native species. Across the nation, the spread of invasive plants, animals and pathogens is considered to be one of the most serious ecological problems, second only to habitat destruction (U.S. Department of Interior 2002). Reducing impacts from invasive species is one of the priority strategic goals for the USDA Forest Service for 2003 through 2008. Recently, efforts to prevent, control and eradicate these species have increased, and more emphasis has been given to the management of invasive nonnative animals and plants at the county, state and federal levels. Education efforts are beginning to expand in cooperation with state and county partnerships.

Many invasive nonnative species are well established on the national forests and are difficult to control or eradicate. Some species (such as bullfrogs, starlings, arundo, cheatgrass and black mustard) are so prevalent they may always persist. A continuing threat is the potential for introduction of new invasive species and the spread of those that are currently present. Mosquitofish (*Gambusia afinis*) and sport fishing species continue to be introduced into aquatic habitats in many parts of southern California. Products used on the national forests can also provide sources of infestation. The movement of humans, vehicles, equipment, boats, livestock, wildlife, wind and water can spread seed and reproductive plant parts. Aquatic species in southern California continue to be spread by the flooding of irrigation canals and ditches.

The presence of urban communities within and adjacent to the national forests and lands under special-use permit also contribute to the introduction and spread of invasive nonnative species. Feral cats and dogs (descendants of domestic house pets abandoned on the national forests) prey on native wildlife. Noxious weeds such as Spanish broom (*Spartium junceum*) and pampas grass (*Cortaderia selloana*) used in urban landscaping often become established on nearby National Forest System lands. English ivy (*Hedera helix*), bigleaf periwinkle (*Vinca major*), and Spanish broom grown at recreational residence cabins under special-use permit also displace native vegetation and reduce native vegetation used by wildlife. Invasive nonnative plants occur in higher densities along roadways; in areas disturbed by off-road driving, livestock and fuel treatments; in campgrounds; along recreation trails and at trailheads; in utility corridors and fuelbreaks; and in aquatic habitats modified by dams and diversions.

Animals

In a survey of non-indigenous species of the South Coast Bioregion, Dudley and Collins (1995, cited in Stephenson and Calcarone 1999) concluded that the region was particularly hard-hit and had more nonnative species than any other California bioregion.

Table 464: Invasive Nonnative Animal Species lists the 38 principal invasive nonnative animals and their threat levels believed by Forest Service biologists to be the most problematic on the southern California national forests. Surveys completed by the four southern California national forests are limited in extent, but information from U.S. Geological Survey and university surveys contributes to our knowledge of where these species occur. The list will change as new invasive species arrive in southern California and new information becomes available.

Appendix C (Integrated Invasive Animal and Plant Control on the National Forests of Southern California 2003) describes the integrated invasive nonnative animal management activities conducted in 2003 on each southern California national forest. To date, the national forests have primarily concentrated on removal of bullfrogs, brown-headed cowbirds, and nonnative fish. Species that are currently being eradicated or have been removed in the past are shown in table 464. Prevention, education and eradication program efforts are beginning to expand.

Plants

A noxious weed is a plant that has been designated as a pest by law or regulation. Both California and the U.S. federal government maintain lists of plants that are considered threats to the well being of the state or country. The two lists differ significantly. In California, plants that are troublesome, aggressive, intrusive, detrimental or destructive to agriculture, silviculture or important native species and are difficult to control or eradicate are designated as noxious weeds. Invasive nonnative plants that affect national forest ecosystems may or may not be designated noxious weeds.

The same conditions of topography, geology and climate that give rise to California's unusual biological diversity also provide suitable habitat for a wide variety of nonnative plant species (Bossard and others 2000). Ninety-nine species of invasive nonnative plants that are on lists maintained by the California Exotic Pest Council (Cal EPPC 1999) are found in or near the southern California national forests (table 463: Invasive Nonnative Plant Species, page 179). These 99 species are believed by Forest Service botanists, range managers and cooperating agencies to pose threats to southern California ecosystems. Twenty-eight of these nonnative plants are on the California Department of Food and Agriculture noxious weed list (California Department of Food and Agriculture 2000).

The nonnative plant species displayed in table 463: Invasive Nonnative Plant Species vary in their degree of invasiveness and competitiveness; therefore, different species warrant different levels of management concern. Although all of these plants outcompete native plants, compromising biodiversity; some species (such as cheatgrass and black mustard) are so widespread that extensive programs of eradication would not be practical.

Appendix C (Integrated Invasive Animal and Plant Control on the National Forests of Southern California 2003) describes the integrated invasive nonnative plant management activities conducted in 2003 on each southern California national forest. Inventory, prevention, education and eradication efforts are beginning to expand. To date, the national forests have primarily concentrated on treatment of areas infested with arundo, tamarisk, Spanish and French brooms, pampas grass, yellow and purple star-thistles, Dalmatian toad flax, artichoke thistle, Italian thistle, Cape ivy, tree-of-heaven, *Euphorbia dendroides* and sweet clover. Species that are currently being eradicated or have been removed in the past are also shown in table 463 (page 179).

Habitats At High Risk of Degradation by Invasive Species

Invasive nonnative species are ecological indicators whose presence is a warning of an ecosystem potentially in decline. In many situations, invasive species are the symptoms, not the cause, of decline. When the cause is not remedied, populations of invasive species typically increase, resulting in further ecosystem degradation.

Based upon the Weed Risk Assessment for the forest plan revision (in Appendix C), riparian communities, chaparral, coastal sage scrub, desert woodland and scrub, Monterey coastal communities, montane conifer forests, and oak savannas are ecosystems in decline as a result of previous human disturbances, natural processes, or lack of natural processes. These vegetation communities are currently affected by invasive species, have a high probability of being affected by the proposed action, or both.

Riparian Communities

Riparian ecosystems are among the most susceptible to invasion by nonnative species. In many southern California streams, native plants and animals were adapted to a dynamic equilibrium, which included flood disturbance, that maintained diverse structure, age classes, and community composition. Today, development, dams, water diversions, groundwater extraction, stream channelization, grazing, roads, and recreation use have modified many of these streams and created conditions that favor some of the most aggressive invasive species (DeLoach and others 2000). Humans have either accidentally or deliberately introduced most of the invasive species that are present.

Arundo (*Arundo donax*) has been documented in 50 drainages within the planning area, with the highest concentrations on the Angeles National Forest and downstream of the planning area in the coastal basins (Stephenson and Calcarone 1999). It consumes large quantities of water, forms monocultures of dense, highly flammable thickets that clog water channels, and displaces native riparian vegetation. Arundo degrades habitat for three endangered bird species and for a variety of aquatic species, including steelhead trout.

Tamarisk *(Tamarix racemosa, T. parviflora, T. gallica, and T. chinensis*) has been documented in at least 60 foothill and desert streams in the planning area (Stephenson and Calcarone 1999). Although it inhabits disturbed locations, tamarisk also invades locations not regulated by dams or affected by grazing. Its deep roots enable it to extract water from great depths and to grow farther back on the bank than other riparian species. Tamarisk tolerates salt levels of 18,000 to 36,000 ppm (salt tolerance of cottonwood and willows is 1,500 to 2,000 ppm) and excretes salt in leaves that fall and accumulate on the ground, preventing growth of native vegetation (DeLoach and others 2000). The large water usage of tamarisk (200 gallons per day) contributes to a lowering of water tables that can cause springs to dry up and permanent streams to become intermittent. Over time, high salt concentration and reduced water levels result in tamarisk thickets that preclude re-establishment of native species. Stephenson and Calcarone (1999) list primary watersheds where arundo and tamarisk are present.

Invasive animal species present in streams and ponds throughout southern California national forests that cause the greatest harm include bullfrogs (*Rana catesbeiana*), African clawed frogs (*Xenopus laevis*), aquatic pets such as goldfish and turtles (*Chelydra serpentina, Trachemys scripta elegans*, *Chrysemys picta*), mosquitofish, and 15 fish species released in south coast reservoirs and drainages to improve sport fishing.

In uplands immediately adjacent to riparian areas, Argentine ants (*Linepithema humile*) and red imported fire ants (*Solenopsis invicta*) have replaced many populations of native ants, affecting species that rely on native ants for food. These aggressive ants are known to kill arroyo toads and ground nesting birds with their venomous stings. Brown-headed cowbirds (*Molothrus ater)* occur throughout the planning area and on adjacent lands. They lay their eggs in the nests of other birds and rely on the hosts to incubate the eggs and raise their young. Brown-headed cowbirds have caused declines in the reproductive success of several threatened, endangered and sensitive bird species and large numbers of other native bird species (Robinson and others 1995). The European starling (*Sturnus vulgaris*) takes over other birds' nests and uses them for their own. Starlings have caused declines in populations of cavity-nesting birds such as the purple martin, western bluebird and woodpeckers. Continuing and increasing the priority to manage invasive species within riparian systems is needed on all southern California national forests.

Chaparral (Low Elevation Chaparral Adjacent to the Urban Interface)

Fire return intervals are within the natural range of variability in most chaparral areas of southern California; they have not been substantially affected by fire suppression (Keeley 2001). In intact chaparral ecosystems, natural regeneration after wildland fire occurs quickly, providing ground cover and shade at the soil level within a short time period. This is due to the germination of fire-following flora, the abundance of shrubs and perennial herbaceous plants that regrow quickly from sprouts or tubers, and the presence of many shrub species whose seeds are stimulated to germinate by fire.

Many acres of chaparral remain intact and are not at risk of infestation by weeds. There are however, locations of low elevation chaparral adjacent to the Wildland/Urban Interface (WUI) that are at high risk of invasion by nonnative plants. This is due to the large acreage of low elevation chaparral burned in the 2003 and 2004 wildfires, the risk of reburning in areas recently burned, and fuel treatments in the WUI Defense zone needed to protect urban communities from wildfire. Factors that contribute to this risk include the high number of low elevation weed species present in southern California, the presence of these weeds within or adjacent to burned areas, the high potential for weed seeds to have been transported on fire suppression equipment across large areas, the high number of miles of fuelbreak constructed, and increased ground disturbance after the fires caused by unauthorized motorized vehicle access due to the reduction of vegetation density.

Locations that have burned too frequently may have been affected by reduced shrub diversity and cover as shrubs burned again prior to their ability to establish a seed bank (Zedler and others 1983). Locations already infested with nonnative annual grasses may be at risk of frequent fire, especially in 2005 with the abundant herbaceous vegetation produced by near-record winter rains. WUI Defense zone treatments in chaparral will remove most shrub cover, creating invasion opportunities for nonnative annual grasses. In WUI Threat zones, the frequent treatment required to keep shrub fuel volumes low may create enough disturbance to increase weed invasion of these zones also. Both disturbed and undisturbed low elevation chaparral located adjacent to WUI Defense zones and fuelbreaks may be susceptible to invasion by nonnative species from the treated areas (Merriam and others, submitted). Within low elevation chaparral adjacent to the urban interface that has recently burned and is not within WUI Defense zones, an emphasis on fire prevention and suppression is needed to prevent re-burning. Public education and weed control are also needed.

Coastal Sage Scrub

Coastal sage scrub typically has a long fire return interval; this vegetation type has become degraded in locations adjacent to urban areas where wildfires have occurred too frequently. Recovery after fire depends on sprouting shrubs and a dormant seed bank of native fire-following species that is stimulated by the heat, smoke and charate of the fire to germinate. Fires that occur too frequently promote establishment of invasive nonnative plants, such as annual grasses, which increase fire frequency to a level that eventually excludes the reestablishment of shrubs (Keeley 2001). This process can convert coastal sage scrub to annual grassland. The resultant nonnative grasslands are suitable locations for establishment of even more noxious weeds (Bossard and others 2000). Risk of type conversion is especially high across large acreages of coastal sage scrub on the national forests of southern California that burned in the 2003 and 2004 wildfires and in locations proposed for WUI Defense zones. Within coastal sage scrub stands that have recently burned, fire prevention and fire suppression are needed to prevent re-burning and reduce the risk of conversion to annual grassland (Keeley 2001). Public education is also needed.

Desert Woodland and Scrub

Pinyon-juniper woodland and desert scrublands require long fire rotation intervals for regeneration. Wangler and Minnich (1996) estimated the average fire return interval for pinyon-juniper woodland to be 480 years. Suitable conditions for plant establishment in these dry regions occur infrequently, and recovery from fire requires a long period without disturbance (Bainbridge and Virginia 1995). Small organisms play an important role in the ecology of desert soils. Cryptogamic crusts - living mats of algae, fungi, lichens, and nitrogen-fixing bacteria - increase water infiltration and provide microsites for seedling establishment (Bainbridge and Virginia 1995). Locations that have burned within the last century or that have been affected by grazing or off-route vehicle travel are more susceptible to annual grass invasion because the living crust has been degraded. As densities of annual grasses increase, fire frequency increases and shrubs are displaced. Pinyon-juniper and desert scrub communities affected by this situation can remain in a constant state of degradation. Fire prevention, fire suppression, and efforts to limit ground disturbing activities are needed in these vegetation types to allow time for regeneration to occur.

Monterey Coastal Communities

Monterey coastal communities have a long history of disturbance from landslides, recreational activity in the coastal watershed, and livestock grazing (Jones and Stokes 2003). Invasive plant species are well established in some locations, including six species designated as noxious weeds. French broom (*Genista* *monspessulana*) occurs in the understory of Santa Lucia fir forests, and Andean pampas grass (*Cortaderia jubata*) occupies road cuts, cliff habitat and hillsides along the coast (Stephenson and Calcarone 1999). Both species, along with Kikuyu grass (*Pennisetum clandestinum*), Italian thistle (*Carduus pycyocephalus*), yellow star-thistle (*Centaurea solstitialis*), tecolote (*Centaurea melitensis*) and sticky eupatorium (*Ageratina* sp.) are present within grazing allotments. Management of invasive species is needed in coastal Monterey plant communities because these species are among the greatest threats to the integrity of the natural vegetation (Jones and Stokes 2003).

Montane Conifer Forests

The long interval of fire suppression in montane landscapes has likely reduced the introduction of invasive species (Keeley 2001). Southern California conifer forests that are not disturbed by urbanization, road construction, recreation activities or grazing do not contain large numbers of invasive plants; those that are present do not affect large areas. The shaded soil conditions resulting from the closed canopy forest and understory shrubs, combined with down woody material and pine needles that cover the forest floor, help prevent weed establishment. Lack of fire suppression equipment transporting weed seeds into conifer forests combined with lack of soil disturbance from fire suppression activities may have also reduced opportunities for weed introduction.

In locations that have been disturbed, invasive plants such as cheatgrass (*Bromus tectorum*), ripgut brome (*Bromus diandrus*), red brome (*Bromus madritensis* ssp. *rubens*), and mustards *(Brassica* spp.) are present. Density varies from site to site with the degree and frequency of soil disturbance. Red brome is distributed widely in the planning area and forms a dense understory in open ponderosa pine forest near Lake Gregory in the San Bernardino Mountains, where it poses a fire threat and may be inhibiting conifer recruitment (R. Minnich, UC Riverside, pers. comm. as cited in Stephenson and Calcarone 1999). A high density of cheatgrass cover within montane conifer forest with black oak is present on fuelbreaks on National Forest System land in the Lake Arrowhead area. Spanish broom (a state-designated noxious weed) is present in urban housing communities adjacent to these fuelbreaks and also within recreational cabin tracts under permit on National Forest System lands within WUI Defense zones. Project planning is needed to ensure treatment areas are surveyed for invasive species, locations are mapped, and measures are included in project design to reduce introduction and spread. Public education and weed control are also needed.

Oak savannas

The understory vegetation in savanna woodlands with open canopies in California now consists mainly of nonnative annual grasses and a mix of native and nonnative forbs (Barbour and Minnich 2000); this is true on the southern California national forests as well. Soil moisture availability to oak seedlings has been shown to be reduced by annual nonnative grasses (Danielsen and Halvorson 1991, cited in Stephenson and Calcarone 1999), possibly contributing to the lack of oak regeneration widely noted. The conversion of what once may have been perennial grass-dominated vegetation to annual grasses also makes this habitat susceptible to invasion by other nonnative annual plants, including noxious weeds (Bossard and others 2000). Habitat management to promote tree regeneration is needed.

Watershed

Composed of steep, naturally erosive mountains formed by dynamic geologic forces, the watersheds of the southern California national forests provide a relatively direct delivery system for precipitation and sediment to reach streams. National Forest managers play a unique and important role in water resources: responsibility for the headwaters and primary source areas for most of the major river systems in southern California, and control over the primary recharge area for most fractured-rock aquifers within the mountains. These river systems serve as ecological corridors that connect the mountains to the sea.

Using the Los Angeles Basin as an example of the hydro-geologic regimes which form and maintain these watersheds, the following is a descriptive outline based on the works of R.U. Cooke's *Geomorphological*

Hazards in Los Angeles (Cooke 1984) and William Graf's *Fluvial Processes in Dryland Rivers of the Los Angeles Basin* (Graf 1988). The upper San Gabriel River watershed has a long history of large flood events and associated sedimentation. The mountains of the Transverse Ranges (Santa Monica, Santa Susana and San Gabriel mountains) are characterized by high relative relief, deep and pervasive dissection, and innumerable extremely steep slopes. As a result, the valley-side slopes in the mountains are exceptionally active environments, in which rates of debris production and removal are extremely rapid by comparison with other areas and regions (Cooke 1984). Past storm events in the area have resulted in substantial sedimentation in the three reservoirs (Cogswell, San Gabriel and Morris). During January of 1969, approximately 2,535,716 m^3 was deposited in San Gabriel Reservoir. In the following month, an additional 2,502,100 m^3 of sediment entered San Gabriel Reservoir (total = 5,037,816 m^3)(Cooke 1984).

Dryland river systems are dominated by short, high magnitude storm events. In areas with substantial coarse alluvium, many arid rivers exhibit braided channel morphology. Braided channels are generally characterized by abundant bedload, steep channel gradients, highly erodible banks, and highly variable discharge (Graf 1988). In dryland river systems, flood events are almost always the forcing factors that convert meandering channels to a braided morphology. In several arid regions, large storm events have been responsible for changing the dominant channel configuration from meandering to braided in watersheds of varying sizes. The Gila River in eastern Arizona in the late 1890s had a narrow (only meters wide in some areas) meandering stream channel, but in 1905 a series of large storm events eliminated the meandering channel and produced a braided channel more than a kilometer wide in some reaches (Graf 1988). In the 1940s, dense riparian vegetation and sedimentation narrowed the Gila River channel and, by the 1980s, the stream had a compound appearance similar to its meandering channel geometry of the 1890s (Graf 1988). Due to the role of large storm events, the change from braided back to meandering channel morphology is much slower than the change from meandering to braided channel geometry.

Horizontal instability (resulting from changes in discharge, sediment load and riparian vegetation) is often present in dryland braided river systems. On large alluvial fans, the plugging of channels with sediment and debris results in dramatic changes in the location of active channels (Graf 1988, Mount 1995). Rates of channel migration are highly variable and depend on the magnitude of storm flows and the resistance of channel substrate. In addition to horizontal instability, many dryland channels exhibit substantial vertical instability through entrenchment. In continuous channels, channel entrenchment can result from the rapid upstream migration of headcuts during large storm events (Graf 1988). In general, channel entrenchment is the result of some change in the amount and/or rate of delivery of water and sediment to the river channel. Three common types of causal mechanisms for the above changes include land management, climatic change, and internal adjustments (Graf 1988, Mount 1995). Although there is substantial debate in the literature regarding the causal link between specific land use changes and the associated physical processes that lead to channel entrenchment, many arid river systems can exhibit substantial vertical channel change during large storm events (Graf 1988).

The information above emphasizes natural changes in channel morphology that are typical of dryland fluvial systems. The combination of high intensity rainfall events, poor soil development, and steep slopes often generates high magnitude storm events that transform stream channel morphology and associated riparian habitat, which should be recognized when describing aquatic and riparian habitat areas and evaluating potential human impacts on stream channel morphology and aquatic and riparian habitat in southern California.

A healthy watershed operates in dynamic equilibrium. This balance can be affected by national forest management activities, off-forest uses, and natural events such as earthquakes and wildland fires. Heavy precipitation and flood events cause erosion and sedimentation, and naturally occurring chemical compounds found in the rocks can affect surface water quality. Management activities, public uses and natural events that disturb the soil surface, as well as those that impede or remove streamflow, generally have the greatest potential to affect aquatic and riparian-dependent resources. The risk of adverse impacts increases the closer a ground-disturbing activity is to a stream, riparian area or wetland. Surface water, floodplains, groundwater, wetlands, and riparian areas are all closely related through proximity to one another and through interflow of water traveling at the subsurface between streams and groundwater aquifers (Winter and others 1998).

Urbanization near and adjacent to the national forests can and is already having a marked effect on national forest resources. Many stream channels downstream of the national forests' boundaries have been altered through flow management or channelization, which has caused a break in the connectivity with natural streams that previously flowed through towns, cities and farmland to the Pacific Ocean.

Surface Water

The climate in this region is best described as Mediterranean, characterized by wet winters and dry summers, with mild seasonal changes. It is cyclic in nature, with consecutive years of low rainfall and extended droughts, as well as years with high rainfall and associated flooding. Annual potential evapotranspiration rates on most watersheds exceed the precipitation rate by at least a two-to-one margin. Potential evapotranspiration rate is the maximum rate at which water could be evaporated from wet surfaces and transpired by plants based on local climate, and it is a broad general indicator of the overall water balance of an ecosystem. Average annual precipitation on the national forests varies dramatically with latitude, longitude and elevation, ranging from 2 to 3 inches in the eastern deserts, to 40 to 42 inches in the coastal redwoods, and to 60 inches or more on the higher mountain peaks, usually in the form of snow. Little or no precipitation occurs in the planning area during approximately three-quarters of the year (Fujioka and others 1999).

Local flood peaks generally occur during major rainfall events, which threaten life and property during these periods. Large-scale and high-return-interval floods are associated with major sub-tropical events in the southern part of the planning area and with northern Pacific frontal systems in the northern portion of the planning area. Wildland fire-related flood events are exacerbated by the large amounts of sediment released by the fires that "bulk" the flood flow volumes to double or triple their average volumes.

The United States land base is divided and sub-divided into successively smaller watersheds or hydrologic units. The hydrologic units are arranged within each other, from the smallest cataloging units to the largest regions. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two- to eight-digit numbers based on the four levels of classification in the hydrologic unit system (Seaber and others 1987). The fifth level of classification is the "watershed" unit, which varies in size from 40,000 acres to 250,000 acres. The four southern California national forests include the headwaters for 88 fifth-code HUCs (referred to as "watersheds" throughout the rest of the document). The planning area includes both National Forest System (NFS) lands and other ownerships within the boundaries of the national forests. Approximately 69 percent of the watersheds are in non-Forest Service ownership (see table 123: Watershed Acreage, Land Ownership And Summary Of Watershed Condition Ratings By Forest).

Table 123. Watershed Acreage, Land Ownership And Summary Of Watershed Condition Ratings By Forest

National Forest	Watersheds	Watershed Acreage	Non-NFS land Acreage	Percent of Watershed in Non-NFS land	Watershed Condition Rating		
					Good	Moderate	Poor
ANF	21	2,533,874	1,698,373	67%	11	7	3
CNF	13	2,520,093	1,935,145	77%	4	8	2
LPNF	35	4,623,278	2,895,933	63%	18	16	1
SBNF	19	3,295,926	2,454,011	74%	10	3	6
Total	88	12,973,121	8,983,462	69%	43	34	12

NFS: National Forest System

The significance of water yields from vegetation and fuels treatments depends on aspect, elevation, soils, geology and vegetation cover as well as on annual precipitation. The four southern California national forests are a source of water for municipal, commercial and agricultural uses and for streamflows necessary to maintain healthy aquatic and riparian resources. Streamflows from forest watersheds result from total precipitation minus losses from evaporation, transpiration and groundwater storage. Trees and chaparral have an impact on water available to streamflow by intercepting precipitation in their canopies, which is then evaporated back into the atmosphere. Trees also transpire significant amounts of water, which depletes water reserves in the soil and increases the groundwater capacity for subsequent rainfall or snowmelt (Troendle and Kaufmann 1987).

Estimated water yield conditions (on National Forest System lands only) have not changed measurably since the analysis conducted for the existing forest plans, which estimated the total annual water yield from the national forests to be approximately 1,200,000 acre-feet. It is expected that short-term changes in water yield from southern California national forests management will occur during the implementation of this plan. However, the limited amount of precipitation and high evapotranspiration rates common in this climatic zone severely limit the long-term changes in water yield (Ziemer 1986).

There are approximately 2,398 miles of streams and 30,316 acres of lakes and reservoirs within the planning area, although most reservoirs are on non-National Forest System lands (Stephenson and Calcarone 1999) (see table 124: Water Located Within The Southern California Planning Area).

Table 124. Water Located Within The Southern California Planning Area

National Forest	Miles of Stream	Acres of Lakes and Reservoirs
Angeles NF	385	6,765
Cleveland NF	348	8,498
Los Padres NF	1,134	8,477
San Bernardino NF	531	6,576
Total	2,398	30,316

Surface Water - Quality

Watershed conditions, or watershed health, on the national forests vary depending on amount of disturbance that has occurred within each watershed and the effect of the disturbance on the natural integrity of the watershed as a whole. The 88 watersheds on the southern California national forests have been analyzed and assigned a watershed condition rating (see table 123: Watershed Acreage, Land Ownership And Summary Of Watershed Condition Ratings By Forest, page 199) based on disturbance and overall watershed health criteria identified in the watershed condition rating methodology (USDA Forest Service 2000). Disturbances within the watershed including location of National Forest System and non-system roads, mining, recreation, grazing, and special uses can adversely affect a watershed's condition. The severity of effects is influenced in part by the local terrain, fire regime, precipitation and potential geological hazards. Changes in watershed condition are reflective of changes in the long-term reliability of a watershed to provide the expected water quality and quantity. Watersheds with a condition rating of poor frequently contain only a small amount of National Forest System land relative to the total watershed acreage. Most conditions leading to poor ratings are associated with high road densities, agriculture, and urban developments within the floodplains off the national forests.

While most water produced on the four southern California national forests meets or exceeds federal and state water quality standards, those waters that do not meet State Regional Water Quality Control Board standards (Clean Water Act, Section 303 (d)) can be designated by the state as "impaired." Impairments are alterations in water quality factors typically associated with temperature, sediment and chemicals. There are 34 state-designated impaired stream segments, lakes or reservoirs across the four southern California national forests (State of California 2003). These water bodies are usually found in low elevational areas, have associated floodplains, and have easy vehicle access and high use rates. State listed 303(d) impaired waters will be considered during site-specific analysis as projects are proposed. Steps will be taken to maintain at least the existing quality of these waters. Opportunities to improve conditions will be identified and implemented as funding allows.

Surface Water - Uses

The year-round demand for water is magnified by the large and increasing human populations surrounding and using the national forests (Davis 1998). The national forests provide domestic-use and drinking water for many southern California communities. Much of the water from forest streams is appropriated, meaning that the amount and location of the diversion is registered with the state; some watersheds are actually being adjudicated. Adjudication is a binding, court-approved allocation of specific amounts of water to specific persons within a watershed; adjudication restricts forest water uses. Large streams flow off the national forests, where the water is captured for private, municipal, industrial or agricultural uses. In 14 watersheds the current assigned water right exceeds 25 percent of the estimated annual flow.

In addition, surface water found on the four southern California national forests plays a vital role in sustaining our natural resources. Surface water is used both non-consumptively and consumptively, both of which uses are highly valued and depend on high-quality water.

Non-Consumptive Water Uses

Non-consumptive water uses include water needed by wildlife, fisheries and riparian vegetation as well as water needed for hydroelectric generation, streamside recreation and overall aesthetics. Many of the recreational activities on the national forests revolve around streams and water bodies, including sightseeing, camping and day-use in the form of water play, fishing and boating. One of the primary responsibilities of the Forest Service is to ensure that adequate amounts and quality of water are available to support natural resources such as fish, wildlife, and riparian vegetation found on the national forests. A reliable source of flowing water to streams and a dependable volume of flat water in reservoirs and lakes are critical to the existence and survival of the fish, wildlife and plant species that live on the national forests. The dynamics of streamflow and the proximity of groundwater largely determine the extent and character of riparian, wetland, and aquatic habitats. Seasonality, volume, duration and year-to-year variability of streamflow all greatly influence the structure and composition of ecological communities found in the stream channel and adjacent wetlands.

Several hydroelectric projects draw water from watersheds lying in part or totally on National Forest System lands. These hydroelectric projects include both large storage reservoirs and small "run of the river" projects. In addition, a number of flood control and water-supply dams with impounded reservoirs on each national forest preserve domestic water supplies and control downstream flooding. The presence of dams and diversions on most of the national forests' major streams has altered aquatic and riparian habitats and reduced the capability of these habitats to support native species (Stephenson and Calcarone

1999). These impoundments have dramatically affected the distribution of steelhead trout and their access to historical habitat, as well as other native fish species. Downstream of some dams, however, the regulated release flows can actually deliver above-natural late season flow levels that help support aquatic species that may have otherwise been negatively affected by droughts.

Table 125. Percentage Of Total Watersheds Allocated For Public Water Supplies

Forest	Percentage of Watersheds That Serve As Public Water Supplies	Percentage of Watersheds With Filed Water Rights	Percentage of Watersheds Where Filed Water Rights Account For 25% of Estimated Annual Flow	Percentage of Watersheds Fully Appropriated or Adjudicated
Angeles NF	45	100	17	33
Cleveland NF	32	36	5	59
Los Padres NF	34	97	3	20
San Bernardino NF	52	52	15	74

Consumptive Surface Water Uses

Consumptive surface water uses include drinking water, mining operations, dust abatement, fire fighting, special-use permits, and use at Forest Service facilities, campgrounds and administrative sites. Water resources on the national forests contribute significantly to public water supplies as well as to agricultural and recreational development (Socioeconomic Recommendations Task Group 2002). Most of the major reservoirs in and around the national forests store water for public water supplies and agricultural uses outside the national forest boundaries. Community drinking water supplies are wholly or partially provided in 44 watersheds on the national forests (see table 125: Percentage Of Total Watersheds Allocated For Public Water Supplies). The percentage of total watersheds allocated for public water supplies in some watersheds presently constitutes a large percentage of the total water produced from the national forests. In order to meet current demand, large quantities of water are imported into southern California from both northern California and the Colorado River to the east. Some of the highest consumptive uses authorized by Forest Service special-use permits are for adjacent landowners who use water for their homes, yards, pastures, and agricultural endeavors such as orchards, vineyards and pastures.

Demand for national forest water extraction special-use permits is expected to increase in the future. The State Water Resources Control Board will rule a stream segment or watershed to be fully appropriated (that is, no water is available for new water rights applications) on a case-by-case basis. The demand for water is particularly apparent in the number of existing water rights associated with each watershed. Approximately 74 percent of the watersheds on the national forests have at least one water right filing; approximately 44 percent of all the watersheds on the four southern California national forests are being appropriated or adjudicated.

Intensive water use and management have resulted in a dramatic reduction in the extent and distribution of riparian and native freshwater habitats in this region. It has been estimated that 95 percent to 97 percent of riparian habitat in southern California coastal floodplain areas has been eliminated. In addition, much of what remains must function under a highly modified hydrologic regime including upstream dams that regulate streamflow. Clearly, no other landscape feature has been modified by human activities to the same degree as freshwater habitat (Stephenson and Calcarone 1999).

Surface water, riparian, and groundwater resources are generally tightly connected. The following tables depict the types of management activities that can affect these water related resources:

- Table 219: Potential effects to streambanks from management activities
- Table 220: Potential effects to channel morphology from management activities
- Table 221: Potential effects to the ability of the RCA to catch sediment before it enters the stream from management activities
- Table 222: Potential effects to water quantity from management activities
- Table 223: Potential effects to water quality (from toxins) from management activities

Table 219. Potential effects to streambanks from management activities

Type Of Disturbances	• Streambank degradation as a result of management prescriptions or actions • Inadvertent degradation of streambanks from overuse by humans
Type Of Management Activities	• Vegetation treatments • Prescribed burning • Wildfire suppression • Livestock grazing • Recreation use that exceeds carrying capacity • Unauthorized use of NFS lands • Mining • Road management (adjacent to roads and at stream crossings)
Effect	• Decreased bank stability, collapsed banks • Increased soil compaction, erosion and sedimentation • Disruption of large woody debris inputs
Consequence To Water And Riparian Dependent Resources	• Water quality degradation (temperature, pH, sedimentation) • Loss of food nutrients and habitat for aquatic and riparian dependent species

Table 220. Potential effects to channel morphology from management activities

Type Of Disturbances	• Physical alteration of channel • Impede or restrict streamflows
Type Of Management Activities	• Impoundments • Mining • Recreation overuse (mechanized, nonmechanized and dayuse), including excessive amounts of recreational dam building (water play) • Unauthorized off-route vehicle use
Effect	• Disrupt the proper functioning of the channel (through structure placement, creating flat water where there was flowing water) • Channel type conversion, channelization, alteration of channel geometry, or disruption of flow and hydrologic processes
Consequence To Water And Riparian Dependent Resources	• Water quality degradation (temperature, pH, sedimentation) • Loss of food nutrients and habitat for aquatic and riparian dependent species, alteration of riparian vegetative community (+ or -)

Table 221. Potential effects to the ability of the RCA to catch sediment before it enters the stream from management activities

Type Of Disturbances	• Ground disturbing activities within and outside of RCAs
Type Of Management Activities	• FS facilities or areas: roads, trails, railroads, utility corridors, fuelbreaks, recreation open areas - OHV and target shooting, and the associated stream crossings • Management of those facilities: construction, reconstruction, maintenance • The Uses: driving within designated areas, unrestricted vehicle use off route (dayuse, mountain bikes, motorcycles, and vehicles, dispersed camping)
Effect	• Increase soil compaction • Increase erosion • Increase turbidity • Increased sediment delivery to streams • Disrupt proper functioning of the channel (through increased sediment delivery and transport within the stream channel) • Increased fire starts
Consequence To Water And Riparian Dependent Resources	• Water quality degradation (temperature, pH, sedimentation) • Loss of food nutrients and habitat for aquatic and riparian dependent species • Alteration of riparian vegetative community (+ or -)

RCA: Riparian Conservation Area

Table 222. Potential effects to water quantity from management activities

Type Of Disturbances	• Water extraction or diversion
Type Of Management Activities	• Management of hydroelectric projects, municipal and domestic water uses • Transport of water through tunnels • Water wells • Unlawful activities like drug labs and marijuana cultivation
Effect	• Alteration of quantity and quality of water • Disruption of normal hydrograph (timing, magnitude and duration of flow) • Alteration of the stream channel in response to altered flow • Alteration of riparian vegetative community (+ or -) • Depletes groundwater (overdrafting or water seepage into tunnels) • Redistributes water between watersheds • Increase in nonnative, invasive species habitat conditions • RCA fragmentation (loss of connectivity)
Consequence To Water And Riparian Dependent Resources	• Lowered water quantity • Water quality degradation (e.g., temperature, pH and sediment) • Loss of food nutrients and habitat for aquatic and riparian dependent species

RCA: Riparian Conservation Area

Table 223. Potential effects to water quality (from toxins) from management activities

Type Of Disturbances	• Actions that contribute chemical compounds and toxins into water bodies or aquifers
Type Of Management Activities	• Mining • Unauthorized uses on NFS lands (dumping mechanical fluids, sanitation problems, etc.) • Road maintenance (e.g. surfactants and oils) • Accidents (e.g. train crash, spills, etc.) • Wildfire suppression (foams and retardants) • Special uses with septic systems or onsite wastewater treatment • Abandoned landfills
Effect	• Reduction in shading and leaf drop • Alteration of surface water quality and contamination of aquifers • Vegetation type conversion
Consequence To Water And Riparian Dependent Resources	• Water quality degradation (temperature and pH) • Loss of food nutrients and habitat for aquatic and riparian dependent species • Loss of riparian dependent species, especially aquatic organisms

Riparian Ecosystems

Riparian ecosystems are most easily identified in regions with limited water availability, such as much of southern California. These are distinct ecological communities adjacent to water bodies, especially near the mid- to large-order streams below 4,000 feet elevation in the foothills and valleys (Stephenson and Calcarone 1999).

Riparian ecosystems are characterized by the presence of trees, shrubs or herbaceous vegetation that requires free or unbound water, or by conditions that are more moist than those of surrounding areas. On most areas on the national forests, annual precipitation does not exceed losses to transpiration and evaporation; moisture availability is frequently a limiting factor affecting vegetation location, pattern, and composition. To date, riparian ecosystems on the national forests have only been partially mapped from field investigations. These linear features on the landscape are difficult to accurately map across large areas.

Aquatic ecosystems are the stream channels, lakes, reservoirs, ponds, vernal pools, seeps, springs, wetlands or estuary beds; the water itself; and biotic communities that occur therein. The Monterey Ranger District on the Los Padres National Forest administers the unique environment of coastal beaches in certain areas but does not manage sub-tidal and deepwater estuarine and marine wetlands.

Riparian conditions fluctuate over time, based on flood cycles, drought cycles, and human activities. These are disturbance ecosystems that are sensitive to change and easily damaged, yet they respond rapidly when corrective action is initiated. Statistically, floodplains are subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year. Floodplains occupied by healthy vegetation reduce the severity of floods by allowing floodwaters to spread out over the floodplain. Generally, the floodplains in the southern California national forests are in good functioning condition, except following large wildland fires and after high precipitation years that result in riparian- and streambank-damaging events.

Healthy riparian areas act like a sponge, absorbing water readily during periods of excess precipitation and high streamflows. Water slowed by riparian areas enters streambank storage and groundwater recharge areas. Some of the water is released later, sustaining late summer and fall base streamflow. Healthy riparian areas (with an abundance of trees and other vegetation) slow flood waters and reduce the degree and extent of downstream flooding. Riparian areas improve water quality by filtering run-off and sediment from flood flows and adjacent upland slopes. Additional benefits provided by riparian areas include food, water, air temperature moderation, and cover for many animals and nesting birds. They often provide sheltered upstream and downstream movement corridors for riparian-dependent species to reach other habitats. Fish depend on healthy riparian areas to provide stable channels, sustained water supply, clean and cool water, food and streambank cover.

Riparian-dependent resources are those natural resources that owe their existence to the riparian area, including fish, amphibians, reptiles, fairy shrimp, aquatic invertebrates, plants, birds, mammals, and soil and water quality. Watersheds are managed to maintain watercourses in proper functioning condition and to maintain, enhance, or restore conditions for riparian-dependent resources.

Riparian ecosystems, aquatic ecosystems, wetlands, reservoir/lakeside zones, and floodplains are all included in Riparian Conservation Areas (RCAs). Although the terms riparian ecosystems and RCAs will be used interchangeably in the following discussions, by strict ecological definition they may not be the same in all instances. Riparian Conservation Areas are an administratively designated zone designed to call attention to the need for special management practices to maintain and/or improve watershed and riparian resources. The RCAs serve to protect watercourses from soil erosion and vegetative disturbances from other than natural processes adjacent to the watercourse and areas upslope. Riparian ecosystems are managed to maintain or improve conditions for riparian-dependent resources. Preferential consideration is given to riparian-dependent resources when conflicts among land use activities occur. Riparian Conservation Areas overlap all land use zones and include the following areas:

- Perennial streams, intermittent streams, meadows and any other areas with riparian conditions (lakes, reservoirs, ponds, wetlands, vernal pools, seeps, and springs). They may also include floodplains and inner gorges (the canyon walls created by a combination of down-cutting, under-cutting and mass movement on the slope walls) of stream channels as well.
- Suitable and occupied habitat delineated for threatened, endangered and petitioned water-dependent species (e.g., fish, amphibians, plants, and birds).

Riparian Conservation Areas are managed primarily to protect and maintain the following important habitat components for threatened and endangered species and non-federally-listed fish, wildlife, and plant species habitat: a) water quality; b) water quantity; c) site productivity; d) channel stability; and e) riparian vegetation.

The National Forest Management Act requires that special attention be given to the land and vegetation for approximately 100 feet (~30.5 meters) from the edges of all perennial streams, lakes, and other bodies of water. This requirement is intended to protect riparian-dependent resources and stream water quality from adverse effects, primarily erosion and sedimentation, related to national forest management activities. On the southern California national forests, RCAs include this minimum required 100 foot (~ 30.5 meters) distance from the edge of water bodies and, in addition, also extend to include wider distances based on imperiled species habitat requirements and water quality protection needs determined over the past 15 years. Distances for those streams that support anadromous steelhead trout on the Los Padres and Cleveland National Forests will follow the guidance found under PacFish policy (USDA Forest Service and Bureau of Land Management 1995) (see Appendix E in Part 3 of the forest plans and the steelhead trout species account found in the reading room). Riparian Conservation Area boundaries will include aquatic ecosystems, floodplains and riparian vegetation, wetlands, and meadows.

Riparian Conservation Area acreage has been modeled and represents approximately 19 percent of the lands managed by the national forests (see table 126: Percent Of Modeled RCA Acreage Relative To Total

NFS Land Base). These acreage values are undoubtedly lower than actual since wetlands, especially vernal pools smaller than one acre, were not generally modeled.

Riparian Conservation Areas are key to maintaining productive fisheries and wildlife habitat, attenuating flood flows, providing quality water for downstream users, supplying groundwater recharge, being available as diverse scenery and recreation locations, and sustaining forage production. The objective is to protect the riparian ecosystem and vegetation with an emphasis on preventing the causes of management-initiated watershed and riparian degradation.

Table 126. Percent Of Modeled RCA Acreage Relative To Total NFS Land Base

National Forest	NFS Land Total Acreage	RCA Total Acreage	Percent RCA Out Of Total NFS Lands Acreage
Angeles NF	655,855	99,291	15
Cleveland NF	434,496	62,238	14
Los Padres NF	1,767,979	379,291	21
San Bernardino NF	672,393	116,101	17
Total	3,530,723	656,921	19

NFS: National Forest System
RCA: Riparian Conservation Area

Riparian Areas - Quality

In the overall southern California geographic area, riparian habitats have declined in quality and quantity at low elevations, where they historically were most extensive. Estimates indicate that channelization and diversion of streams in the past century have reduced the extent of riparian habitats in southern California by more than 90 percent (Faber and others 1989). More recently, strong regulatory policies on "no net loss" of wetlands and floodplains have helped to check this decline (Stephenson and Calcarone 1999). The extent of riparian habitats on National Forest System lands is relatively stable according to analyses conducted by Stephenson and Calcarone (1999).

The health, vigor and structural condition of the riparian vegetation are generally good across the four southern California national forests, except where affected by large-acreage wildland fires (Stephenson and Calcarone 1999). Foothill riparian areas are cool, pleasant places near large and growing urban populations, so increases in recreation pressure are inevitable. Riparian habitat degradation currently tends to be localized in a few popular, easily accessible areas (Stephenson and Calcarone 1999). Livestock grazing in riparian areas within the national forest has been substantially reduced during the past 15 years, resulting in some improvements in vegetation condition.

Riparian vegetation can vary from redwoods and alders on the Monterey coast, to chaparral in the coastal foothills, to conifers and oaks in the montane conifer forests (Stephenson and Calcarone 1999). The extended drought and the subsequent bark beetle infestations occurring on the four southern California national forests are currently reducing streamside vegetative cover, especially in mature, primarily mixed conifer forests and chaparral stands. In the short term, this is increasing the large woody debris supply on sections of some streams; in the long term, the supply may be diminished below normal because of the slow rate of regrowth in many of these areas. One of the biggest threats is that these riparian areas within the vegetation mortality zones are very likely to burn up in a wildland fire, in which case the vegetation and the large woody material will also be lost in the short term.

Riparian Areas - Uses

Riparian areas are the locations where land management activities have great potential to disrupt ecosystem processes and interactions and can produce adverse effects. Management focus in these areas is on avoiding and minimizing potential management impacts. The cool temperatures, shade and water features found in riparian areas attract not only aquatic and terrestrial wildlife species, but humans and livestock as well. To provide the conditions needed by riparian-dependent natural resources, these sensitive areas are managed to allow for uses that are either neutral or beneficial to the riparian conservation area (RCA).

These areas are attractive to national forest visitors, as described in the Recreation section, and receive intensive pressure for day and overnight uses such as water play, picnicking, family gathering, camping, hiking, mountain biking and fishing. In general, effects depend on the timing of the use, sensitivity of the location, type of use and intensity and specific behaviors of the recreationists.

The primary national forest management activities that affect the condition of surface water, riparian conservation areas and groundwater include: fuels and vegetation treatment; recreation use and development; road and trail construction and maintenance; water extraction and management; mining; other special uses that occur streamside such as recreation residences and organization camps; special land use designations such as research natural areas, wilderness and special interest areas; grazing; unauthorized activities; and watershed restoration. Effects from ground-disturbing activities can include but are not limited to soil compaction, stream channel degradation, increased erosion, and sedimentation. Vegetation treatments have potential to remove or destroy riparian vegetation and to affect water quality when herbicides are used. Water extraction and diversion can result in long-term effects by altering the quantity and quality of streamflows and by affecting a channel's capacity to carry normal flows. Watershed restoration treatments (such as riparian vegetation restoration, stabilization of sediment sources, and restoration of abandoned mine lands) are designed to improve conditions for riparian-dependent resources.

As standard operating procedure, management activities are designed to avoid riparian conservation areas or allow minor encroachments and proactive riparian treatments based on site-specific project-level planning. Routine applications of measures that protect water quality and riparian conservation areas—such as those in the Water Quality Management for National Forest System Lands in California, Best Management Practices Handbook (USDA Forest Service 2000), Best Environmental Design Practices (see Landscape Management), and environmental protection stipulations—are incorporated into special-use permits, contract specifications, and field operation plans for all management activities. In addition, the effects of wildland fire are minimized using resource advisors assigned to the fire, and the associated flooding is mitigated through the Burned Area Emergency Response (BAER) process.

Surface water, riparian and groundwater resources are generally tightly connected. Table 218: Potential Effects to Riparian Vegetation from Management Activities, depicts the types of management activities that can affect these water-related resources.

Table 218. Potential Effects to Riparian Vegetation from Management Activities

Type Of Disturbances	Vegetation removal through management prescriptions or actions Inadvertent destruction or removal of vegetation from overuse by humans, vehicles or animals
Type Of Management Activities	• Vegetation treatments • Prescribed burning • Wildfire suppression • Livestock grazing • Recreation use that exceeds carrying capacity • Unauthorized use of NFS lands • Mining
Effect	• Reduction in shading, leaf drop, large woody debris, streambank stability, soil compaction, increased erosion and sedimentation • Input of ash, soot, or chemical compounds to stream • Increased fire starts
Consequence To Water And Riparian Dependent Resources	• Water quality degradation (temperature, pH, sedimentation) • Loss of food nutrients and habitat for aquatic and riparian dependent species • Loss of aquatic species from toxic levels of chemicals • Loss of riparian vegetation connectivity upstream and downstream

Groundwater

Groundwater (the water beneath the Earth's surface) is an integral part of the biological and physical ecosystem within national forests. Like surface water, groundwater depends on precipitation as its source. Together with surface water, it defines the water balance within a watershed. Groundwater and surface water are physically connected in some settings, such as along alluvial channels and fractured bedrock stream channels. The exchange of water between surface flow and groundwater flow is called interflow; it results in recharge of aquifers when there is a surplus of surface water, and seepage into stream channels from aquifers when surface water dries up.

Surface and groundwater vary in the amount and means of water transport. Stream channels do not define groundwater aquifer boundaries. The origin of water recharging underground aquifers beneath one topographic watershed may actually lie across the divide in another watershed. Geologic features such as varying rock types, faults, joints and fractures exert a controlling influence on the occurrence, movement, quantity and quality of groundwater. Groundwater normally passes slowly through the interconnected fracture, fault and pore spaces within "solid" rock. Consequently, groundwater is usually a more limited resource than surface water in a given area and requires different management strategies. In addition, groundwater is more difficult to quantify and locate because it is unseen. While many surface water issues and concerns also apply to water beneath the surface of the ground, groundwater has distinct differences from surface water that bring unique aspects to its management. Examples include the difficulty in determining how and where water flows underground, differences in surface- and groundwater laws, and differences in determining and managing groundwater quantity and quality.

The total amount of water in storage in the rocks surrounding a hard-rock well is usually small, so that groundwater levels and the well's yield can decline dramatically during dry years. In contrast, the volume of water stored in many alluvial soils can amount to 10 to 15 percent of the volume of the alluvium. Alluvial deposits that are potential aquifers cover roughly 2 to 3 percent of the Angeles, Cleveland, and Los Padres National Forests, and 13 percent the San Bernardino National Forest.

Groundwater (and its associated aquifers) can be affected by: (1) changing the amount of water available for recharge of an aquifer; (2) overdrafting the sustainable aquifer capacity or flow (quantity), or changing the amount of water extracted; (3) contamination of groundwater (quality); or (4) damage of the aquifer (physical integrity). Most national forest management activities have limited consequences related to groundwater. Water developments, mineral and energy operations, and wildland fire have the most potential to affect groundwater quality, quantity and use.

Initially, the national forests of southern California were established as "watershed forests," in large part to ensure more favorable water flows. Now, with heavy population demands for use of forest resources, and with the value of water constantly increasing, the balance between the maintenance of water for forest resource needs and the extraction of water for human needs can be controversial. When water is pumped from private wells adjacent to national forest boundaries, or within in-holdings or corridors, a large amount of that water could be coming from aquifers beneath National Forest System lands. Those extractions could be adversely affecting national forest resources but the degree of impact is usually difficult to quantify.

In his book exposing the issues facing groundwater development, Robert Glennon (2002) states: "All over the West, development is occurring immediately adjacent to federal lands as the private sector tries to accommodate the demand for recreational opportunities.... [T]hese developments next to national parks, national forests, monuments, and wildlife refuges pose special challenges for federal land managers. Citizens want increased access to federal lands for recreation, but using groundwater to serve development on private lands threatens sensitive springs and creeks located on federal lands." Adjacent developments that are potentially affecting national forest groundwater supplies, especially on the Angeles, Cleveland and San Bernardino National Forests, include water bottling operations, golf courses, ski areas, casinos, housing projects, and other recreational developments. For special uses on National Forest System lands, groundwater impacts are addressed during screening and application analysis processes.

Management of surface water and groundwater includes issues of water quality and quantity, water rights, coordination with other government agencies, collaboration with national forest users and dependent resources, urbanization along the national forests' boundaries and within inholdings, increasing demands on surface water and groundwater resources, and heightened recognition of the dependence of unique national forest resources on groundwater.

"Groundwater pumping in the USA has increased dramatically in just the past few decades. Groundwater constitutes more than 25 percent of the nation's water supply. As water becomes more scarce, it will fetch higher prices, and people will go to greater lengths to secure rights to it" (Glennon 2002). Local groundwater and imported water from the Colorado River and northern California are the two primary sources of water in southern California. Demand for water in southern California is expected to continue to grow because of population expansion, new industry and the commercial development of water. As more and more of the above-ground sources are used, groundwater withdrawal will increase (Socioeconomic Recommendations Task Group 2002). Heavy use demands overlay an uncertain but potentially declining supply of groundwater in the limited fractured-rock aquifers representative of most National Forest System lands in southern California. Indeed, Senator Diane Feinstein (in a keynote speech at a March 2002 "Water Summit" in San Jose, California) described water shortage as potentially the next big crisis in the state.

Groundwater - Quantity

The quantity of groundwater available on the four southern California national forests is unknown. A recent article in the magazine *Western Water* (July/August 2003), "California Groundwater: Managing a Hidden Resource," states: "Individual regions are beginning to map the extent of the problem, but 'unfortunately, comprehensive information regarding California's groundwater quality and quantity is lacking,' according to a March 2003 report by the State Board [of Water Resources]. 'This lack of information impairs the ability of regulators and the public to protect and manage the state's groundwater basins/subbasins'" (Pitzer 2003, p. 13). There is significantly less information on groundwater aquifers in the mountains underlying the four national forests in southern California than there is on aquifers underlying much of the rest of California.

Groundwater is extracted through springs, horizontal wells and vertical wells. In California, the subsurface flow of a stream is considered surface water by the state and governed by the State Water Resources Control Board (SWRCB) with permitting, regulatory and statutory adjudicative authority.

The major alluvial aquifers (many of which are recharged from National Forest System lands) are well documented by the State of California, but the "bedrock fracture aquifers" and "porous rock layers" are less well-known and difficult to inventory. All aquifers are subject to overdrafting (extracting more groundwater than sustains or recharges an aquifer), contamination, insufficient recharge due to drought, and changed underground conditions due to earthquakes, tunneling, drilling and other causes.

Groundwater is a limited renewable resource because of the slow rate of groundwater movement through bedrock, the human dependence on groundwater sources, the decline in aquifer levels during extended drought cycles, the dependence on recharge from seasonal precipitation, and the restricted storage capacity of the bedrock. The potential for the overdraft of groundwater is already recognized within some areas on National Forest System lands, especially adjacent to national forest boundaries where development is encroaching, and on inholdings and areas with intermixed private and National Forest System lands. At this time, information is limited to assess the effects of Forest Service and off-forest uses and proposals for groundwater developments.

Groundwater recharge can be increased by reducing evapotranspiration, slowing run-off and creating artificial recharge. Removal of vegetation—whether through wildfire, prescribed fire, timber harvest or other means—reduces evapotranspiration and makes more water available for infiltration, assuming that it does not run off too rapidly. Conversely, vegetation in floodplains slows the speed of the water run-off and allows the water to infiltrate, although some then becomes available for uptake by vegetation.

Following fires or vegetation manipulation, where the slopes have adjusted to a stable angle in conjunction with the local climate and forest vegetation, the increase in water entering shallow aquifers can result in slope movement (landslides, debris flows and erosion). Both roads and stream channels experience impacts from groundwater-related slope instability.

Past studies that quantify water loss via transpiration and its effects on groundwater indicate that removing vegetation will not significantly increase groundwater reserves in low precipitation climates like southern California. Vegetative cover is beneficial to slopes, and helps reduce erosion and debris flows (Neary pers. comm.). Additionally, Pete Wohlgemuth (Pacific Southwest Research Station) adds that there is some potential to increase water yield by converting chaparral to grasslands, but at the expense of slope stability and accelerated erosion. Radical ecosystem alterations could always be initiated if water yield was the paramount management priority, but it would probably be at the expense of the biological communities and their habitats that are equally if not more important (Wohlgemuth pers. comm.).

Water is slowly released from aquifers back to the channel throughout the year. Reservoirs can store winter precipitation and augment late summer groundwater levels as water soaks into the substrate. If soil is compacted or if land is covered with developments or paved, less area is available for water infiltration and more is likely to run off. These conditions also add to increasing flood flows.

Surface water and groundwater interflow in alluvial aquifers is a continuum, with water moving between the ground surface and the subsurface. Reduction of groundwater quantity in an alluvial aquifer due to pumping from wells may affect streamflow as the loss from the stream to the aquifer occurs. The change in streamflow may or may not be measurable. In contrast, construction of a dam and storage of water behind it can increase the groundwater levels in the surrounding area. The amount of water available for aquifer recharge can be increased following a wildland fire, because of reduced evapotranspiration from the burned vegetation. However, if the fire creates hydrophobic soils that reduce water infiltration, water may not be able to soak in for recharge until the hydrophobicity dissipates.

Damage to the aquifer can occur by overdrafting; by drilling through one aquifer into another; and by tunneling, mining or other excavations that release groundwater from an aquifer or introduce contaminants. Collapse of an aquifer from overdraft can cause subsidence, although this usually happens in alluvial aquifer basins, most of which are off the national forests. An aquifer could potentially be damaged by deep wells drilled for water, oil, gas or geothermal exploration or geophysical investigation; however, when those holes are sealed, the damage usually can be repaired.

Past groundwater use on National Forest System lands has been generally low, with some exceptions. However, use is rising within private inholdings, and adjacent urban areas are drilling more wells close to national forest boundaries. Most groundwater extracted from National Forest System lands comes from fractured bedrock aquifers, porous rock layers, and perched aquifers in landslide deposits rather than from the large valley aquifers. Many wells on the Cleveland and Angeles National Forests and a few on the Los Padres and San Bernardino National Forests have been going dry or experiencing lower water levels.

Examples of wells and springs on the Cleveland National Forest that have experienced declining well levels or have gone dry in recent years, include Upper San Juan Campground well, Palomar horizontal well (spring development), Japatul Fire Station well, Oasis Spring, Cuyapaipe well, and Alpine Ranger Station well (Graham pers. comm.). More than 22 wells and 5 springs have gone dry in recent years at recreation facilities, fire stations and settlements within the Angeles National Forest boundary (Andresen pers. comm.). The cause of the decreasing water levels may be overdraft, drought, or a combination of the two.

Overdrafting can also be influenced by use of surface water (Department of Water Resources 2003). When surface water is taken out in the upper watershed, such as for municipal, agricultural or industrial uses, it lowers the recharge of the aquifer down-gradient and can contribute to overdrafting. Competition between natural resources and human uses can be difficult to quantify when the underground character of the aquifer is unknown. Renewing or increasing groundwater special-use permits could add to the competition without adequate assessment of aquifer conditions and uses.

Groundwater - Quality

It is generally assumed that groundwater is safe for consumption without treatment (U.S. Geological Survey 1998). As a result of EPA's Surface Water Treatment rule, wells on National Forest System lands are drilled to reduce the potential risk of contaminated or non-potable surface water supplies, since groundwater is less easy to contaminate than surface water. Aquifers filter and de-contaminate groundwater during long residence; furthermore, properly constructed wells include seals designed to keep contamination out.

Nevertheless, groundwater and the aquifers that contain it can become contaminated. The quality of groundwater extracted from springs and wells involves both biological and chemical characteristics.

Chemical and biological contamination can result from urbanization near or within national forests. "In general, groundwater contamination stems from the misuse and improper disposal of liquid and solid wastes; the illegal dumping or abandonment of household, commercial, or industrial chemicals; the accidental spilling of chemicals from trucks, railways, aircraft, handling facilities, and storage tanks; or the improper siting, design, construction, operation, or maintenance of agricultural, residential, municipal, commercial, and industrial drinking water wells and liquid and solid waste disposal facilities. Contamination can reach groundwater from activities occurring on the land surface, such as industrial waste storage; from sources below the land surface but above the water table, such as septic systems; from structures beneath the water table, such as wells; or from contaminated recharge water" (Bachman and others 1997, p. 27).

The sources of contamination that are most likely to affect National Forest System lands include: improperly sealed wells (water wells, oil and gas wells, or exploration wells); tunnels; mine adits; landfills; underground leaks of pipes and tanks; leach lines; surface spills; human and animal waste and dead animals; and agricultural or industrial chemicals. Watershed recharge areas could be contaminated by infiltration of pollutants; fortunately, very few examples of contamination have occurred. In one example on the Los Padres National Forest, leaking diesel tanks contaminated the soil and groundwater. The national forest installed monitoring wells and is working with the County Environmental Health Department on corrective actions.

In some instances, the quality of groundwater can be affected by naturally occurring geologic conditions leading to radioactivity, brackish water quality or elevated levels of mineral constituents. High mineral content is not uncommon in wells within National Forest System lands, but the minerals can usually be treated so the water is safely consumable. Overall, groundwater quality has only been a minor problem on National Forest System lands.

Groundwater contributing to surface water flow can affect its quality. Generally, groundwater will improve or sustain water quality in a surface stream. However, activities such as mining can create subsurface conditions leading to acid mine drainage or increased concentration of heavy metals in groundwater, which may then affect surface water quality.

In summary, groundwater quantity and quality on the four southern California national forests are generally good in interior National Forest System lands distant from major developments, except in isolated cases where existing wells cannot keep up with (mostly) recreational demands and where isolated cases of contamination occur. Near national forest boundaries, where urban areas and large developments are occurring, groundwater quantity is declining but quality is generally good.

Groundwater - Uses

On-forest resource and management uses for groundwater include campgrounds, administration sites and recreational cabins. Maintenance of streamflow, distribution of plants and animals, and sociological and economic interests all depend on groundwater. The diversity of plants found in meadows often is a function of the availability of shallow groundwater. The presence of groundwater within the root zone for much of the year maintains many of the valuable habitats within the national forests. Release of water from groundwater aquifers maintains base flows of streams during dry periods. In some cases, groundwater seeps and springs are important to maintaining riparian area viability and habitat. In coming years, national forest managers anticipate increased requests for extraction, storage and distribution facilities on National Forest System lands for groundwater resources.

Much of the groundwater for urban uses comes from aquifers surrounding and sometimes extending into National Forest System lands. Such uses include wells drilled within or adjacent to national forest boundaries for agricultural or industrial uses; withdrawals for commercial developments, water bottling operations, golf courses and snow-making in ski areas; and domestic uses for local communities and private in-holdings. Developments that extract water directly from or immediately adjacent to National Forest System lands are expanding in southern California. The closer the well is to National Forest System lands, and the greater the quantity of water extracted, the higher the potential that the extraction will affect the sustainability of forest ecosystems.

Groundwater extractions, and potentially surface water diversions, are used for snowmaking at ski areas within the administrative boundaries of the San Bernardino and Angeles National Forests. "As private corporations vie for the extraordinary profits to be earned from bottled water, cities are frantically searching for new supplies of water to accommodate population growth, and most often, are turning to groundwater as the solution" (Glennon 2002). Groundwater is valuable both on and off-forest in the form of water supply wells. Some wells are small and serve only one residence or minor use. Others are large and pump large volumes of groundwater. The exact number, distribution, volume of water, or use of wells within the administrative boundaries of the four southern California national forests is not known. The

Forest Service Natural Resource Information System water rights database lists 6 wells on the Cleveland National Forest, 19 on the Los Padres, 35 on the San Bernardino, and 55 on the Angeles National Forest; most are for domestic and mining uses, and some are for agriculture, stock watering and other miscellaneous uses.

Tunnel construction under National Forest System lands can influence groundwater dynamics by changing water flow through, into, and out from groundwater aquifers. Water seepage into a tunnel can heighten the risk of water loss from the aquifer with potential ramifications to surface resources. Since fault zones are often locations of relatively high water flow in fractured rock aquifers, excavation of tunnels through earthquake fault zones can exacerbate this potential, cause changes in aquifer recharge, and affect riparian-dependent resources. Lining tunnels to reduce impacts to aquifers from tunneling operations is extremely costly. Nevertheless, since aquifer integrity and groundwater quality and quantity could be compromised, each new tunnel proposed will be assessed separately for needs such as lining or other seepage control measures.

Existing tunnels on the Angeles National Forest include about 31 miles of water conveyance tunnels (mostly lined), and 0.25 mile of highway tunnels (all tunnel mileages are estimates). On the San Bernardino National Forest, there are several railroad tunnels totaling less than 0.5 mile, no highway tunnels, five water projects and FERC (Federal Energy Regulatory Commission) tunnels totaling 13 miles, and a major water conveyance project in progress that will total about 13 miles of lined tunnel when completed. There are no existing water conveyances or vehicle tunnels on the Cleveland National Forest; however, there are current proposals for five water conveyance tunnels totaling 36 miles and three vehicle tunnels totaling 30 miles. On the Los Padres National Forest, there are four short transportation tunnels totaling less than 0.25 mile, one railroad tunnel bordering the national forest for 0.5 mile, and 3 water conveyance tunnels totaling 12 miles. One of those tunnels (which is only partially lined) contributes an estimated 1,000 acre-feet per year of groundwater, through natural seepage, to the total water outflow. Another is estimated to seep between 1,500 to 3,000 acre-feet per year out of the mountain (Bridgwater pers. comm.). Additionally, an unknown number of miles of mining adits and shafts exist on all four southern California national forests.

Soil

Soil is one of the basic components of the environment. Most living organisms depend on the soil for their initial source of nutrients. Soil absorbs and holds nutrient-rich water, releasing it at varying rates to supply nutrients for microorganisms and plants, which become the food and habitat for larger animals and people. Soils influence the type of vegetation present and many management opportunities and needs. Healthy soils have adequate vegetative cover that is a function of a site's capability and can provide benefits such as forage for wildlife and livestock, water, recreation, wood products, and aesthetics. In turn, few if any activities are conducted on National Forest System lands that do not have the potential to affect soil resources in one way or another.

A land type association (LTA) level ecological unit inventory (EUI) for the four southern California national forests was completed in 2001, which included all land within the boundaries of the Angeles, Cleveland, Los Padres and San Bernardino National Forests, including private, state and tribal lands (O'Hare and others 2000). The EUI found that thermic soils cover 63 percent of the area and are the dominant soils temperature regime (see table 227: Soils Found Within the EUI Area).

Table 227. Soils Found Within the EUI Area

Soil Temperature Regime	% of Area	Mean Annual Soil Temperature °F
Thermic	64	59 to 72
Mesic	34	47 to 59
Frigid	< 2	< 47 or > 47(summer)

EUI: Ecological Unit Area
(Temperatures recorded at 20 inches depth)

Within the four southern California national forests, warm air temperatures coupled with often-shallow soils result in low available moisture to support plant growth and thus lower levels of cover for soil erosion protection. The range of landscape soil units in the EUI demonstrates the complexity of parent materials that occur in the area, while the wide range of soil depths provides evidence of the steepness and high rates of erosion that can occur. Many soils are predominantly coarse-textured, shallow, and highly permeable and have little profile development. These soils are typically 20 inches or less in depth. Deeper, more productive soils are generally found on more stable slopes on gently rolling hills or are located in valley bottoms. They generally have medium or fine texture at the surface layer and fine-textured subsoil with high water-holding capacity.

Two thermic landscape soil units have the most widespread coverage: T2, which constitutes about 23 percent of the area; and T8, which makes up about 16 percent of the area (see table 228: Landscape Soil Units and the percentage of area that they comprise in the southern California National Forests). The two major mesic landscape soil units, M2 and M3, each constitute about 8 percent of the area.

Table 228. Landscape Soil Units and the percentage of area that they comprise in the southern California National Forests

Landscape Soil Units	Percentage of southern CA National Forests
T1, Thermic Sedimentary and Badland Soils, shallow to moderately deep	3.2
T2, Thermic Metamorphic or Sedimentary Soils, shallow to moderately deep	24.6
T3, Thermic Sedimentary Soils, moderately deep to deep	7.7
T4, Thermic Alluvial Soils, deep	2.3
T5, Thermic Mostly Serpentinitic Soils, shallow to deep	0.8
T6, Thermic Rock Outcrop and Very Shallow Soils	1.8
T7, Thermic Calcareous Soils, shallow to deep	0.3
T8, Thermic Granitic and Metamorphic Mountainside Soils, mostly shallow	16.8
T9, Thermic Granitic and Metamorphic Mountainside Soils, shallow to deep	5.0
T10, Thermic Foothill Metavolcanic Soils, shallow to moderately deep	0.4
T11, Thermic Gabbro Red Clayey Upland Soils, moderately deep to deep	0.8
M1, Mesic Sedimentary Soils, moderately deep to deep	2.7
M2, Mesic Granitic, Metamorphic, and Sedimentary Mountainside Soils, shallow to deep	8.3
M3, Mesic Granitic and Metamorphic Colluvial and Residual Soils, shallow to deep	8.5
M4, Mesic Granitic Shallow Soils	7.2
M5, Mesic Granitic Deep Soils	1.5
M6, Mesic Granitic and Metamorphic Soils, shallow to moderately deep	1.1
M7, Mesic Alluvial Deep Soils	2.3
M8, Mesic Granitic and Metamorphic Mountainside Soils, moderately deep to deep	2.8

Landscape Soil Units	Percentage of southern CA National Forests
F1, Frigid Calcareous Soils, shallow to deep	0.5
F2, Frigid Granitic and Metamorphic Mountainside and Colluvial Soils, moderately deep to deep	1.1
Water	0.1

Most soils in the southern California national forests are classified as having low soil productivity (see table 100: Forest Soil Productivity). However, this productivity level does not preclude them from management activities. Properly planned and managed activities maintain and can even improve soil productivity levels.

Table 100. Forest Soil Productivity

National Forest	Productivity group	Estimated % of Forest
Angeles (655,387 acres)	Low	50
	Moderate	27
	High	12
Cleveland (433,958 acres)	Low	70
	Moderate	15
	High	10
Los Padres (1,760,982 acres)	Low	50
	Moderate	35
	High	8
San Bernardino (671,686 acres)	Low	69
	Moderate	10
	High	3

(The remainder of the soils is considered non-productive)

Air

Most air pollution experienced by the four southern California national forests comes from the nearby urban areas. Nearly 6 percent of the United States population lives in southern California. The national forests are located in highly urbanized environments that are administered by ten air pollution control districts (APCDs). The area of the Los Padres National Forest that is administered by southern Kern County air pollution control authorities is minimal in size and is not discussed in detail. All but one of the districts is considered to be in either nonattainment or maintenance status for the federal National Ambient Air Quality Standards (NAAQS), and all are considered to be in nonattainment for state standards (see table 229: Attainment Status (One or More Criteria Air Pollutants)). The degree or severity of nonattainment is displayed in table 230: Southern California Counties Nonattainment Status. The federal and state attainment statuses are based on the level of criteria pollutants measured against the NAAQS and the California Ambient Air Quality Standards. Six principal pollutants (criteria pollutants) are measured: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), lead, and particulate matter as both PM10 (particulate matter less than 10 microns in diameter) and PM2.5 (particulate matter less than 2.5 microns in diameter). Like the NAAQS, individual APCDs have established levels of environmental significance, against which projects are gauged (see table 101: Air Pollution Control District Significance Criteria).

Table 558. Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]		Federal Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Ozone (0_3)	1 Hour	0.09 ppm (180 μg/m^3)	Ultraviolet Photometry	0.12 ppm (235 μg/m^3)[8]	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	—		0.08 ppm (157 μg/m^3)[8]		
Respirable Particulate Matter (PM10)	24 Hour	50 μg/m^3	Gravimetric or Beta Attenuation	150 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 μg/m^3		50 μg/m^3		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		65 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 μg/m^3	Gravimetric or Beta Attenuation	15 μg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	—	Gas Phase Chemiluminescence	0.053 ppm (100 μg/m^3)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.25 ppm (470 μg/m^3)		—		
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	—	Ultraviolet Fluorescence	0.030 ppm (80 μg/m^3)	—	Spectrophotometry (Pararosaniline Method)
	24 Hour	0.04 ppm (105 μg/m^3)		0.14 ppm (365 μg/m^3)	—	
	3 hour	—		—	0.5 ppm (1300 μg/m^3)	
	1 Hour	0.25 ppm (655 μg/m^3)		—	—	—
Lead[9]	30 Day Average	1.5 μg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 μg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption

Pollutant	Averaging Time	California Standards[1]		Federal Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer—visibility of ten miles or more (0.07—30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta attenuation and Transmittance through Filter Tape.		**No Federal Standards**		
Sulfates	24 Hour	25 $\mu g/m^3$	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 $\mu g/m^3$)	Ultraviolet Fluorescence			
Vinyl Chloride[9]	24 Hour	0.01 ppm (26 $\mu g/m^3$)	Gas Chromatography			

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calender year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
4. Any equivalent procedure which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.
5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.
8. New federal 8-hour ozone and fine particulate matter standards were promulgated by U.S. EPA on July 18,1997. Contact U.S. EPA for further clarification and current federal policies.
9. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

California Air Resources Board (7/9/03)

Table 230. Southern California Counties Nonattainment Status

County[1]	Criteria Pollutant	Air Pollution Control Authority	Federal Status[1]	State Status[2]
Los Angeles	Carbon Monoxide	Los Angeles South Coast Air Basin, CA	Serious	Nonattainment
Los Angeles	Ozone	Los Angeles South Coast Air Basin, CA	Extreme	Extreme
Los Angeles	Ozone	Southeast Desert Modified AQMA, CA	Severe-17	Extreme
Los Angeles	PM_{10}	Los Angeles South Coast Air Basin, CA	Serious	Nonattainment
Orange	Carbon Monoxide	Los Angeles South Coast Air Basin, CA	Serious	Attainment
Orange	Ozone	Los Angeles South Coast Air Basin, CA	Extreme	Extreme
Orange	PM_{10}	Los Angeles South Coast Air Basin, CA	Serious	Nonattainment
Riverside	Carbon Monoxide	Los Angeles South Coast Air Basin, CA	Serious	Attainment
Riverside	Ozone	Los Angeles South Coast Air Basin, CA	Extreme	Extreme
Riverside	Ozone	Southeast Desert Modified AQMA, CA	Severe-17	Moderate
Riverside	PM_{10}	Coachella Valley, CA	Serious	Nonattainment
Riverside	PM_{10}	Los Angeles South Coast Air Basin, CA	Serious	Nonattainment
San Bernardino	Carbon Monoxide	Los Angeles South Coast Air Basin, CA	Serious	Attainment
San Bernardino	Ozone	Los Angeles South Coast Air Basin, CA	Extreme	Extreme
San Bernardino	Ozone	Southeast Desert Modified AQMA, CA	Severe-17	Moderate
San Bernardino	PM_{10}	Los Angeles South Coast Air Basin, CA	Serious	Nonattainment
San Bernardino	PM_{10}	Trona, CA	Moderate	Nonattainment
San Diego	Ozone	San Diego, CA	Serious	Serious
San Diego	PM_{10}	San Diego, CA	Attainment	Nonattainment
Santa Barbara	Ozone	Santa Barbara-Santa Maria-Lompoc, CA	Serious	Moderate
Santa Barbara	PM_{10}	Santa Barbara-Santa Maria-Lompoc, CA	Attainment	Nonattainment
Ventura	Ozone	Ventura Co, CA	Severe-15	Severe
Ventura	PM_{10}	Ventura Co, CA	Attainment	Nonattainment
Kern*	Ozone	Kern Co, CA	Serious	Moderate
Kern*	PM_{10}	Kern Co, CA	Attainment	Nonattainment

See Notes, next page

[1] Portions, not all, of some counties are in nonattainment status.
Nonattainment counties relevant to the four southern California forests (US EPA: Criteria Pollutant Area Summary Report (Green Book)). Accessed on-line 7/24/03 at http://www.epa.gov/oar/oaqps/greenbk/astate.html)
[2]Accessed on-line 1/18/05 at http://www.arb.ca.gov/desig/adm/adm.htm
PM_{10}: Particulate Matter less than 10 Microns
*A portion of this county lies within the San Joaquin Valley APCD.

Table 229. Attainment Status (One or More Criteria Air Pollutants)

Air Pollution Control District	Federal Attainment Status	State Attainment Status
Monterey Bay Unified	Maintenance	Nonattainment
San Luis Obispo	Attainment	Nonattainment
Santa Barbara	Nonattainment	Nonattainment
Ventura	Nonattainment	Nonattainment
South Coast	Nonattainment	Nonattainment
San Diego	Nonattainment	Nonattainment
San Joaquin Unified	Nonattainment	Nonattainment
Antelope	Nonattainment	Nonattainment
Mojave	Nonattainment	Nonattainment

Table 101. Air Pollution Control District Significance Criteria

Air District	Pollutant Level of Significance Lb/day			
	ROG	NO_x	PM 10	CO
Monterey Bay Unified	137	137	82	
San Luis Obispo	25	25	25	550
Santa Barbara	240	240	80	
Ventura Ojai Valley	5	5		
Ventura (not Ojai Valley)	25	25		
San Joaquin	10 ton/yr	10 ton/yr		
Mojave	137	137	82	
South Coast	55	55	150	550
San Diego	N/A	N/A	N/A	N/A

Cite: CAPCOA significances levels http://www.arb.ca.gov/coatings/arch/ceqa/feir/appendh.pdf 7/26/03
ROG: Reactive Organic Gases
NO_x: Nitrogen Oxide
PM 10: Particulate Matter less than 10 Microns
CO: Carbon Dioxide

If an area does not meet the NAAQS, the U.S. Environmental Protection Agency (EPA) designates the area a federal nonattainment area. The EPA assigns maintenance status to areas that have recently reached attainment. Standards for PM2.5 (released in 1998) will likely result in additional federal nonattainment areas in southern California. If an area is in federal nonattainment, federal agencies must determine if emissions from their projects will have an adverse effect on the air district's attainment status. This Clean Air Act requirement is referred to as a general conformity determination.

Pollution is generally higher near urban areas, where industry is located and the largest numbers of vehicles are in use. Highway vehicle emissions release a substantial portion of the ozone precursors and hazardous air pollutants (HAPs). The four southern California national forests are located within ten counties whose emissions total 63 percent of the HAPs, 59 percent of the 33 prioritized urban toxics, and

33 percent of the pesticides released in the state (McCorison and others 2003). These same counties also release large amounts of criteria pollutants (see table 232: Air Background emissions).

Table 232. Air Background Emissions

County	PM_{10} (ton/yr)	SO_x (ton/yr)	NO_x (ton/yr)	ROG (ton/yr)
Los Angeles	67,000	19,000	241,000	184,000
Orange	20,000	2,000	64,000	58,000
Riverside	33,000	800	57,000	36,000
San Bernardino	52,000	3,000	101,000	45,000
San Diego	46,000	6,000	80,000	74,000
Ventura	18,000	3,000	23,000	25,000
Santa Barbara	11,000	11,000	29,000	26,000
San Luis Obispo	12,000	4,000	10,000	10,000
Monterey	17,000	500	20,000	16,000
Kern	29,000	4,000	62,000	36,000
Total	305,000	53,300	687,000	510,000

PM_{10}: Particulate Matter less than 10 Microns SO_x: Sulphur Oxide NO_x: Nitrogen Oxide ROG: Reactive Organic Gases

Current ozone concentrations in urban areas near the four southern California national forests exceed the NAAQS, implying that nearby areas within the national forests might also be considered unhealthy for people because of ozone concentrations. Forest vegetation exposures to ozone are causing growth reductions in sensitive plant species on the national forests and could cause these species to become less abundant, or in some cases sensitive genotypes might totally disappear from the national forests (McBride and Miller 1999, Nash and Sigal 1999, Temple 1999).

Common sources of air pollution within the national forests include emissions from wildland fires, unpaved roads, and vehicle emissions. Smoke contributes to PM10/PM2.5 and to a lesser degree nitrogen dioxide, carbon monoxide and ozone levels. Driving on unpaved roads adds to the fine particulate matter (fugitive dust) in the air. Fugitive dust and smoke can become part of the regional air mass, adding to regional haze. Internal combustion engines both on and off the national forests are a major source of nitrogen oxides and reactive organic gases (ROG), which are precursors to ozone.

Local visibility is affected by several variables, including the amount, size, and type of airborne aerosols and particulates. Visibility data from the San Gorgonio Air Quality Monitoring Station have remained relatively constant for the past six years, with the top 10 percent of annual visual ranges averaging between 112 and 124 miles (180 and 200 km), and the lower 10 percent ranges averaging between 24 and 26 miles (38 and 42 km) (McCorison and others 2003). These visibility ranges reflect the influence of local meteorology and the levels of pollutants reaching the national forests generated within the Los Angeles Basin. This effect can be far-reaching; pollutants from the Los Angeles Basin were found by the Grand Canyon Visibility Transport Commission to be one of the clearly identifiable sources of regional haze affecting the Grand Canyon and Colorado Plateau.

Of the 21 wildernesses administered by the southern California national forests, the Clean Air Act has designated seven of them mandatory Class I areas (see table 231: Southern California Forest Class I Areas). In a Class I area, increases in particulate matter and sulfur dioxide over baseline concentrations may not exceed levels set by the the Clean Air Act. A total of 553,360 acres is classified as Class I. All of the remaining land in the four southern California national forests is Class II.

Table 231. Southern California Forest Class I Areas

Wilderness	Acres	Forest
San Gabriel	36,118	Angeles
Agua Tibia	15,933	Cleveland
San Rafael	197,380	Los Padres
Ventana	202,178	Los Padres
Cucamonga	12,781	San Bernardino
San Gorgonio	56,722	San Bernardino
San Jacinto	32,248	San Bernardino

Geologic Resources and Hazards

Geologic resources and hazards affect forest management activities and vice versa. Geologic resources include unique landscapes and scientifically valuable geologic, geomorphic and paleontologic features; critical groundwater/aquifer resources that supply water for humans and ecosystem sustainability; minerals; and materials with unlimited uses.

The Forest Service approach to geologic hazards has evolved beyond merely fixing troublesome landslides to a broader understanding of the inter-relationships between the factors that cause slope instability and the effects of that disturbance on the overall landscape and ecosystem. Earth movement affects groundwater and surface water flow and quality, increases soil erosion and downslope sedimentation, alters plant and animal habitat and communities, and potentially affects human activities and facilities (for example, landslides, earthquake activity). Conversely, fire and land disturbance from roads, trails, facilities and other human uses affect the potential for increasing landslides, debris flows, and other forms of slope and channel instability by changing slope cover and steepness, root viability, water availability and uptake, soil loss and compaction, and surface drainage patterns.

The physical characteristics of the mountain ranges set the stage upon which ecological phenomena operate. For example, where plants and animals find a home depends first upon the lay of the land. Mountains, valleys and plains each define different microclimates. Subtle differences in landforms, rock types and outcrop extent, surface water, soil moisture, aspect, and the size and location of groundwater aquifers and recharge zones are all subject to management and can create differences in plant and animal habitats, stimulating evolutionary diversification. The lay of the land changes at a slow rate when the natural and man-made disturbances are minimal, and it changes rapidly when major environmental events and/or human disturbances occur.

The relationship between geology and the occurrence of plants and animals is vital and complex. Some plants are endemic to specific rock types (such as carbonate or serpentine plants) or rock-geomorphic settings (pebble plain plants). Some plant-animal communities are endemic to geomorphic settings (such as vernal pools on basalt flows). More common are plants restricted to particular rock compositions that produce habitat for certain species (for example, in granitic rocks black sage [*Salvia mellifera*] is largely restricted to the rock type called gabbro and thus affects in part the distribution of the coastal California gnatcatcher). Some cactus species are partial to volcanic and/or conglomeratic sedimentary rocks that host the coastal species of the cactus wren (Morton pers. comm.).

More than 600 different rock units have been named and mapped in the area of the four southern California national forests (Morton pers. comm.). Each rock unit has different chemical and physical properties and responds differently to earthquakes and landslides, weathering and erosion, excavations and other land uses.

Southern California is one of the most tectonically active regions in the United States. Many of the mountains are younger, the rocks are more fractured and deformed, and the slopes are steeper and more often subject to landslides and intense surface erosion than most other mountain ranges. Certain rock types (such as shale and "Franciscan" rocks on the Los Padres National Forest, schist and other "basement rocks" on the Angeles and San Bernardino National Forests, and certain volcanic and metasedimentary rocks on the Cleveland National Forest) are more prone than others to erosion and various types of landslides, which can present increased risks to humans, facilities and other resources.

Geologic Setting

Understanding the physical characteristics of mountain ranges in southern and central California is important to recognizing how and why there is such great variety in ecosystem composition and distribution and to identifying the potential for providing for human uses and affecting management activities. The following discussion references each of the mountain ranges within the four southern California national forests (see map at `http://www.fs.fed.us/r5/scfpr/map/geology.pdf`).

Starting from the north and moving southward, the Coast Ranges on the Los Padres National Forest—consisting of the Santa Lucia Range (from Monterey to the Cuyama River); the Caliente and La Panza Ranges (S. San Luis Co.); and the San Rafael, Sierra Madre and San Emigdio Ranges (including Mt. Pinos)—are a series of mountains that roughly parallel the San Andreas Fault and the Pacific Ocean coastline between San Francisco Bay and Santa Barbara County. River drainage patterns are strongly controlled by geologic structures such as faults and folds, producing major river systems such as the San Antonio, Nacimiento, Cuyama and Sisquoc rivers. Differences in rock types are associated more with fault boundaries than with changes between mountain ranges.

Dominant on the Monterey District are two very different types of "basement rocks" that have been thrust dramatically upward and exposed within the Coast Ranges. Between the San Andreas and Sur-Nacimiento faults, basement rocks known as the Salinian Block consist of metamorphic rocks and granitic plutons. Southwest of the Sur-Nacimiento Fault Zone, basement rocks are ocean crust sedimentary and volcanic rocks of the Franciscan Formation. Further south in the Santa Lucia District (southern Santa Lucia Range), the Franciscan rocks phase out and younger sedimentary sandstone, shale and conglomerate predominate. Mineral deposits (mostly in Franciscan rocks) include mercury, chromium, gold, silver, gypsum, antimony, jade, uranium, slab-rock and limestone/marble. Most of the highest priority abandoned mines have been reclaimed but a few still need mitigation of hazards. Oil and gas is produced in the Cuyama basin, part of which is within National Forest System land. Terrestrial sedimentary formations underlying the Cuyama Badlands contain important vertebrate fossils that in the past have been legally collected under permit and curated by various museums and educational institutions, but illegally collected by others.

The Transverse Ranges are a unique east-west oriented physiographic province within California. The province includes a number of sub-parallel mountain ranges and intervening valleys that extend eastward from the offshore Channel Islands in the Pacific Ocean to the desert area where the province forms the boundary between the Mojave and Colorado Deserts. All of the Angeles National Forest and parts of the Los Padres and San Bernardino National Forests are within this physiographic province. The mountain ranges included within these national forests from west to east are the Santa Ynez, Topatopa, Sierra Pelona, San Gabriel, and San Bernardino mountains. These ranges are characterized by a very diverse and structurally complicated array of rock types, representing a repository of mineral wealth, a multitude of diverse biological habitats, and one of the most structurally active fault zones in the country. They form a youthful and rugged landscape, as well as dynamic changing landscapes in response to seismic activity, landslides, flooding and other natural events. The San Andreas Fault separates the San Gabriel from the San Bernardino Mountains. Much of the earthquake activity occurs along numerous faults throughout the ranges. Some of these faults are mapped, others are not.

The Santa Ynez-Topatopa Mountains, and smaller mountain segments to the north within the Los Padres National Forest, are composed almost entirely of marine sedimentary rocks of Cenozoic and late Mesozoic age. North of Santa Barbara is the southernmost extent of the highly disorganized ocean-floor rock types called the Franciscan Formation. In the vicinity of Mount Pinos are older Mesozoic granitic rocks and Precambrian and Mesozoic metamorphic rocks. These basement rocks are elevated adjacent to the major active San Gabriel and San Andreas faults, which border the national forest on the northeast side. Other major fault zones include the Santa Ynez and the San Cayetano faults. Many smaller faults and folds criss-cross the landscape and have been mapped by legendary geologist, Thomas W. Dibblee Jr., who donated his geologic mapping of the Los Padres National Forest to the Forest Service in 1979. Landslides (often triggered by earthquakes) are common, especially in shale and clay formations.

The chief mineral resources of the Santa Ynez-Topatopa Mountains are oil and gas, mercury, gypsum, phosphate, borates, geothermal, clay and gold. Forest-wide, the Sespe, Upper Ojai, and Cuyama oil fields are historical and currently active oil and gas producers, and other areas are mapped as high potential for oil and gas occurrence. Groundwater development and three water conveyance tunnels on and adjacent to the national forest have tapped vast sources of water near and within the national forest, but the effects on other resources and regional groundwater levels are not completely understood.

The Sierra Pelona Mountains and Ridge Basin Block cover the western part of the Angeles National Forest. They are composed of metamorphic (notably the Pelona Schist) and plutonic rock or volcanic rock at higher elevations, and folded and faulted sedimentary rocks in the lower elevations and along the major San Gabriel Fault Zone. The "Pelona Schist" is a geologic formation known for numerous, large, slow-moving landslides that have affected water flow and road stability in some areas.

The San Gabriel Mountains consist of some of the most tectonically active mountains in the United States; they include a variety of some of the oldest "granitic" and metamorphic (schist and gneiss) rocks in California. Along the margins of the San Gabriel Mountains are exposures of younger sedimentary and volcanic rocks. A major fault (the Vincent Thrust) is related to a large number of occurrences of tungsten and gold. Placer gold in both the San Gabriel River and Lytle Creek was probably derived from rock adjacent to the Vincent Thrust. Numerous mineral deposits of economic value have been mined, including magnetite, gold, tungsten, titanium, quartz, anorthosite, iron, feldspar, silica, marble, graphite and common variety minerals.

The San Gabriel Fault Zone traverses the length of the southern part of the Angeles National Forest. The San Andreas Fault is located along the north side of the mountains, crossing Big Pines Highway and California State Route 2. Abundant landslides form widespread and important physiographic elements in the highly fractured rocks. The Crystal Lake, Cow Canyon, Manker Flats and Coldwater Canyon landslides are some of the largest landslides in southern California. The Heath Canyon landslide above Wrightwood produces material for debris flows that are a hazard for Wrightwood. Besides the Pelona Schist, other basement rocks commonly develop large, fast-moving rock avalanches in steep terrain. Large areas of the San Gabriel Mountains are subject to fast-moving debris flows during wet winters (Morton pers. comm.). The large landslides are infrequent occurrences but demonstrate the potential hazards to development below unstable areas.

Separating the San Gabriel and San Bernardino Mountains is Cajon Pass, where numerous vertebrate and invertebrate fossils of considerable scientific interest have been found, some of which are curated at the county museums of Los Angeles and San Bernardino Counties.

The San Bernardino Mountains consist primarily of Mesozoic and older crystalline basement rocks. Included are granitic rocks of Cretaceous, Jurassic and Triassic age and metamorphic rocks of Mesozoic, Paleozoic and Precambrian age. Paleozoic and late Precambrian rocks include extensive carbonate rocks, some of significant economic importance. Minor deposits of younger marine and terrestrial sedimentary rocks occur both within and along the mountain flanks. These mountains include the highest peak and the only mapped glacial deposits in southern California. Minerals of value include large, rare (in the western U.S.), exceedingly pure deposits of carbonate rocks, common variety deposits (sand and gravel), gold, silver, lead, copper, tungsten and graphite. The San Andreas Fault Zone borders the southern edge of these mountains. Landslides are common in the San Bernardino Mountains and include the famous

Blackhawk landslide, which traveled northward from the mountains almost three miles onto the desert floor by riding a layer of compressed air (Morton 2002). The Forest Falls area of Mill Creek has been the site of numerous debris flows, avalanches, and boulder falls, triggered by earthquakes and monsoonal rainfall.

South of the Transverse Ranges are the Peninsular Ranges. These ranges include the San Jacinto and Santa Rosa Mountains within the San Jacinto District of the San Bernadino National Forest, along with the Santa Ana, Agua Tibia-Palomar-Aguanga, and Cuyamaca-Laguna Mountains on the Cleveland National Forest. The Peninsular Ranges extend 775 miles south of the border to the tip of Baja California, Mexico. The core of the ranges in southern California is the Peninsular Ranges Batholith, composed of granitic intrusive rocks and surrounded on the east and west sides by older metamorphic rocks. These ranges have been faulted and eroded in-place longer than other California mountain systems, have not been significantly folded, and have erosional surfaces and drainage patterns quite different from the Transverse and Coast Ranges. They also have fewer landslides than the San Gabriel and San Bernardino mountains.

The San Jacinto and Santa Rosa Mountains have a core or basement of granitic (quartz diorite plutons) rocks; some metamorphic (banded gneiss) and metasedimentary rocks; and minor amounts of younger sedimentary rocks and valley fill deposits. These rocks were compressed (squeezed up) between the San Jacinto and Banning faults, both considered active. The San Jacinto and Hot Springs fault zones and various associated sub-parallel faults pass through the western and southern portions of the San Jacinto Ranger District. Landslides are common in the San Jacinto River area but absent in much of the rest of the district. However, rockfalls are common on the north and east sides of the San Jacinto Mountains. Past mineral prospects include gold, tungsten, tourmaline, feldspar, quartz and marble.

The Santa Ana Mountains (covered by the Trabuco Ranger District of the Cleveland National Forest) are dominantly older (Mesozoic) deformed marine sedimentary rocks intruded by granitic rocks, overlain by volcanic rocks, and flanked by younger sedimentary rocks. The major active Elsinore fault zone forms the northeast range boundary. Many smaller faults are located within the mountains, especially within the sedimentary rock units. Landslides are abundant in the sedimentary, volcanic and prebatholithic rocks, with only a few within the batholithic rocks. Mineral prospects have included gold, copper, lead, silver, zinc and clay.

Included within the Palomar Ranger District are the Agua Tibia-Palomar-Aguanga Mountains and Pine Mountain areas in the north and the more subdued topographic area west of Mesa Grande. The district is mainly underlain by batholithic, metamorphic rocks and intermixed granitic and metamorphic rocks. Younger sedimentary rock is mostly confined to valley bottoms. The Elsinore Fault Zone separates the northern Agua Tibia-Palomar-Aguanga Mountains area from the Mesa Grande area. The northern portion of the Palomar Ranger District is laced with numerous sub-parallel faults between the Elsinore and Agua Caliente fault zones. The south Palomar area appears to be devoid of active faults and extensive landslides.

Three major gem pegmatite areas are adjacent to the Cleveland National Forest, with small, mineralized zones extending onto the national forest. Just south of the western part of the Palomar Ranger District is the Pala pegmatite district. The Pala pegmatite district and Mesa Grande district to the south are the two most important gem pegmatite districts in California. Pala pegmatite dikes produced gem tourmaline and kunzite, the lilac-colored gem variety of spodumene that was first found at Pala. The Stewart pegmatite dike was the principal source of lithium for the United States for a number of years. Southeast of Pala is the Rincon pegmatite district, known more for beryl and quartz crystals than tourmaline. Mines in the Himalaya dike in the Mesa Grande pegmatite district were the major producers of gem tourmaline. The Himalaya mine alone produced about 90 tons of tourmaline, probably more than any other tourmaline mine in the world. Several pegmatite dikes were mined for gem material on Aguanga Mountain and in the Pine Mountain area. Near Black Mountain, south of Mesa Grande, an area of gabbro has been prospected for nickel.

The Laguna and Cuyamaca Mountains cover the east side of the Descanso Ranger District, with smaller peaks and ranges to the west. This district is dominantly granitic with scattered zones of gabbro intrusive and hybrid rocks (mixed granitic-metamorphic rocks). A large zone of schist extends from north of Cameron Guard Station to north of Julian. The schist is of interest because of occurrences of gold-bearing veins. The most productive gold mines were in the Julian district, slightly overlapping the northeast corner of the southern Descanso Ranger District. Various other gold mining districts had historical mining activity. In the Cuyamaca area east of Harrison Park, almost on the national forest boundary, a small amount of nickel-cobalt-copper-bearing gabbro was mined at the Friday Mine. Other minerals include quartz, feldspar and tungsten. The active Elsinore fault zone borders the eastern side of the district; no extensive landslides are recognized.

Geologic Resources

Geologic resources that may be affected by, or have an effect on, management activities include:

- Geologic character and scenic beauty of the landscape: cliffs, peaks, gorges, outcrops, "roadcuts," "badlands-type" erosional features, etc.;
- Fossil (paleontologic) resources, both vertebrate and invertebrate;
- Cave resources;
- Groundwater resources (see Watershed section on groundwater, page 209);
- Locatable, leasable and common variety minerals used for industrial, pharmaceutical, strategic, energy and valuable gemstone and mineral wealth purposes (see Minerals and Energy section);
- Geologic special interest areas (see special area designations descriptions in the forest plans);
- Rock and soil construction materials and fill; and
- Rocks and minerals collected by rockhounds.

The southern California area has important paleontologic (fossil) resources that are sought by collectors, universities and museums. Some of these scientifically important fossil resources are being lost to rapid deterioration and decomposition when exposed on the surface, and others are being lost to unauthorized collecting. The lack of a paleontologic resources management plan is a barrier to an organized management approach. Rare but significant known assemblages of vertebrate fossils occur on the Los Padres, San Bernardino and Angeles National Forests; these include the remains of camels, three-toed horses, oreodents, pronghorn antelope, sloths, whales, dolphins, turtles and many smaller mammals and rodents. Invertebrate fossils are much more common and are legally collected in small quantities for personal, non-commercial use.

Few cave resources have been inventoried in southern California; most known caves are small and often associated with cultural and biologic resources. Larger caves may be present on National Forest System land, particularly in limestone deposits; when discovered they may require special protection for unique or delicate features or other management action.

Areas of distinctive geology and related historical activities provide interpretative opportunities for the public and enhanced recreation experiences. For example, Quatal Canyon on the Los Padres National Forest (the only designated geologic special interest area in the four southern California national forests) has excellent examples of spectacular badlands topography; distinct (scenic attractiveness class "A") scenery; geomorphic features; and unique fossils. It provides scientific, educational and recreational opportunities for visitors but needs interpretation and protection from vandalism. Areas that may be considered as special interest areas over the life of the plan include: Mormon Rocks on the San Andreas

Fault; gemstone outcrops on the Cleveland National Forest; areas of historical placer gold mining and oil drilling on the Angeles and Los Padres National Forests; and the world-famous San Andreas fault zone.

Rock and soil construction materials and fill sources are generally small and used for road maintenance projects. However, there are significant sand and gravel deposits within the four southern California national forests in close proximity to large urban centers. Additional sources will likely be requested. Exploitation of these resources could have impacts on other resources. These are described more fully in the Minerals and Energy section.

Rocks and minerals are collected for personal use from many locations on the four southern California national forests, and collection is allowed, in some cases through a special-use authorization, for non-commercial purposes.

Geologic Hazards

Geologic hazards that may be affected by, or have an effect on, management activities include:

- Slope and channel instability (landslides, debris flows, rockfalls, mudflows, soil slips, dry ravel) and associated issues of appropriate disposal of slide waste materials;
- Seismic zone activity (earthquake shaking, ground rupture or displacement, seismic induced waves on water bodies [seiches]);
- Subsidence, collapse and liquefaction;
- Foundation failures associated with dams, roads, bridges and retaining structures;
- Flooding and snow avalanches;
- Naturally occurring rocks with toxic heavy metals or other hazardous minerals;
- Acid mine drainage;
- Wind-blown dust (source of silicosis);
- Coastal cliff erosion (applies only to the Monterey Ranger District of the Los Padres National Forest), and hazardous streambank erosion;
- Abandoned/inactive mines (and associated physical and chemical hazards) and abandoned/inactive landfills (which may contain hazardous materials and pathogens that could contaminate groundwater, surface water and soil);
- Contaminated groundwater (covered in the Watershed section); and
- Volcanic activity (present in northern California but has not been an issue during historical times in central/southern California).

Geologic hazards can cause great risk to human health and safety and can cause costly repairs, environmental effects, and inconveniences for communities, travel corridors and businesses. Encroaching urbanization and increasing recreation uses can affect and be affected by many of the hazards listed above. The risk of creating or exacerbating geologic hazards and risks to humans, facilities and other resources can be greatly increased by wildland fire and by disturbance from land management activities such as road construction, reconstruction or maintenance, mining, oil and gas exploration and development, recreation developments and uses, and construction and operation of dams, reservoirs and tunnels. A tragic example was the loss of 15 lives during the "Christmas Storm" (2003) on the San Bernardino National Forest, where debris flows from saturated slopes burned in the Old and Grand Prix fires of October 2003 devastated church retreat facilities, commercial campgrounds, and residential developments located within floodplains and on alluvial deposits.

Humans can be at risk by driving or recreating in landslide-prone terrain, living or working in facilities beneath or near the edge of steep slopes subject to landslides and rockfall, or recreating in unsafe abandoned mines or areas with toxic materials. Landslides, debris flows, earthquakes and floods are the primary hazards that affect buildings, roads and other improvements. These same hazards can adversely affect other resources, such as water quality, plant and animal species and habitats, and archaeological sites. In addition, the soil and rock materials deposited by these hazards often must be removed from roadways, drainage structures, sediment catchment structures, and so forth, and placed in stable, approved sediment placement sites. The lack of sufficient approved sites is an issue to be addressed during project planning.

All four southern California national forests are prone to seismic hazards; however, the three northernmost national forests have most of the landslide concerns. Extracting groundwater has been known to cause earthquakes, land subsidence and drying up of wells and riparian areas. Earthquakes often cause landslides and can cause soil liquefaction and large waves in water bodies. Areas disturbed by landslides frequently attract invasive nonnative plants, alter vegetative communities and animal habitats, and alter stream courses. Some rock and soil types are susceptible to deep-seated mass movements, others to shallow soil slips, surface erosion, or dry ravel. Some are quite stable under most circumstances unless over-steepened by faulting or man-made excavations. "Outwash" of upland slide material can cover and decrease the fertility of downslope agricultural lands and damage roads or structures in its path.

The San Andreas Fault (one of the world's largest vertical faults) is the boundary between two major tectonic plates and traverses the Los Padres, Angeles and San Bernardino National Forests. Numerous other associated faults (many of which are active) formed as tectonic pressures squeezed the mountain ranges up.

Flooding often follows catastrophic fire events and usually is increased in volume by soil and rock material from debris flows, erosion and landslides. Flooding is also addressed in the Watershed and Wildland Fire and Community Protection sections. Snow avalanches can occur at higher elevations, especially on north-facing slopes, and are especially hazardous in snowplay areas. Both of these fast-moving natural phenomena present increased risks to humans.

Toxic substances are commonly recognized as potential by-products of industrial and mining operations. Less known is that toxic substances naturally occur on some of these National Forest System lands. Certain rock formations contain toxic heavy metals or cancer-causing minerals, such as asbestos, mercury, lead, silicon and radon. Acid mine drainage can occur where sulfides contribute acid discharge to surface water or groundwater (Griggs and Gilchrist 1983). Mining, road building and other surface disturbances can bring these substances into contact with people, either directly through dust, or indirectly through water.

Coastal cliff erosion is present along the Big Sur coast of the Los Padres National Forest. The coastline is estimated to erode at an average rate of four feet per year, more in some areas, less in others (Duffy pers. comm.). The implications are that California State Highway 1 (which passes along coastal cliffs for approximately 43 miles through National Forest System land) endures frequent and massive landslides, primarily from the highly unstable Franciscan Formation, on an almost annual basis as the coastline recedes. As a result, substantial amounts of slide material need sediment placement sites, requiring dedication of stable and suitable National Forest System land for that purpose.

The environmental and safety problems related to abandoned mine sites on or affecting National Forest System land are of increasing concern. Polluted run-off from chemicals or acid mine drainage represents a potential water quality and habitat concern. Physical hazards (such as vertical shafts, unstable adits and eroding mined landscapes and tailings) are also potential problems. In addition, bats or other wildlife (some of which are threatened, endangered, proposed, candidate or sensitive species) inhabit some of the mines. When mines undergo reclamation, bat and other wildlife surveys are conducted to prescribe any needed mitigation.

In the mid 1990s, the southern California national forests inventoried abandoned and inactive mines (AIM) to assess their impact on human health and safety and the environment. Approximately 500 abandoned or inactive mine sites out of approximately 550 locations on the four southern California national forests were inventoried as sites for field examination. Of these, a total of 21 sites with chemical hazards (such as acid rock drainage) were identified in the field, and an unknown number of sites contained varying degrees of physical hazards. The national forests annually review the results of these inventories and determine which of the highest priority sites need additional investigation or reclamation; many of the highest priority sites have already been fixed.

Social and Economic Environment

Social considerations include the social value that public lands provide to the various visiting and surrounding population and, conversely, how the demographic makeup and values of people influence how the public are managed. Humans are part of the ecosystem and are integral to management of the national forests in perpetuity. Economic considerations include an assessment of impacts on the regional economy and the economic efficiency of the alternatives in terms of the value of national forest benefits relative to the cost of providing them.

A socioeconomic assessment of southern California was completed in late 2001, to provide a foundation of social and economic information for the development of natural resource policies, strategies and decisions. Three major reports (including the assessment) provide the research base from which much of the following information for the Affected Environment is drawn. The three reports are: *Southern California Socioeconomic Assessment: Sociodemographic Conditions, Projections, and Quality of Life* (Struglia and others 2003); *Atlas of Social and Economic Conditions and Change in Southern California* (Raettig and others 2001); and *The Role of Population Projections in Environmental Management* (Struglia and Winter 2002). This research provides a snapshot of the socioeconomic conditions and projected future conditions for the socioeconomic area surrounding the four southern California national forests (Angeles, Cleveland, Los Padres and San Bernardino). The socioeconomic assessment and supporting research are organized around a geographic region of influence. The region includes 26 California counties that constitute five regionally and politically distinct areas, selected for their geographic proximity or relationship to the national forests. These five areas are: Southern California Association of Governments (SCAG), Association of Bay Area Governments (ABAG), Central Valley, Central Coast, and San Diego Association of Governments (SANDAG). The county makeup of the five areas is as follows:

- **ABAG**: Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Solano;
- **Central Coast**: Santa Cruz, Santa Barbara, San Luis Obispo, Monterey;
- **Central Valley**: Fresno, Kern, Kings, Merced, Sacramento, San Benito, San Joaquin, Stanislaus;
- **SANDAG**: San Diego; and
- **SCAG**: Imperial, Los Angeles, Orange, Riverside, San Bernardino, Ventura.

Where possible, information that was used from the above reports has been updated with data from the 2000 Census. The research is supplemented with additional information from the 2000 Census and additional sources, as cited.

Population Trends and Urban Envelopment

The Angeles National Forest lies within Los Angeles, San Bernardino and Ventura counties, which are home to approximately 12 million people. The San Bernardino National Forest lies within San Bernardino and Riverside counties, which are home to approximately 3.3 million people. The Cleveland National Forest lies within San Diego, Orange, and Riverside counties, which are home to approximately 7.2 million people. The Los Padres National Forest (which covers the largest area and is the most rural in character) occupies the Central Coast area within Kern, Ventura, Santa Barbara, San Luis Obispo, and Monterey counties, and has an adjoining population of approximately 2.5 million people. The population is expected to increase through 2040 in all counties, with the Central Valley Region expected to have the largest increase in population across the forecast period (from 1990 to 2040). In 2000, 91percent of the total state's population resided in the socioeconomic geographic region of influence, which includes the San Francisco Bay Area.

Historical

Southern California and the state as a whole have shown similar rates of population increase and exceed the national rate of increase. While the United States population increased by 11.6 percent between 1990 and 2000, both California and the study area grew 12.0 percent. Rapid growth is expected over the next two decades. Total population in the assessment area is projected to grow from 31 million in 2000 to 39 million in 2020 (see table 460: Population Growth Trend, 1960 - 2020).

Table 460. Population Growth Trend (in Millions), 1960-2020

1960	1970	1980	1990	2000	2010	2020
15	19	22	28	31	34	39

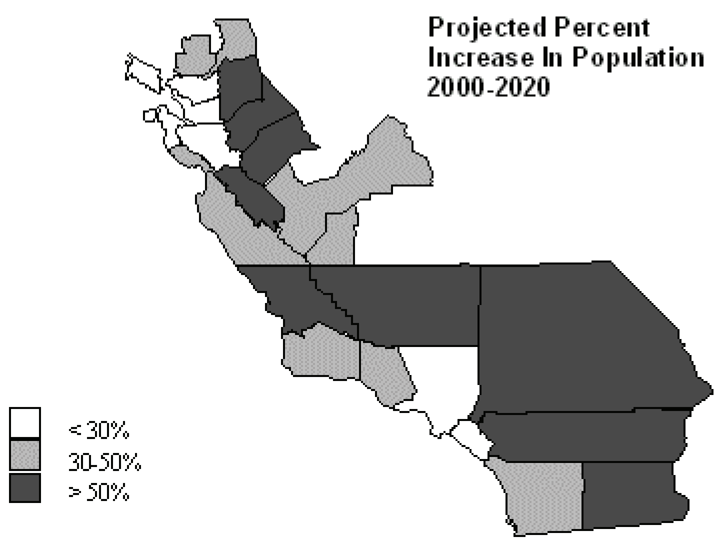
Table Source: Interim County Population Projections; State of California; Department of Finance; Demographic Research Unit; http://www.dof.ca.gov/HTML/DEMOGRAP/repndat.htm#projections

Projections

Los Angeles County had the highest population increase in the 1990 census, followed by San Diego County. In 2000, Orange County replaced San Diego County as the county with the second highest population. Also in 2000, San Bernardino County surpassed Santa Clara County, Riverside County surpassed Alameda County, and Monterey County surpassed Santa Barbara County in population (Struglia and others 2003).

These population trends can be translated into measures that further describe the nature of the populations surrounding the four southern California national forests. Table 168: Population Characteristics Compared for the U.S., Calif, and So. Calif Assessment Areas in 1990 and 2000 (Part 1 of 2) shows populations numbers by total, ethnic group, population density and other characteristics in comparisons among the United States, the state of California, and five areas of influence.

Looking at persons per square mile in table 169: Population Characteristics Compared for the U.S., Calif, and So. Calif Assessment Areas in 1990 and 2000 (Part 2 of 2), the populations surrounding the four southern California national forests are typically much higher in density than the rest of California and the national average. The populations are also more diverse, particularly with respect to Hispanics and Asian/Pacific Islanders. In addition to being dense, the populations are in immediate proximity to national forest boundaries. The only exception to this is the Central Coast area, in which the Los Padres National Forest is located. Densities are lower in this region, reflecting not only a moderately more rural character but also a very large forest in the Los Padres, which occupies a significant part of the



Source: Interim County Population Projections; State of California; Department of Finance; Demographic Research Unit; http://www.dof.ca.gov/HTML/DEMOGRAP/repndat.htm#projections area and which drives densities down. But even the Los Padres National Forest is significantly affected by adjoining urban populations and is facing trends toward surrounding urban envelopment.

The increases in regional population and community development immediately adjacent to national forest boundaries have a number of foreseeable management impacts within the national forests themselves. Demands will increase for corridors across the national forests for transportation, water and utilities to support the urban infrastructure. In addition to current extensive use of national forest mountaintops for electronic sites from which signals can be radiated over long distances, there will be a need for cell phone sites along transportation corridors. Because surface water sources are fully used, there will be continued demand for additional groundwater withdrawals. The proximity of communities will require formation of fire safe councils and prioritization of fuels treatments in community defense zones to reduce the danger of the spread of fire from the national forest to the community and vice versa. Demands will increase for recreation and other special-uses requiring facilities tailored to population diversity, with an emphasis on access.

Table 168. Population Characteristics Compared for the U.S., Calif, and So. Calif Assessment Areas in 1990 and 2000 (Part 1 of 2)

Variable	United States		California		SANDAG		SCAG	
	1990	2000	1990	2000	1990	2000	1990	2000
Total Population (mm)	248.7	281.4	29.8	33.9	2.5	2.8	14.6	16.5
Percent of the State (%)								
Hispanic or Latino (of any race) (%)	9.0	12.5	25.8	32.4	20.4	26.7	33.1	40.6
Not Hispanic or Latino (%)	91.0	87.5	74.2	67.6	79.6	73.3	66.9	59.4
One Race	N/A	85.8	N/A		N/A	70.4	N/A	57.1
White (%)	75.6	69.1	57.2	48.8	65.4	55.0	49.7	38.8
Black or African American (%)	11.7	12.1	7.0	7.0	6.0	5.5	8.0	7.3
American Indian or Alaska Native	0.7	0.7	0.6	1.1	0.6	0.5	0.4	0.4
Asian/other Pacific Islander (%)	2.8	3.7	8.8	11.9	7.4	9.1	8.8	10.4
Some Other Race (%)	0.1	0.2	0.2	1.1	0.2	0.2	N/A	0.2
Two or More Races	N/A	1.6	N/A	2.7	N/A	2.9	N/A	2.3
Persons per square mile	70.3	79.6	190.8	217.2	594.1	670	383.9	434.7
Average Household Size	2.63	2.59	2.79	2.87	2.69	2.73	2.98	3.08
Median Age	32.9	35.3	31.4	33.3	30.9	33.2	30.6	32.3
Education, persons 25 or older								
Less than a 9th grade education	10.4	7.5	11.2	11.5	7.6	7.9	13.8	13.7
High school graduate or higher	75.2	80.4	76.2	76.8	81.9	82.6	72.2	73.0
Bachelors degree or higher	20.3	24.4	23.4	26.6	25.3	29.5	18.7	20.9

Notes for Tables 168 and 169:
NA = not available
— = not applicable
Sources: U.S. Department of Commerce, Bureau of the Census 2000;
Source: U.S. Census Bureau
Note: This table provides a summary for the United States of the data that are included in the Redistricting Data Summary File for states. Data are shown for the population indicating one race and for the population indicating two or more races. The population of one race is the total of the population in the 6 categories of one race. The population of two or more races is the total of the population in the 57 specific combinations of two or more races. The redistricting files for states include data for all 63 groups.
This table summarizes data from the four detailed tables in the redistricting files for states. The difference between the population by race in 1990 and the population by race in 2000 is because individuals could report only one race in 1990 and could report more than one race in 2000. Due to other changes in the census

questionnaire, the race data for 1990 and 2000 are not directly comparable. Thus, the difference in population by race between 1990 and 2000 is due both to these changes in the census questionnaire and to real change in the population. 2 Numbers for the six race groups may add to more than the total population and the six percentages may add to more than 100 percent because individuals may indicate more than one race. For example, a person indicating "American Indian and Alaska Native and Asian and Native Hawaiian and Other Pacific Islander" is included with American Indian and Alaska Native, with Asian, and with Native Hawaiian and Other Pacific Islander. 3 The Hispanic or Latino population may be of any race. Source: Table 3 in this news release, and U.S. Census Bureau, 1990 census.
SANDAG: San Diego Association of Governments
SCAG: Southern California Association of Governments

Table 169. Population Characteristics Compared for the U.S., Calif, and So. Calif Assessment Areas in 1990 and 2000 (Part 2 of 2)

Variable	California		Central Coast		Central Valley		ABAG	
	1990	2000	1990	2000	1990	2000	1990	2000
Total Population (mm)	29.8	33.9	1.2	1.3	3.4	4.1	5.5	6.2
Percent of the State (%)								
Hispanic or Latino (of any race) (%)	25.8	32.4	25	33.2	23.8	31.4	15.7	19.5
Not Hispanic or Latino (%)	74.2	67.6	75	66.8	76.2	68.4	84.3	80.5
One Race	N/A		N/A	64.4	N/A	65.2	N/A	77.2
White (%)	57.2	48.8	66.5	57.1	62.0	49.9	58.8	47.8
Black or African American (%)	7.0	7.0	3.2	2.3	5.9	6.4	9.3	7.9
American Indian or AlaskaNative	0.6	1.1	0.6	0.5	0.9	0.8	0.5	0.3
Asian/other Pacific Islander (%)	8.8	11.9	4.6	4.3	7.4	8.0	15.8	20.8
Some Other Race (%)	0.2	1.1	N/A	0.2	N/A	0.2	N/A	0.3
Two or More Races	N/A	2.7	N/A	2.3	N/A	3.1	N/A	3.4
Persons per square mile	190.8	217.2	119.5	132.9	150.8	180.3	1203	1350
Average Household Size	2.79	2.87	2.72	2.79	2.96	3.06	2.60	2.66
Median Age	31.4	33.3	31.8	34.4	29.8	31.1	34.0	36.2
Education, persons 25 or older								
Less than a 9th grade education	11.2	11.5	10.0	11.1	15.8	14.7	6.8	6.9
High school graduate or higher	76.2	76.8	79.5	79.1	68.8	71.1	83.8	84.9
Bachelors degree or higher	23.4	26.6	25.2	28.2	14.4	15.4	31.7	38.2

As the area becomes more urbanized, there is high value placed on natural-appearing landscapes and their preservation for future generations. This attitude is part of a national trend. The generation of local income, jobs and commercial activities from national forest sources is becoming less important than preserving the national forest landscape and managing it for future generations. In a telephone survey with 7,069 responses, which was conducted across the lower 48 states, the following preferences were obtained for the associated value statements:

- Preserve the ability to provide a "wilderness experience": 77 percent;
- Conserve and protect sources of water: 72 percent;
- Conserve and protect ecosystems and wildlife habitat: 87 percent;
- Maintain resources today to preserve future choices: 61percent; and
- Allow diverse uses such as grazing and recreation: 72 percent.

By contrast, the following value statement was valued least of all:

- Provide jobs and income for local economies: 33 percent. (Source: Shields and others 2002.)

These percentages add to more than 100 percent because any respondent could hold one or all of the above values at the same time. Therefore, while some respondents might feel that the national forests could provide jobs and income while still conserving ecosystems and habitat, most respondents chose to deemphasize commercial activities that provide jobs and income while emphasizing conservation and diverse public uses.

In "A Letter from Economists to President Bush and the Governors of Eleven Western States Regarding the Economic Importance of the West's Natural Environment," Ed Whitelaw (editor) maintained that agencies must strive to improve economic efficiency without compromising environmental integrity. The letter goes on to say, "communities in the West will find they cannot have a healthy economy without a healthy environment." This acknowledges that economic health is tied to sustainable levels of resource use. In southern California, sustainable resource use is tied to consumptive recreation uses that potentially damage the landscape. Economic health is also related to fuels management and frequencies of recurring fires that potentially alter the landscape through permanent changes to the ecosystem. And, economic health is related to changes in the landscape by intrusion of urban infrastructures such as roads, utilities, water diversions and other permitted activities. The relation to economic health is that people need natural surroundings to balance the increasingly urbanized landscape; natural surroundings are necessary to continue to attract and hold the productive populace needed to sustain a thriving economy.

The potential conflict between conserving the landscape and allowing diverse uses captures the management challenge facing the Forest Service today. In southern California, the four national forests have become islands of green in an urban landscape. It is important to serve local populations and their needs in ways that conserve the landscape while continuing to provide opportunities for the public to experience the national forests. These needs are at least as important as supporting the urban infrastructure with travel and utility corridors and commercial commodities. The inherent value of an undisturbed forest landscape is not easily quantified in dollar terms; however, it could be considered incalculable as a resource of finite supply in the midst of a very large metropolitan area. Knowledge of public attitudes and demographics contributes to providing a balance of public and resource use while protecting the ecosystem.

Population Characteristics

Ethnic and Racial Diversity

The assessment region has a rich history reflecting early Indian settlements and lifeways, the land uses and cultures of Mexican ranchers and farmers, arrival of explorers, the establishment of missions and presidios, the gold rush, settlers from eastern and midwestern states and immigration from numerous nations.

Total population for the area equaled nearly 31 million people in 2000. More than one third (or 10.7 million) were of Hispanic or Latino origin (see table 461: Ethnic Origins, Assessment Area 2000).

Table 461. Ethnic Origins, Assessment Area 2000

Hispanic or Latino (of any race)	Two or More Races	Some Other Race	Native Hawaiian or other Pacific Islander	Asian	American Indian or Alaska Navtive	Black or African American	White
33.56%	2.68%	0.21%	0.32%	11.52%	0.43%	6.92%	44.36%

The most ethnically and racially diverse area was the SCAG region in 1990, followed closely by the Central Valley. Hispanics of any race were a higher percentage of the regional population within the SCAG region, while the largest percentages of non-Hispanic blacks and non-Hispanic Asians were found in the ABAG region (Struglia and others 2003).

The SCAG and ABAG regions had the highest percentages of population that were foreign-born in 1990. Among counties, San Francisco and Los Angeles had approximately one-third of their populations as foreign-born and San Luis Obispo had the lowest percentage (less than one-tenth) (Struglia and others 2003).

Whites and American Indians are expected to decline as a proportion of the population in most counties. Blacks vary by county in expected increase or decrease, falling within a range of 5 percent variation. The most dramatic changes are expected for Hispanics and Asian/Pacific Islanders; both groups are expected to increase as a proportion of the total population in most counties. Hispanics are expected to increase the most in four of the regions, while Asian/Pacific Islanders are projected for the greatest increase in the ABAG region (Struglia and others 2003).

Immigration Trends

According to a special report released in 2003, titled "They Came to California, Legal Immigration in 2000," California admitted the greatest percentage (26 percent) of immigrants across the nation. The next highest state of immigration (New York) received less than 15 percent. Ninety-five percent of California's legal immigrants settled in counties within the socioeconomic assessment area. Approximately half of the nation's immigrants from Mexico and Taiwan settled in California with a total representation from 85 percent of the world's countries.

Of the legal immigrants that settled in California, the breakout within the assessment area is as follows:

ABAG	24 %
Central Coast	3 %
Central Valley	9 %
SANDAG	7 %
SCAG	52 %
Other California Counties	5 %
Total	100%

Linguistic Diversity

In 1990, across the assessment areas, the Central Coast had the greatest percentage of people five years of age and older who speak Spanish at home; the ABAG region had the highest percentage of people five years of age and older who speak a language other than Spanish or English at home (Struglia and others 2003).

The proportion of limited English proficient (LEP) students in 1990 was highest in Imperial, Los Angeles, Monterey, Orange and San Francisco counties. Across regions, SCAG showed the highest proportion of students who were LEP (Struglia and others 2003).

The largest percentage of LEP students spoke Spanish in 24 of the counties, with San Francisco and Sacramento having languages other than Spanish represented in the majority LEP language(s) (Struglia and others 2003).

Percent of population who speak a language other than English at home:

- U.S., 17.6 percent

Highest three states:

- California, 39.5 percent
- New Mexico, 35.5 percent
- Texas, 32.0 percent

Table 170 displays information about languages spoken at home in California from the 2000 Census.

Table 170. Language Spoken at Home, State of California, 2000

LANGUAGE SPOKEN AT HOME CALIFORNIA, 2000 CENSUS	Number	Percent
Population 5 years and over	31,416,269	100.0
English only	19,014,873	60.5
Language other than English	**12,401,756**	**39.5**
Speak English less than "very well"	62,77,779	20.0
Spanish	8,105,505	25.8
Speak English less than "very well"	43,03,949	13.7
Other Indo-European languages	1,335,332	4.3
Speak English less than "very well"	453,589	1.4
Asian and Pacific Island languages	27,09,179	8.6
Speak English less than "very well"	1,438,588	4.6

Geographic Distribution

Recent decades have shown shifts of population away from the coastal/metropolitan areas of Los Angeles and the Bay Area toward the Central Valley and Inland Empire (Struglia and Winter 2002).

The socioeconomic area's population is primarily urban, with only two counties having more than 50 percent of their population in unincorporated areas. The percentage of growth in unincorporated areas is greater than in incorporated areas; however, because the total numbers are smaller, the overall impact on population is minimal. Only three of the 26 counties in the socioeconomic area are not classified as metropolitan counties (Raettig and others 2001).

The socioeconomic area is projected to continue to increase in population; however, more of that population is expected to affect the Central Valley (a potential loss of one million acres of prime farmland by 2040 is forecast), the Inland Empire (San Bernardino and Riverside Counties within the SCAG region), and the eastern portion of the ABAG region (Struglia and Winter 2002).

Age Structures

Median ages are expected to vary across gender, race/ethnicity, and county through 2040. A trend of increasing median age is expected, steepest among the American Indian, white and black populations. The age structure among Hispanics and Asian/Pacific Islanders is much younger across the forecast period (Struglia and others 2003).

Disability

Not much variability among counties in the SEA region was noted in percentage of population with disabilities. About half of all individuals with a disability had either a severe disability or multiple disabilities and required assistance with daily living (Raettig and others 2001).

Social and Economic Conditions

Educational Attainment Trend

Across all counties, elementary schools served the largest number of students in 1998 to 1999, with the highest average enrollment per school at the high school level. Academic performance among county schools participating in the STAR 9 achievement test varied widely, with San Diego County showing the highest average performance across schools. Central Valley counties had the greatest numbers of schools performing below or well below average (Struglia and others 2003).

Kings, Imperial and Merced counties had the lowest percentage of population, 25 years of age or older, with postsecondary degrees, and the highest percentage of the population without high school diplomas. On the other end of the spectrum, Marin, San Francisco and Santa Clara counties show the highest levels of educational attainment among the population (Raettig and others2001).

Wage Trends and Levels

Five of the San Francisco Bay Area counties consistently had increasing wages, but wages in the state and assessment area have been higher than the national average wage per job for more than 20 years. However, wages in the three non-metropolitan counties in the assessment area (Imperial, Kings and San Benito) have consistently been lower than wages in the metropolitan counties, and the gap has continued to widen. The average wage level per job has been highest in the San Francisco Bay Area, Sacramento County, Los Angeles County and Orange County. None of the counties with wage levels in the lower third ranking show a trend of increasing wages. While wage levels in several counties average among the highest in the state and even in the nation, all but seven of the SEA counties in the region had income maintenance averages (through welfare programs) above the national average 1987 to 1997. Central Valley counties were among the highest in average annual income maintenance per capital. Los Angeles County alone has more welfare recipients than 48 other states. This contradiction between high average wage levels and high income maintenance payments illustrates a growing statewide concern about disparities in income distribution. Many of the welfare recipients in California have a basic skills gap compared to those who are employed in the state (Raettig and others 2001) (see table 171).

Table 171. Comparative Median and Per Capita Income in 1999 Dollars

Indicator	United States	California	Southern California Assessment Area
Median Income, Households	$41,994	$47,493	$49,442
Median Income, Families	$50,046	$53,025	$55,808
Per Capita Income	$21,587	$22,711	$23,054
Median Earnings, Male Full-Time	$37,057	$40,624	$41,318
Median Earnings, Female Full-Time	$27,194	$31,722	$31,475
Income Below Poverty Level, All Ages	12.4%	14.2%	13.7%
Income Below Poverty Level, Related Under 18	16.1%	19.0%	17.3%
Income Below Poverty Level, 65 Years or Older	9.9%	8.1%	7.9%
Income Below Poverty Level, Families	9.2%	10.6%	10.0%

Unemployment Rates

Unemployment rates in California and the assessment region have followed national trends since 1980 but have been higher than the national rate since the 1990s recession, which was prolonged and severe in California. Unemployment rates have been highest in the Central Valley and Central Coast regions, and comparatively lower in the San Francisco Bay Area and southern California. Two of the three non-metropolitan counties had high rates of employment growth during the period between 1987 and 1997, but also had high unemployment rates (Raettig and others 2001).

Economic Diversity and Federal Assistance

Economic diversity is highest in the counties along the Pacific Coast. The SEA region and the nation have been transitioning from a manufacturing-based economy to a knowledge-based economy. Fastest growing industries in the region between 1987 and 1997 include services, finance and related sectors, and state and local government. Tourism is a mainstay of the California economy. Federal lands-related payments make up less than one-tenth of 1 percent of the county expenditures in the SEA region as a whole (Raettig and others 2001).

Agriculture and Change in Agricultural Land

The acreage of farmland in the state and the SEA region decreased by approximately 10 percent between 1987 and 1997. However, the acreage of cropland harvested increased by more than 10 percent during that same period (Raettig and others 2001).

Environmental Quality

Water quality was variable by watershed, with many watersheds crossing over counties within a region and across regions. The best water quality ratings were within the SANDAG and SCAG regions; the poorest quality was within the Central Valley. Watershed quality averages are provided only for purposes of comparison and should be viewed with caution. Emissions for 1996 varied widely by type and level across counties. However, across all counties and regions a general trend for reduced emissions was forecast, with the exception of particulate matter (PM) and PM10 types (Struglia and others 2003).

Diverse Values and Behaviors

Traditional values and behaviors favoring quiet and solitary or small-group activities that involve camping, hiking, hunting and fishing are now coexisting or competing with more recent activities including mountain biking, off-highway vehicles, large group activities and illegal activities (such as transmigration of undocumented immigrants and marijuana cultivation). The expanding populations of southern California create demands for a variety of recreaton experiences that create inherent conflicts with other user groups in the national forests. Much of the conflict is related to noise. Large groups and vehicle-oriented activities tend to be noisy and disruptive. Open-area target shooting is noisy, can be unsafe to bystanders and contributes to trash and toxic metal buildups. Sheer population pressure combined with a lack of substitute open space has resulted in more instances of depreciative behaviors. Some examples are loud music, graffiti, broken gates, bullet holes in signs, and unauthorized cross-country trails that are unmaintained and prone to erosion. Finally, the economic profitability of illegal drug cultivation and transmigration of undocumented workers is an external socioeconomic condition that inevitably creates conflict on public lands.

The presence of a large surrounding urban population creates an opportunity to serve more people and to cultivate public support for national forest conservation and management strategies. Conflicts between national forest uses are mitigated through the allocation of suitable uses to minimize conflict (zoning), design of developed recreation facilities to separate conflicting activities, and design criteria (standards) that apply to project-level decisions. Some examples of this are separating motorized and non-motorized use, concentrating electronic equipment to distinct sites, allowing motorized use on designated routes or areas only, developing more group-use sites in developed recreation areas, using a permitting process to control large events, restricting target shooting to designated sites, etc. Public education and enforcement are key to developing public understanding and appreciation for accomodating public uses while conserving the national forest environment and to protecting the public from nuisance or illegal activities.

Heritage Resources

Heritage resources (defined as cultural, historical, archaeological, ethnographic, and tribal) represent past human activities or uses and, by their nature, are considered an irreplaceable and nonrenewable resource if not managed for preservation over the long-term. Because heritage resources represent important cultural values, they are of special concern to the public. Interest in our heritage and concern over the destruction of archaeological sites has prompted the passage of national, state and local levels of legislation that are designed to promote and protect these examples of our nation's historical and traditional legacy.

Heritage resources on the southern California national forests represent a diversity of cultures and their uses of landscapes, including native people, colonial California, late 19th and 20th century state and

American history, Civilian Conservation Corps, World War II and post-WWII military features, the Cold War, and Forest Service history.

The concentration of cultural sites on the southern California national forests is among the highest of all the national forests in the state. Table 245: Heritage and Tribal Data for Southern California Forests indicates the number of heritage resource sites by type and status located within the four southern California national forests. The total extent of the heritage resource database for the national forests has not been determined; however, on average, approximately 8.5 percent of the national forests' acreage has been inventoried for heritage resources. Most of these surveys have been project-specific rather than large-scale or systematic surveys. Almost 300,000 acres of land have been inventoried for heritage resources and more than 5,900 heritage resource sites have been recorded on the four southern California national forests.

Table 245. Heritage and Tribal Data for Southern California Forests

	Angeles NF	Cleveland NF	Los Padres NF	San Bernardino NF	Total
Acres	655,400	434,000	1,761,000	672,000	3,522,400
Acres Surveyed	31,200	18,600	139,100	109,600	298,500
Percent	4.8%	4.3%	7.9%	16.3%	8.5%
Sites	962	1,258	2,536	1,169	5,925
Prehistoric	365	1,163	1,820	674	4,022
Historic	575	185	445	370	1,575
Multi-component	22	0	53	44	119
Unidentified	0	0	218	121	339
NRHP	8	2	54	5	69
NRHP Eligible	154	45	89	122	410
Not Eligible	95	120	77	45	337
No Determination	705	1,367	2,320	996	5,388
State Historic Landmarks	4	0	0	8	12
Federally Recognized Tribes	0	22	1	11	31*

The CNF and SBNF have three tribes that overlap within their sphere of influence.
Data is from FY02 Regional Report to the Secretary of the Interior (updated by current GIS Inventory databases).

The next tables list nationally and state-designated historic places on the national forests. The National Register is the legal criteria by which federal agencies and others define the significance of heritage resources.

Table 246. National Register of Historic Places by Forest

National Register Of Historic Places	Forest	Type	Number
Mount Lowe Railway	ANF	Historic	1
Old Ridge Route	ANF	Historic	7
Bear Valley Prehistoric Site	CNF	Prehistoric	1
Greystone Villa—Cabin 18	CNF	Historic	1
Kirk Creek Campground	LPNF	Prehistoric	2
Knapp Ranch Cabin	LPNF	Historic	1
Eastern Sierra Madre Ridge Archeological District	LPNF	Prehistoric	51
Crowder Canyon Archeological District	SBNF	Prehistoric	4
Henry Washington, Survey Marker	SBNF	Historic	1

Table 247. State Historic Landmarks by Forest

State Historic Landmark	Forest	Type	Number
No. 514 Pomona Water Power Plant	ANF	Historic	1
No. 632 Old Short Cut	ANF	Historic	1
No. 717 The Angeles National Forest	ANF	Historic	1
No. 919 St. Francis Dam Disaster Site	ANF	Historic	1
No. 96 Mormon Road	SBNF	Historic	1
No. 576 Santa Fe and Salt Lake Trail Monument	SBNF	Historic	1
No. 577 Mormon Trail Monument	SBNF	Historic	1
No. 578 Stoddard-Waite Monument	SBNF	Historic	1
No. 579 Daley Toll Road Monument	SBNF	Historic	1
No. 618 Garces-Smith Monument	SBNF	Historic	1
No. 619 Holcomb Valley	SBNF	Historic	1
No. 977 The Arrowhead	SBNF	Historic	1

Analysis of the heritage resource database indicates that there is a discrepancy between the number and types of heritage resources known and the number that should be found on the national forests based on information from ethnographic studies, archaeological research and historical documents. These studies indicate the presence of a range of human activities and resulting heritage sites on the national forests that is not reflected in the current database of known archaeological sites. Thus, there are more heritage resources identified as occurring on the national forests than have been formally recorded.

The national forests occupy a transition zone, both culturally and environmentally, between the inland valleys and deserts and the coast and coastal basins. As such, the focus of research has been in neighboring areas rather than the national forests, resulting in the lack of specific cultural sequences for the national forests. However, general sequences for southern California have been adapted to the national forests (Baksh and Hector 2002, Bean and others 1991, Blakley and Barnette 1985, Brandoff-Kerr and Eileen 1982, Carrico and others 1981, Earle and others 1995, Headley 1993, Horne 1981, McIntyre 1979, 1986; Robinson 1989, 1991; Robinson and Risher 1993). Some of these overview documents identify historical trends or "temporal activity" focuses (such as the great hiking era) specific to the national forests, although these trends are usually tied to the history of the local area. Updating ethnographic overviews is a part of this revision effort.

Initial occupation of the national forests has yet to be determined. Heritage resources on the southern California national forests represent nearly 9,000 years of human occupation and use. This span of occupation is more recent than for neighboring areas such as coastal basins and inland deserts, where archaeological evidence indicates a greater antiquity (Moratto 1984). Cultural development within the national forests may have evolved along different lines reflecting adaptation by different cultural groups from different environments. By the time of European contact, several distinct groups were recorded as exploiting the mountainous environment (see table 248: Indigenous Groups at time of European Contact for Southern California Forests). The southern California national forests are associated with the earliest land expeditions in California by European explorers. Use of the national forests by the European population first centered on travel; mission-related activities (including post-secularization communities and other early California settlements); homesteading; mining; and ranching, before culminating in a recreation focus of the activities within the national forests.

Table 248. Indigenous Groups at time of European Contact for Southern California Forests

Tribe	Angeles	Cleveland	Los Padres	San Bernardino
Cahuilla		X		X
Chumash	X		X	
Costanoan			X	
Cupeno		X		
Esselen			X	
Gabrielino	X	X		
Kumeyaay (Ipai/Tapai)		X		
Kitanemuk	X			
Luiseno/Juaeno		X		
Salinan			X	
Serrano	X			X
Tataviam	X			

Site types typically expected to be found on the national forests include Native American villages and other habitation sites, cultural landscapes, traditional cultural properties, plant and mineral resource collection areas and sites, food processing sites, tool manufacturing sites, trails, ceremonial sites, mines, roads, homesteads, cabins, hotels, railways, timber extraction sites, Forest Service administration sites, recreation residences, resorts, Civilian Conservation Corps camps, water diversion and impoundment structures, and military bases and features (including training locales, Strategic Air Command air bases, and Nike missile bases).

Prehistoric heritage resources tend to represent cultural and environmental interactions over time and closely reflect responses, in terms of location and site type, to changing environmental and climatic conditions. The natural forest conditions that we currently identify as undisturbed (usually found in the more remote portions of the southern California national forests) are actually the result of the influence of past customs and practices of the previous populations of Native Americans. Historic heritage resources tend to represent cultural and economic needs, facilitated by technology and its advances, to dominate rather than to interface with the environment.

The demand for or use of any heritage resource will generally fall into one of two categories: (1) non-consumptive, where the use does not deplete the resource (preservation); and (2) consumptive, where the use does deplete the resource (elimination). The demand has generally been consumptive for heritage resources, resulting from other land management activities. Since most of the national forests are characterized by steep topography and limited water availability, different populations typically used the same areas over time. It is the norm rather than the exception that Forest Service campgrounds are found on top of Native American campsites, resulting in long-term damage to and destruction of the Native American sites. Studies have shown that a diversity of impacts resulting from the development and use of public lands threaten the heritage resources located within those lands (Lyneis and others 1980). Heritage resources are basically a non-economic or non-producing resource, and special care may be needed to protect them when other activities in a place or area may have a higher priority than history and archaeology. These are fragile resources, susceptible to effects from natural causes (such as erosion) and human causes (fire, vandalism), which result in deterioration, damage and, ultimately, their elimination. Non-consumptive demands include requests for traditional cultural uses and access to National Forest System land, site protection, interpretation or scientific study. Heritage resources can also be used for public benefit for preservation of the area's heritage.

These heritage resources enrich people's experiences by creating opportunities to discover the national forests' unique past. They enhance local communities and build bridges of understanding between the national forests and their neighbors. Heritage information contributes to overall national forest management by helping the Forest Service understand past human interaction with forest ecosystems.

Tribal and Native American Interests

American Indians and Alaska Natives are recognized as people with distinct cultures and traditional values. They have a special and unique legal and political relationship with the government of the United States as defined by history, treaties, statutes, court decisions and the U.S. Constitution. Tribal governments have considerable powers that are frequently separate and equal to those of state and local governments. The policy of the U.S. Government is to support Native American cultural and political integrity, emphasizing self-determination and government-to-government relationships. There are many rights and privileges associated with treaties and other agreements, such as grazing, hunting, subsistence, and access to and gathering of national forest resources. In addition, land and resources hold a special and unique meaning in the spiritual and everyday lifeways of many American Indians.

The southern California national forests remain committed to cultivating good relationships with American Indian tribes and Native American groups. National Forest System lands and resources represent significant cultural and economic values to American Indians. Forest Supervisors have the responsibility for maintaining a government-to-government relationship with federally recognized Indian tribes. They are to ensure that the national forests' programs and activities honor Indian treaty rights and fulfill trust responsibilities, as those responsibilities apply to National Forest System lands. Treaties, statutes and executive orders often reserve off-reservation rights and address traditional interests relative to the use of federal lands. Forest Supervisors also administer programs and activities to address and be sensitive to traditional native religious beliefs and practices and provide research, transfer of technology and technical assistance to Indian governments. The national forests also consult with non-federally recognized tribes, organizations and individuals.

Currently, several agreements are in place between federally and non-federally recognized tribes and the southern California national forests. The Los Padres National Forest has negotiated a memorandum of understanding with the Santa Ynez Band of Mission Indians (2002) and the Salinan Nation (2001) that declared that all parties wish to continue to enhance their mutually beneficial relationship that includes Native American cultural and ancestral concerns as part of the management of the Los Padres National Forest. An agreement was executed between the San Manual Band of Mission Indians and the San Bernardino and Angeles National Forests (2001) that formally recognizes their government-to-government relationship. This memorandum of understanding outlines the goal of increased cooperation between the national forests and the Indian tribe in order to develop community opportunities and partnerships in the areas of mutual interest; it also documents national forest recognition of the importance of the Indian tribe and its need to have access to and the use of certain natural resources existing in the national forests.

American Indian people have occupied areas in southern California for thousands of years. Archaeological evidence and historical and ethnographic accounts attest to the diversity, longevity and importance that American Indian groups have had in this area (see table 302: Federally Recognized Tribes Within Forests' Sphere Of Influence, page 244).

Nationwide, 45 national forests are located near 86 American Indian reservations in 22 states. The four southern California national forests have 30 reservations (representing 10 percent of the nation's total) located within 10 miles of the national forests; these national forests are thus directly associated with the largest number of reservations in the state and in the country, more than any other national forest. The reservations range in size from 6 acres to 36,000 acres. The population of the federally recognized groups associated with these reservations range from 7 to 1,685 (with the total population almost 10,800), and the number of individuals actually living on the reservation range from 0 to more than 1,470 (U.S. Department of Interior, Bureau of Indian Affairs 2002).

Contemporary uses or concerns have centered on access to national forest resources of cultural or traditional importance and to areas with special or sacred values, often the locales of ceremonial activities. As more people visit and use the southern California national forests, conflicts are common between Native American uses of culturally important areas and other uses of these same areas.

There are also other local tribes, groups and individuals who have not been federally recognized but who, like the federally recognized tribes, still look to the national forests for traditional and contemporary uses and as part of their ancestral homeland (see table 303: Non-Federally Recognized Tribes Within Forest's Sphere Of Influence). The large urban area surrounding the southern California national forests contains the highest off-reservation Native American population in the nation, most from other parts of the country and many also federally recognized. They too look to the national forests as a place to maintain traditional and contemporary uses and practices. This sometimes results in conflict between the local and non-local Native American groups.

Studies indicate that American Indians attach deep emotional, symbolic and spiritual meanings for those areas that used to be their traditional lands, including those lands that are publicly owned and managed by government resource management agencies. These perceptions and meanings influence their current lifestyles, environment and quality of life (McAvoy and others 2001). Researchers also have noted that the dominant society's (in this case, Anglo-Hispanic) sense of place often conflicts and competes with the minority people's (Native Americans) sense of place, resulting in different realities or "contested terrain" that present challenges for public land management agencies (McAvoy and others 2001).

Table 303. Non-Federally Recognized Tribes Within Forest's Sphere Of Influence

Tribe	ANF	CNF	LPNF	SBNF
Esselen Nation			X	
Fernandeño Tataviam	X			
Gabrielino-Tongva Tribal Council of San Gabriel	X			X
Gabrielino-Tongva Tribal Council of the Gabrielino Tongva Nation	X			
Gabrielino Tongva Indians of California	X			
Kawaiisu Tribe			X	
Intertribal Council of Tongva	X			X
Juaneno Band of Mission Indians Acjachmemen Nation (multiple)		X		X
Ohlone Bear Clan			X	
San Luis Rey Band of Mission Indians		X		
Salinan Tribe			X	
Tehatchapi Indian Tribe	X			
Tejon Tribe			X	

Table 302. Federally Recognized Tribes Within Forest's Sphere Of Influence

Tribe	ANF	CNF	LPNF	SBNF
Agua Caliente Band of Cahuilla Indians				X
Augustine Band of Mission Indians				X
Barona Group of the Capitan Grande Band of Mission Indians		X		
Cabazon Band of Mission Indians				X
Cahuilla Band of Mission Indians		X		X
Campo Band of Mission Indians		X		
Capitan Grande Band of Mission Indians		X		
Cuyapaipe Band of Mission Indians		X		
Inaja/Cosmit Band of Mission Indians		X		
Jamul Band of Mission Indians		X		
La Posta Band of Mission Indians		X		
La Jolla Band of Mission Indians		X		
Los Coyotes Band of Mission Indians		X		X
Manzanita Band of Mission Indians		X		
Mesa Grande Band of Mission Indians		X		
Morongo Band of Mission Indians				X
Pala Band of Mission Indians		X		
Pauma Band of Mission Indians		X		
Pechanga Band of Mission Indians		X		
Ramona Band of Mission Indians		X		X
Rincon Band of Mission Indians		X		
San Manuel Band of Mission Indians				X
San Pasqual Band of Mission Indians		X		
Santa Rosa Band of Mission Indians				X
Santa Ynez Band of Mission Indians			X	
Santa Ysabel Band of Mission Indians		X		
Soboba Band of Mission Indians		X		X
Sycuan Band of Mission Indians		X		
Torres-Martinez Desert Cahuilla Indians				X
Viejas (Baron Long) Band of Mission Indians		X		

Recreation

The focus of outdoor recreation management is to provide a wide range of environmentally sustainable opportunities in natural settings in order to meet the needs and desires of visitors. People have always enjoyed relatively free access and opportunities on federal public lands, although recreation was not a high priority when the country first began to set aside national forests. Recreation use was present at that time, but it was an unstated secondary benefit enjoyed by a relative few. However, since the end of World War II, demand for outdoor recreation on public land has grown. Outdoor recreation is the fastest growing use within the national forests and grasslands, a use expected to dramatically increase in the future.

Most of the approximately 31.3 million people who live near, visit or influence the mountain refuges of the Angeles, Cleveland, Los Padres, or San Bernardino National Forests are within a one-hour driving time from the national forests (Struglia and others 2003, U.S. Census 2000). The ethnic and racial diversity of the southern California region is unique within the National Forest System, increasing at a rapid pace so that as of 2000, no ethnic group was the majority, with more than 50 percent of the population. This diverse population differs from traditional national forest users in other areas of the nation in their use patterns, perceptions of the environment and recreation activities enjoyed (Carr and Chavez 1993, Chavez 1992).

Recreation is currently the predominant use of the national forests. For year-round use, these urban national forests rank among the top in the nation. Almost all visitations to southern California national forests are local in origin (Richer and others 2002). With the exception of the Big Sur area of the Los Padres National Forest, these national forests are not national destinations for multi-day vacations. Instead, they are primarily very popular local day-use attractions, often for large, diverse urban groups of extended family and friends engaging in relaxing activities.

While some level of recreation activity occurs almost everywhere on the national forests, the majority is concentrated in a relatively small number of popular areas. These areas are often associated with developed facilities and are easily accessible by road (Stephenson and Calcarone 1999).

Recreation in southern California is a complex social activity, constantly changing and posing increased challenges for agency managers. Some unique factors that affect the environmental sustainability of recreation management within the southern California national forests include:

- The Forest Service has a unique niche of nature-based, day-use mountain recreation in southern California. Key attractions include scenic vistas, green forests, cool temperatures, lake and stream-based waterplay, picnicking, winter sports, wilderness areas and hundreds of miles of trail systems and motorized backcountry recreation routes. Visitors want to escape the stress of urban life, traffic and smog, and to relax in nearby mountain refuges.
- Intensive, all-season recreation leads to resource and habitat impacts and a struggle for the Forest Service to maintain environmentally sustainable recreation opportunities. Competition for space, visitor group and community conflicts, and deterioration of facilities and areas occur in many parts of the national forests.
- There is no off-season in southern California. Use is year-round, often spontaneous (for example, snowplay after major winter storms), and the daily site turnover rate is often high at some facilities.
- There is a lack of room to expand recreation facilities at some popular areas due to steep topography and limiting land boundaries.
- Rapid urban development is occurring adjacent to and within national forest boundaries, leading to use pressures (such as "social" trails) and resource impacts. Urban social problems are migrating to this nearby open space, leading to public safety concerns.
- Demographics are rapidly changing. Complex public information strategies are needed, based on urban orientations and many languages, cultures and class diversities.
- Visitor expectations are higher than in some parts of the country. More amenities are expected, such as recreational vehicle utility hook-ups, flush toilets and hot showers.
- Despite strong regional media markets, little Forest Service identity or branding is perceptible to most people in southern California. A perception exists that some parts of the national forests are, to a certain extent, more of a regional park than federal lands.
- Many new recreation activities originate or become popular in southern California and are first practiced in these urban national forests. They include mountain biking, hang-gliding, radio-controlled airplanes, geocaching and paintball gaming, and more. Development of these new technologies often changes or increases visitors' ability to access and use the national forests.
- There are increased opportunities for recreation and conservation education partnerships between the Forest Service and non-profit organizations, volunteers, and businesses.

- Recreation facilities, areas, and programs on national forests influence local economies by prompting tourism, business and residential sectors.

Outdoor recreation offers significant physical health and societal benefits and is important to the quality of life of most Californians; they spent approximately 2.2 billion recreation visitor days participating in outdoor recreation activities in 1997. Simple and inexpensive activities are engaged in far more often than those that require considerable skill and expertise. National Forest users believe that protection of the environment is an important aspect of outdoor recreation (California State Parks 1998, 2001).

Recreation Setting

Visitors choose specific settings for their activities to enjoy desired experiences. These settings vary by place and are further refined by the recreation opportunity spectrum (ROS), a classification system that describes different settings across the national forests using five classes that range from highly modified and developed settings to primitive, undeveloped settings. These are:

- Primitive - Characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free of evidence of human-induced restrictions and controls. Motorized use within the area is not permitted. There are no developed facilities.
- Semi-primitive non-motorized - Characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction among users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but would be subtle. Motorized recreation is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impacts on recreation experience opportunities. A minimum of developed facilities (if any) are provided.
- Semi-primitive motorized - Characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present but would be subtle. Motorized use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motorbikes is permitted. Developed facilities are present but are more rustic in nature.
- Roaded natural - Characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of people. Such evidence usually harmonizes with the natural environment. Interaction among users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities, which are present and well defined.
- Rural - Characterized by a substantially developed environment and a background with natural-appearing elements. Moderate to high social encounters and interaction between users is typical. Renewable resource modification and utilization practices are used to enhance specific recreation activities. Sights and sounds of humans are predominant on the site and roads and motorized use is extensive. Facilities are more highly developed for user comfort with ample parking.

Attributes typically considered in describing the settings include size, scenic quality, type and degree of access, remoteness, level of development, social encounters, and the amount of on-site management. By describing existing recreation opportunities in each class, the ROS system helps match visitors with their preferred recreation setting. The recreation opportunity spectrum can also be used to plan how areas should be managed for recreation in the future (USDA Forest Service 1986). Changes in a national forest's mix of ROS classes affect the recreation opportunities offered.

In the mid to late 1980s, the Forest Service inventoried and mapped all lands within the Angeles, Cleveland, Los Padres, and San Bernardino National Forests for the original land management plans. The result was a reliable display of existing recreation settings, activities and facilities. The mapping was intended to offer a broad layout of settings and was not applicable at a site-specific level. Site-specific anomalies may have occurred within a given recreation setting. This validated map of ROS classes across the national forests is the adopted ROS for Alternative 1 (see table 254: Current Adopted Recreation Opportunity Spectrum (ROS) - Acres of NFS Lands by Forest). The adopted ROS classes are the baseline against which the proposed distribution of ROS classes as modeled by land use zones under each alternative is compared.

Table 254. Current Adopted Recreation Opportunity Spectrum (ROS)—Acres of NFS Lands by Forest

Classification	Angeles	Cleveland	Los Padres	San Bernardino	Forest Totals	Percent by ROS
Primitive	33,929	0*	580,915	117,792	732,636	21
Semi-Primitive Non-Motorized	175,209	143,781	399,315	162,226	880,531	25
Semi-Primitive Motorized	94,152	95,627	392,045	58,873	640,697	18
Roaded Natural	243,638	153,053	382,974	284,471	1,064,136	30
Rural	114,786	27,728	16,978	32,776	192,268	5
Unclassified	1,269	689	9,149	9,614	20,721	1

* No Primitive ROS classification was mapped within the Cleveland National Forest.

About 60 percent of southwestern California is privately owned. The southern California national forests contain 29 percent of the remaining open, wild, non-urbanized public lands in this region (Davis and others 1998). These natural settings offer high-quality outdoor recreation opportunities. The most notable change in ROS classification since the mid 1980s has been the inclusion of more public land into the primitive and semi-primitive non-motorized ROS categories due the creation of new wilderness. This is especially true for the Los Padres National Forest (see the wilderness section for more details).

Visitor Use, Participation and Satisfaction

While the different settings classified above offer the basic opportunities for recreation experiences, it is important for managers to recognize those activities for which visitors are coming to the national forests, and to understand any trends in user demand. Visitor use, participation and satisfaction are best measured in National Forest Site and Wilderness Visits using the new National Visitor Use Monitoring (NVUM) system. The NVUM project provides scientifically-based, reliable information about the type, quantity, quality and location of recreation use on public lands. Analysis of recreation use before the mid 1990s uses the Recreation Information Management (RIM) system data.

Visitor use from the early to mid 1980s ranged from 2.6 million recreation visitor days (RVDs) on the Cleveland National Forest to 4.3 million on the Los Padres National Forest to 5.5 million on the Angeles National Forest to 6.4 million on the San Bernardino National Forest (USDA Forest Service 1986a, 1987a, 1988a, 1989a). In 1992, the Forest Service reported that the Angeles National Forest was the second highest ranked national forest (out of 141) in the nation for intensity of use (acres per RVD) at 0.071; the San Bernardino National Forest was fifth at 0.122, the Cleveland National Forest sixth at 0.147, and the Los Padres National Forest forty-first at 0.369 (Zinser 1995).

Analyses of visitor use, participation and satisfaction based on the NVUM and other sources are detailed in Appendix L. Visitor Use and Participation (NVUM). The complete reports for the Angeles, Cleveland, Los Padres and San Bernardino National Forests, as well as national status reports may be downloaded from the national Web site: `www.fs.fed.us/recreation/programs/nvum`.

Developed Recreation

Developed recreation facilities have been constructed to offer recreation experiences, protect resources or otherwise manage visitor activities. These facilities range from a complete campground with water systems, toilets and showers, to a simple bulletin board or parking barrier at a parking lot. The four southern California national forests manage a wide array of developed recreation sites, as do most other national forests across the country. The Angeles, Cleveland, Los Padres and San Bernardino National Forests currently offer 376 major developed recreation sites, including 158 family campgrounds, 38 group campgrounds, four equestrian campgrounds, three boating sites, 73 picnic areas and 74 trailheads. This is generally the same quantity as reported in the original land management plans in the mid to late 1980s; however, over the previous plan period, the combined theoretical capacity of all major developed sites (excluding downhill ski areas) has grown from 36,685 persons at one time (PAOT) to the current 46,462 PAOT capacity (see table 104: Major Developed Recreation Sites Capacity). This is an increase of 27 percent in capacity, accomplished by expanding existing facilities or converting overnight use facilities to day-use facilities. While PAOTs are a snapshot in time of the number of people who can occupy developed recreation sites, PAOT-days represent the capacity of the site for the entire season of use. The PAOT-days developed recreation site capacity is 5,225,297 for the Angeles National Forest; 1,880,080 for the Cleveland National Forest; 3,629,884 for the Los Padres National Forest; and 3,264,885 for the San Bernardino National Forest; for a total of 14,000,146 PAOT-days.

Concessionaires (private businesses that operate and maintain government recreation facilities) now operate approximately 83, or 22 percent of these sites. They operate under special use authorization to the Forest Service. The San Bernardino National Forest has the most of these sites (36), and the Cleveland National Forest has the fewest (2 sites). Most of these sites are family or group campgrounds and picnic areas. A national reservation service is used for many sites. Most of the smaller, more isolated sites are still managed by the Forest Service.

Table 104. Major Developed Recreation Sites Capacity

Site Type	Angeles		Cleveland		Los Padres		San Bernardino	
	Sites	PAOTs	Sites	PAOTs	Sites	PAOTs	Sites	PAOTs
Family Campgrounds	49	5,895	17	3,275	67	5,885	25	4,920
Group Campgrounds	8	1,195	5	802	5	715	20	1,060
Picnic Areas	40	4,652	6	365	14	1,928	13	2,900
Equestrian Campgrounds	0	0	0	0	0	0	4	220
Boating	2	717	0	0	0	0	1	100
Interpretive Site	7	759	8	213	0	0	11	879
Trail Head	22	5,098	12	1,180	25	2,526	15	1,822
TOTAL	128	18,316	48	5,835	111	10,410	89	11,901
Year of Comparison/ Total PAOT	**1987**	**13,360**	**1986**	**4,193**	**1988**	**10,571**	**1989**	**8,561**

Source: Forest INFRA II DRS Site V Report, June 2003
PAOT: Persons at one time

Some national forest campgrounds and day-use areas have been upgraded, including a few flush restrooms, hot showers and RV dumps. However, most facilities are outdated and are not designed to meet today's needs. Many developed recreation facilities are now heavily used through three seasons and have trouble accommodating large groups and visitors driving longer and wider recreation vehicles. Many are also not designed to accommodate persons with disabilities. To enhance participation in outdoor recreation by the elderly and people with disabilities, and to meet the Americans with Disabilities Act Accessibility Guidelines, the national forests are striving for improvements in this area by making facilities more accessible. Recreation facilities were evaluated in the late 1990s for accessibility barriers. Corrective actions were identified and are accomplished as funding becomes available. However, any need for additional facilities is far overshadowed by a shortfall in maintenance and rehabilitation funds for existing facilities. As these funds have become available, the trend has been to devote resources to changing and improving day-use areas, campgrounds and other developed recreation sites that receive high levels of use, to better reflect current visitor demographics and use trends.

The relative popularity of day-use over camping can be inferred based on the percentage of total visits as shown in table 255: Estimated Developed Sites Activity Participation Range by Forest.

Table 255. Estimated Developed Sites Activity Participation Range by Forest

Forest	Forest visits	Camping	Picnicking and family day gatherings
Angeles	3.5 million	5%	18%
Cleveland	0.8 million	17%	13%
Los Padres	1.5 million	17%	29%
San Bernardino	2.3 million	10%	18%

Recent National Survey on Recreation and the Environment (NSRE) data for southern California indicate that developed camping increased about 5 percent from 1995 to 2001. Currently, most Ranger Districts report that campgrounds and many other developed sites are full on weekends and on holidays from late May through early September. In the more popular sites, use exceeds capacity. Two types of capacity are considered for management of developed sites: design capacity and operational capacity. Design capacity is based on the number of PAOTs a site is designed to accommodate based upon its level of development. The operational capacity of a site is calculated as 40 percent of the design capacity and is the level beyond which studies indicate long-term resource damage is likely to occur. Information extracted from the Forest Meaningful Measures database suggests that some developed recreation sites in the national forests are nearing or even exceeding operational capacity at the most popular individual sites during holidays and weekends in the high-use summer season. Occupancy rates now range from the low teens to more than 50 percent, with the Angeles National Forest having the most sites with high occupancy rates.

Table 379. Developed Recreation Site Occupancy and Estimated Visits - ANF

Site Type	Development Scale	Number of Sites	PAOT Days	Percent Occupancy	Number of Visits
Boating	4	2	261,705	57%	148,332
Family Campground	1	1	5,475	19%	1,019
	2	14	150,255	30%	54,680
	3	26	774,150	34%	279,877
	4	7	810,300	39%	238,684
	5	3	83,575	17%	17,935
Family Picnic	2	6	57,850	30%	20,033
	3	16	212,430	36%	98,728
	4	10	788,400	29	374,355
	5	10	593,125	17%	108,418
Fire Lookout/Cabin Overnight	3	1	1,825	19%	340
Fishing Site	2	1	25,550	57%	14,595
	3	2	13,688	32%	4,329

Site Type	Development Scale	Number of Sites	PAOT Days	Percent Occupancy	Number of Visits
Group Campground	2	1	18,250	28%	5,140
	3	4	161,000	15%	37,210
	4	2	61,375	31%	27,686
Group Picnic Ground	4	1	73,000	58%	42,600
Information Site	4	1	10,950	83%	9,075
	5	2	21,900	27%	6,291
Interpretive Site Major	4	1	32,865	49%	18,816
	5	3	98,920	27%	30,632
Interpretive Site Minor	4	1	25,550	29%	7,462
Observation Site	3	4	103,295	24%	35,601
	4	3	80,665	30%	35,729
Picnic Site	3	2	44,713	30%	13,073
Playground Park Special Sport Site	4	1	83,220	29%	24,328
Trailhead	2	1	10,950	19%	2,037
	3	4	282,875	31%	116,523
	4	5	300,943	30%	108,839
	5	1	16,425	19%	3,056
Unknown	1	1	9,125	19%	1,698
	2	1	10,950	19%	2,037
Total		138	5,225,299		1,889,158

PAOT: Persons At One Time

Table 380. Developed Recreation Site Occupancy and Estimated Visits - CNF

Site Type	Development Scale	Number of Sites	PAOT Days	Percent Occupancy	Number of Visits
Family Campground	3	12	731,205	21%	205,242
	4	1	52,250	25%	16,996
	5	1	169,725	27%	46,593
Family Picnic	3	6	133,225	31%	44,301
Group Campground	3	5	274,480	14%	38,935
	4	1	10,750	16%	2,991
Information Site	3	4	54,750	49%	22,407
Interpretive Site Minor	3	1	12,775	17%	2,111
Observation Site	3	1	10,220	33%	3,354
Trailhead	3	9	430,700	47%	204,005
Wildlife Viewing Site	3	1	0	25%	0
Total		42	1,880,080		586,935

PAOT: Persons At One Time

Table 381. Developed Recreation Site Occupancy and Estimated Visits - LPNF

Site Type	Development Scale	Number of Sites	PAOT Days	Percent Occupancy	Number of Visits
Family Campground	1	1	0	0%	0
	2	19	198,194	18%	35,385
	3	40	1,032,370	19%	218,617
	4	13	469,070	27%	142,064
	5	1	93,075	29%	27,043
Family Picnic	3	9	197,230	29%	58,797
	4	4	177,390	32%	55,812
	5	1	328,500	29%	95,445
Group Campground	3	2	96,725	20%	19,398
	4	3	164,250	23%	47,078
Observation Site	3	3	55,845	27%	14,810
	4	2	16,425	34%	5,251
Trailhead	2	3	49,275	31%	15,026
	3	11	625,610	19%	150,408
	4	3	68,255	21%	14,289
	5	1	57,670	34%	19,355
Total		116	3,629,884		918,778

PAOT: Persons At One Time

Table 382. Developed Recreation Site Occupancy and Estimated Visits - SBNF

Site Type	Development Scale	Number of Sites	PAOT Days	Percent Occupancy	Number of Visits
Family Campground	1	1	1,325	10%	187
	2	1	10,950	37%	4,020
	3	21	989,005	19%	299,176
	4	1	94,900	22%	20,475
	5	1	112,700	22%	36,846
Family Picnic	3	9	378,125	25%	117,722
	4	4	567,575	29%	146,692
Group Campground	1	1	10,400	21%	3,000
	2	1	13,700	13%	4,690
	3	17	191,600	19%	57,205
Horse Camp	3	3	32,125	18%	9,902
	4	1	29,200	8%	2,337
Information Site	4	1	5,145	18%	1,365
Interpretive Site Minor	3	4	151,270	30%	38,234
	4	2	80,300	26%	19,557
Trailhead	2	1	7,300	24%	1,741
	3	9	487,065	29%	149,138
	4	2	102,200	28%	33,892
Total		80	3,264,885		946,179

PAOT: Persons At One Time

Dispersed Recreation

Dispersed recreation use (which occurs where there are few or no developed facilities present) includes many different opportunities. The most popular activities include dispersed or remote camping, driving for pleasure, wildlife and nature viewing, snowplay, waterplay, hang-gliding, rock climbing, recreational target shooting, hunting, and fishing. Other recreation activities also occur, but in considerably lower use numbers. The southern California national forests have steep slopes; heavy, often impenetrable chaparral at low to mid elevations; and predictable concentrated use areas at canyons, roads and trails, higher elevation forest areas, and level ground. Water (whether lakes or streams) is a powerful magnet for dispersed recreation use in arid southern California. Dispersed recreation capacities were estimated by the most popular dispersed recreation categories noted above. Dispersed recreation use or demand is difficult to estimate, but recent NVUM figures were found to be a useful gauge of visitation.

Dispersed Camping

Dispersed (also known as remote or primitive) camping occurs outside of developed campgrounds. It occurs in both wilderness and non-wilderness areas, with or without a vehicle; however, most dispersed camping use occurs by vehicle.

Management of this activity varies among national forests. National Forest policies for dispersed camping and use of campfires range from no restrictions in some areas, to some restrictions in most areas, to complete closure in a few other areas. Wilderness usually has more specific, restrictive dispersed camping policies. Some wildernesses require camping at designated sites only. In addition, the San Bernardino National Forest uses a "yellow post" (fire-safe) site concept. Seasonal fire restrictions affect all of the national forests.

Most visitors camp where the terrain is level, where some shade is present, and where they are somewhat secluded from other visitors and traffic on roads. Most campers use established travel ways to drive to their campsite; however, these travel ways are often not designated National Forest System routes.

Angeles National Forest: Dispersed camping is generally allowed forest-wide.

Cleveland National Forest: Dispersed camping is allowed in a few designated locations within the Descanso and Palomar Ranger Districts, and not allowed within the Trabuco Ranger District.

Los Padres National Forest: Dispersed camping is generally allowed forest-wide. There are numerous designated trail camps throughout the national forest.

San Bernardino National Forest: Dispersed camping is generally allowed throughout much of the national forest with some use restrictions. There are a combination of designated sites, areas, and yellow post sites.

This land management plan revision estimates the capacity and availability of potential dispersed vehicle camping opportunities by land use zones as modeled by GIS using the following criteria:

- Areas greater than 10 acres in size;
- Less than 15 percent slope;
- Within ¼-mile of any class of roads;
- No shrub cover type (most campers seek shade); and
- The site is not a lake or stream (although it may be near one).

In addition, recreation special-use developments, Forest Service administrative developments, other facilities, non-recreation special use developments and developed recreation site acreage was removed from the total acreage. This analysis results in approximately 2 percent of the total National Forest System land base in southern California being available as potential dispersed vehicle camping (see table 256: Current Acres Potentially Available for Dispersed Vehicle Camping by Forest).

Table 256. Current Acres Potentially Available for Dispersed Vehicle Camping by Forest

Land Use Zone	ANF	CNF	LPNF	SBNF	LUZ Total
Existing Wilderness	56	145	8,534	582	9,317
Backcountry Non-Motorized	35	252	405	481	1,173
Backcountry	789	2,161	20,609	19,575	43,134
Developed Area Interface	1177	487	1438	1236	4338
Critical Biological	19	1	0	0	20
Totals	2,076	3,046	30,986	21,874	57,982

Table 257. Estimated Dispersed Camping Activity Participation Range by Forest

Forest	Total Forest Visits	Estimated Dispersed Camping Activity Participation Range
Angeles	3.5 million	0%
Cleveland	0.8 million	7%
Los Padres	1.5 million	2%
San Bernardino	2.3 million	2%

Historically, dispersed camping use is light, except for seasonal use (that is, heavy during summer, weekends, holidays, and deer hunting season; almost nonexistent in the winter), and locally variable (more use in forested areas with level ground near water). Dispersed camping participation is estimated in table 257: Estimated Dispersed Camping Activity Participation Range by Forest. Some dispersed camping areas absorb seasonal overflow capacity from nearby developed recreation sites. Many other areas are more remote, suiting those visitors who seek out the seclusion and primitive experiences, and are used primarily during hunting season. Table 257: Estimated Dispersed Camping Activity Participation Range by Forest also shows estimates of the dispersed camping (not including backpacking) activity participation range.

Some national forest managers feel that these data are misleading and that more visitors participate than are actually recorded. However, National Survey on Recreation and the Environment (NSRE) trends for southern California indicate that primitive camping activity use decreased 14 percent from 1995 to 2001 even as other activities increased (Cordell and others 2004).

Driving for Pleasure

Driving for pleasure often is the first or only recreation experience visitors have on the national forests. The southern California national forests contain six scenic highways and byways covering approximately 298 miles: Angeles Crest (Angeles), Sunrise (Cleveland), Jacinto Reyes and Big Sur Coast Highway-Route 1-All American Road (Los Padres), and Palms to Pines and Rim of the World (San Bernardino). These scenic travel ways focus on driving for pleasure along some of the most beautiful roadways in the state. In addition to these designated roadways, each national forest has identified several other rural routes that offer excellent opportunities for viewing scenery and other activities over less traveled roads. These rural routes are roads that are not managed specifically for driving pleasure but offer loops and connections to some of the outstanding scenery of the national forests. Rest stops, turnouts, scenic vistas, interpretive panels and roadside picnic areas enhance the driving for pleasure recreation opportunity. Recent estimates of this activity participation range are shown in table 258: Estimated Driving for Pleasure Activity Participation Range by Forest.

No NSRE data were available to indicate whether this activity is increasing in popularity over time; however, Caltrans data indicates an increase of traffic on all California State Highways within the national forest boundaries.

Table 258. Estimated Driving for Pleasure Activity Participation Range by Forest

Forest	Total Forest Visits	Estimated Driving for Pleasure Activity Participation Range
Angeles	3.5 million	3%
Cleveland	0.8 million	60%
Los Padres	1.5 million	15%
San Bernardino	2.3 million	17%

Wildlife and Nature Viewing

Wildlife and nature viewing activities are extremely popular throughout the nation. In southern California, opportunities are more limited because of the large human presence and rapid urbanization, but these activities are no less popular. Wildlife and nature viewing are often among the top five activities in which visitors participate. The national forests represent some of the last refuges for many species of plants and wild animals in southern California. Wildlife and nature viewing on the national forests is widespread and mostly unrestricted. National Forests have signed and interpreted a number of wildlife and nature viewing areas. Some of the most popular opportunities focus around birdwatching (notably the bald eagles at Big Bear Lake and neotropical migratory birds at several riparian locations) and spring wildflower viewing. Birdwatching groups such as Audubon Society chapters sponsor many day and night field trips to the national forests. Sightings of large mammals are rare but valued by the public. The national forests participate in the State of California Watchable Wildlife Program and the Forest Service Naturewatch programs (Eyes on Wildlife, Fishwatch and Celebrating Wildflowers). For example, the San Bernardino National Forest has an inventory of 19 specific watchable wildlife locations. Estimates of wildlife and nature viewing participation are shown in table 259: Estimated Wildlife and Nature Viewing Activity Participation Range by Forest.

NSRE data for southern California indicate that wildlife-viewing activity increased by about 23 percent from 1995 to 2001.

Table 259. Estimated Wildlife and Nature Viewing Activity Participation Range by Forest

Forest	Total Forest Visits	Estimated Wildlife and Nature Viewing Activity Participation Range
Angeles	3.5 million	31%
Cleveland	0.8 million	67%
Los Padres	1.5 million	37%
San Bernardino	2.3 million	31%

Snowplay

The Forest Service maintains a dispersed winter sports area for general snowplay at the end of the Mt. Pinos highway on the Los Padres National Forest. This area is extremely popular and also includes about 60 miles of Nordic ski trail. Up to several thousand visitors may be at this area on a winter weekend. Winter views of snow-covered mountains from the Los Angeles basin draw thousands of visitors to numerous popular dispersed snowplay areas across the Angeles National Forest, often just places where motorists can pull their vehicles over to the side of the road. Safety is a concern in some locations. There are also many dispersed snowplay areas on the San Bernardino National Forest that attract thousands of people on snowy weekends. Snowmobiling is also allowed in limited areas. There are a few popular dispersed snowplay sites on the Cleveland National Forest in the Laguna and Palomar mountain areas. On busy weekends, several thousand visitors may snowplay in the Laguna area, and several hundred in the Palomar area. No specific NVUM data are available for current use estimates, nor for studying trends over time.

Water play

Visitors love to be near and in natural water in southern California. Recent participation figures (see table 260: Estimated Water Play Activity Participation Range) indicate the popularity of waterplay, which is an activity that occurs in streams and lakes, especially during the warmer summer months. It usually involves sitting by, wading through or swimming in water. Some visitors build small rock dams in some streams to restrict water passage and create deeper, longer-lasting pools of water to recreate in. There may be associated activities near waterplay in riparian areas, including picnicking, large family gatherings, and cooking. Waterplay use is very high in the lower elevation canyons of the Angeles and San Bernardino National Forests, including Tujunga, San Gabriel, San Antonio, Lytle Creek and Mill Creek. Santa Ynez Canyon in the Los Padres National Forest also experiences a high level of waterplay activity.

No NSRE data are available to indicate a trend over time.

Table 260. Estimated Water Play Activity Participation Range

Forest	Total Forest Visits	Estimated Water Play Activity Participation Range
Angeles	3.5 million	38%
Cleveland	0.8 million	60%
Los Padres	1.5 million	40%
San Bernardino	2.3 million	45%

Hang Gliding

"Silent soaring" consists of hang-gliding (foot-launched rigid frames that maintain the shape of the wing, with the pilot usually flying in a prone position) and paragliding (foot-launched, ram-air, aerofoil canopies with the pilot in a sitting or supine position). Both types of gliders are designed to be flown and landed with no energy requirements other than wind and gravity. Development density in southern California has caused a reduction of the number of accessible launch sites and landing areas. Many of the remaining launch sites are on public land, and almost all of the mountain sites are located in the national forests. Some of the primary landing areas are on National Forest System land; however, because many of the launch sites have been the starting point for flights exceeding 100 miles, the FAA regulates airspace flight paths (while the glider is airborne) and trespassing laws (post-landing) handle potential conflicts for landings on private land. The number of hang-gliders and paragliders is relatively small. One take-off spot (Crestline [Paivika Ridge]/Marshall on the San Bernardino National Forest) operates with a special use authorization to a local club for the parking lot and toilet. No specific NVUM data are available for current use estimates, and NSRE data are not available to indicate a trend over time. Forest Service managers estimate that relatively few people participate in this activity. Most of the popular, informal hang-gliding take-off spots in southern California national forests are listed in table 261: Hang Gliding Take-offs in Southern California National Forests. Other spots may be located and used in the future.

Table 261. Hang Gliding Take-offs in Southern California National Forests

Site Name	Location	Forest
Wild Cattle	Big Sur/Pacific Valley, near Prewitt Ridge Camp	Los Padres
Cuesta Ridge	Aprox 7 mi. NNW of San Luis Obispo along side road to Tassajera Peak electronic site	Los Padres
Plowshare	Plowshare Peak Electronic Site, Sierra Madre mountains, aprox 2.5 mi. SSW of Hwy 166	Los Padres

Site Name	Location	Forest
Santa Barbara mountain sites	Various launches for different conditions. Adjacent Camino Cielo and Gibraltar Roads, north of Santa Barbara 4 to 5 mi.	Los Padres
Pine Mountain (North and South Launches)	Two locations for two wind directions adjacent PineMtn. Ridge Road,10 mi. north of Ojai	Los Padres
Nordoff Ridge (Nordoff Peak and Chief Peak)	Two locations for two wind directions near Nordhoff Ridge road. Aprox 3.5 mi. north of Ojai	Los Padres
Kagel (Sylmar)	Kagle Mtn, 0.75 mi. east of Pacoima Reservoir Dam—-3 mi. NE of 210 Fwy at Sylmar	Angeles
The Towers and The "2200" (Sylmar)	Towers—contract point .75 mi. WNW of Pacoima Reservoir, and the “2200” is 1.8 mi. WNW of the Towers	Angeles
Crestline (Paivika Ridge)/ Marshall	Marshall—at Marshall Pk— 6 mi. east of the Hwy 15 and Hwy 215 Jct. Crestline —Near Valley View Park—-.6 mi. north of Marshall	San Bernardino
Cucamonga	Near Cucamonga Pk, 10 mi. due West of the Fwy15 and Fwy 215 intersection	San Bernardino
Black Hawk	Blackhawk Mtn., 5.5 mi. NEE of Big Bear city, overlooking the Lucerne Valley	San Bernardino
Lake Elsinore	1.5 mi. SW of Lake Elsinore, 2 sites—"Edwards" and .75 mi. further down 6S05 is "The E"	Cleveland
Horse Canyon	36 mi. east of San Diego, 0.75mi east of Hwy 8 at Buckman Springs	Cleveland

SOURCE: U.S. Hang Gliding Association, as verified by the Forest Service

Rock Climbing

Rock climbing occurs at a few locations throughout the southern California national forests, but it is especially popular at Tahquitz (Lily) and Suicide Rocks in the San Jacinto Ranger District of the San Bernardino National Forest, just east of Idyllwild near the Humber Park Trailhead. Located mostly within the San Jacinto Wilderness, these are the most popular big-wall rock climbing locations in southern California, with glaciated granite similar to Yosemite. Both are multi-pitched crags that require rock climbing gear. Some climbers recreate as individuals or small teams, while others climb with an outfitter/guide under permit to the Forest Service. There are many specific routes up both Tahquitz and Suicide Rocks. Bouldering, or climbing smaller rocks and boulders to learn skills that are used in rock climbing, also occurs at some spots throughout the region, including near the Boulder Basin Campground in the San Jacinto Ranger District. There is also some rock climbing and rappelling in the Santa Clara/Mojave River Ranger District of the Angeles National Forest. The number of rock climbers is relatively small, and was not measured by NVUM. NSRE data for California indicate that rock climbing decreased by about 13 percent from 1994 to 2001.

Recreational Target Shooting

Recreational target shooting (the discharge of firearms, air or gas guns at inanimate objects for the exercise of skill or sighting in of weapons) is a popular activity. It does not include the sport of hunting, which is regulated by the State of California. The national forests have traditionally provided a unique, open, outdoor setting in which shooters can participate in shooting sports in a variety of locations. Some shooting sites (such as gun clubs and concession-operated shooting ranges under special use authorization to the Forest Service) have structured settings similar to facilities found on private land. Other shooting areas on the national forests have less intensively managed shooting opportunities. No specific NVUM data are available for current use estimates, and NSRE data are not available to indicate a trend over time.

Prior to 1980, the Angeles National Forest was generally open to recreational target shooting. In 1980, the Angeles National Forest worked with the County of Los Angeles to restrict recreational target shooting to 14 designated areas. Over time, serious problems including resource damage, large-scale litter, fire safety and public safety required additional closure of specific areas. However, by the early 1990s, two managed (including for safety and resource concerns) concessionaire-operated recreational target shooting areas were opened.

Similar situations on the Cleveland National Forest resulted in most of the national forest being closed to recreational target shooting. The Trabuco Ranger District closed in the mid 1980s and the Descanso Ranger District closed in 1993. About half of the Palomar Ranger District remains open to recreational target shooting, while the other half was closed due to resource issues in 2000.

The San Bernardino National Forest mirrored San Bernardino County's firearm regulations map and ordinances with a mixture of open, restricted and closed recreational target shooting areas. The Riverside County portion of the national forest was generally open to recreational target shooting except for federal and state game reserves, communities, and recreation sites. Following a 1997 temporary closure of the entire national forest to recreational target shooting for public safety and resource protection reasons, the national forest re-opened one concession-operated public range and five designated recreational target shooting areas in the Front Country and Mountaintop Ranger Districts. Two gun clubs were never closed. The San Jacinto Ranger District re-opened to recreational target shooting mostly as before. National Forest-designated and open recreational target shooting areas are subject to temporary closure during periods of high fire danger.

The Los Padres National Forest (being generally more remote from concentrated urban populations) has been able to keep more of the national forest open to recreational target shooting than the other national forests. The national forest currently has two gun clubs under permit and a few designated recreational target shooting areas, and most of the national forest is open to recreational target shooting without special restrictions. The current status of recreational target shooting areas is displayed in table 262: Recreational Target Shooting.

Table 262. Recreational Target Shooting

Component	Los Padres	Angeles	San Bernardino	Cleveland
Concession-Operated Sites	None	A Place to Shoot Burro Canyon	Lytle Creek Firing Line	
Permitted Gun Clubs: Limited or No Public Access	Winchester Gun Club Ojai Gun Club	Desert Marksmen Burbank	Big Bear Sportman's Club Arrowhead Fish and Game Conservation Club	
Designated Shooting Sites by Forest Order (Other Shooting Restrictions May Apply)	3 sites along Camino Cielo	3 sites temporarily closed since 1993.	Big Pine Flat 1N09 Lightning Gulch Arrastre #1/#2 San Jacinto RD (part open)	
Remainder of Forest	Some areas closed by Forest Order, but primarily open.	Closed to shooting.	Closed to shooting.	Closed by District specific order, unless open. Open areas are Orosco Ridge and along Palomar Divide.

Hunting and Fishing

Hunting and fishing in the southern California national forests are permitted and regulated by the California Department of Fish and Game. Hunting and fishing are allowed at certain times of the year depending on the species. The most popular big game is deer. Other types of game hunted on the national forests include bear, turkey, bighorn sheep (occasionally by special lottery), wild pig, quail, band-tailed pigeon, mourning dove, rabbit and waterfowl. Predator calling (coyote, fox, bobcat, etc.) is a common activity. The trapping of furbearers is rare. Fishing is mostly done for stocked rainbow trout in coldwater streams and reservoirs. Warm-water fish (including bass, bluegill, crappie, striped bass and catfish) are also caught in some reservoirs. The Forest Service does not administer any of the larger reservoirs within their boundaries, including Big Bear Lake, Lake Arrowhead, Silverwood Lake, and Pyramid, Piru and Castaic Lakes. Ocean surf fishing opportunities are available on the Los Padres National Forest.

Wild trout management plans have been developed for Sespe, Deep and Bear Creeks (Bloom pers. comm., Stephenson and Calcarone 1999). Upper and lower Piru Creek and the West Fork San Gabriel are currently catch-and-release under consideration for wild trout designation. Other trout streams designated for catch-and-release and barbless hooks include the San Antonio River, the South Fork of the San Jacinto River, and Pauma Creek and the West Fork of the San Luis Rey River on Palomar Mountain. The upper portion of Middle Fork Lytle Creek has been petitioned for wild trout status and has been surveyed over the past three years by the California Department of Fish and Game (Mizuno pers. comm.). The designated sections of these streams are not stocked. There are also many miles of undesignated streams that are not stocked with hatchery-reared trout and have self-sustaining populations of trout. These are generally in more remote locations and provide a high quality fishing experience. The East and West Forks of the San Gabriel River are popular fishing locations, including a unique fishing opportunity for people with disabilities on the West Fork.

Individuals and hunting and fishing groups provide volunteer help to the national forests in maintaining the quality of hunting and fishing areas. Participation estimates are shown in table 263: Estimated Hunting and Fishing Activity Participation Range.

Table 263. Estimated Hunting and Fishing Activity Participation Range

Forest	Total Forest Visits (Million)	Hunting	Fishing
Angeles	3.5	3%	12%
Cleveland	0.8	17%	14%
Los Padres	1.5	1%	5%
San Bernardino	2.3	1%	3%

Recreation Special Use Authorizations

The national forests also offer recreation opportunities in partnership with commercial and non-commercial entities by granting special use authorizations (see table 105: Recreation Special Use Authorization Summary). Also, an annual average of about 85 different groups are issued short-term permits to conduct recreation events within the national forests. Developed recreation site concessionaires are discussed in the developed recreation section.

Table 105. Recreation Special Use Authorization Summary

Category of Use:	Angeles		Cleveland		Los Padres		San Bernardino		Total	
	#	Acres	#	Acres	#	Acres	#	Acres	#	Acres
Clubs	7	41	5	33	3	9	6	7	21	90
Organization Camps	26	206	0	0	9	187	26	322	61	715
Recreation Residences	511	110	306	160	123	40	769	250	1,709	560
Resorts	6	16	2	13	0	0	1	3	9	32
Campgrounds	4	167	2	70	8	276	10	272	24	785
Park, Playground	3	236	0	0	1	40	0	0	4	276
Recreation Events	22	738	5	162	6	1,294	9	85	42	2,279
Outfitter and Guides	1	1	0	0	7	185	12	10,032	20	10,218
Winter Recreation Resort	5	1,459	0	0	0	0	4	2,033	10	2,876
Total	585	2,974	320	438	157	2,031	838	12,388	1,900	17,831

Source: INFRA/SUDS, 7/9/03 as validated by Forest staff

Recreation Residences

Recreation residences are privately built and owned structures on National Forest System land. They are administered by the Forest Service under special use authorization, to be maintained for the use and enjoyment of the permit holders and their guests as vacation sites, not permanent residences. Recreation residences were first built in the 1920s. There are 1,709 recreation residences on 560 acres within 65 tracts in the southern California national forests, which is about 27 percent of those permitted statewide. There are approximately 6,300 recreation residences in California and 14,900 recreation residences in the United States.

There are a total of 65 existing recreation residence tracts:

- Angeles National Forest (22 tracts);
- Cleveland National Forest (16 tracts);
- Los Padres National Forest (6 tracts); and
- San Bernardino National Forest (21 tracts).

No specific NVUM data are available for current use estimates, and NSRE data are not available to indicate a trend over time.

Winter Sports

Winter sports opportunities by special use authorization within the four southern California national forests include downhill skiing and snowboarding, Nordic skiing, and snowplay. These national forests are popular local day-use winter sports attractions and do not have facilities or capacities to match those in the Sierra Nevada, Northwest, or Rocky Mountains. There are no true multi-day "destination resorts" that skiers travel from other parts of the country to visit here. Total skier capacity on the Angeles and San Bernardino National Forests is 31,300 Skiers At One Time (SAOT). There is one closed ski area (Snow Forest) on the San Bernardino National Forest. There are no developed winter sports sites on the Cleveland or Los Padres National Forests.

Table 264. Angeles National Forest Developed Ski Area Capacity

Ski Area	SAOT
Mountain High	6,500
Mount Baldy	2,000
Ski Sunrise	1,500
Mount Waterman	1,200
Kratka Ridge/Snowcrest	800
Total	12,000

Table 265. San Bernardino National Forest Developed Ski Area Capacity

Ski Area	SAOT
Snow Summit	6,500
Bear Mountain	6,500
Snow Valley	5,500
Green Valley	800
Total	19,300

SAOT-Skiers At One Time

The average season of use is from late November to early April. Mountain High on the Angeles National Forest and Snow Summit, Bear Mountain, and Snow Valley on the San Bernardino National Forest all have large snowmaking systems. These areas are capable of maintaining high quality snow coverage over the majority of their ski runs with artificial snow, as long as temperatures are favorable. Mount Baldy and Mount Waterman on the Angeles National Forest have smaller snowmaking systems, which are capable of supplementing the natural snowfall. The remaining developed ski areas have no snowmaking systems, and are totally dependent upon natural snowfall.

The Angeles National Forest authorizes two ski clubs, Buckhorn and Big Pines.

Two Nordic ski areas (Green Valley Nordic and Rim Nordic) are operated under special use authorization within the San Bernardino National Forest. Rim Nordic maintains 10-12 miles of groomed ski trail over existing National Forest System trails. Green Valley Nordic grooms 20 to 25 miles of ski trail over existing National Forest System roads and trails. Both Nordic areas are totally dependent on natural snow, as they have no artificial snowmaking system. The two Nordic areas can usually operate from mid-December through March each winter. During a good winter season, each of the Nordic areas may have up to 2,000 skier visits.

There is one developed snowplay area, Snowdrift Winter Playground, operated under a term special use authorization on the San Bernardino National Forest. This area has a limited snowmaking operation that is used to supplement natural snowfall. The area accounts for about 25,000 visitors during an average winter season. During a favorable winter season, Snowdrift operates from December 1st to April 1st.

Visitor use at developed ski areas has remained relatively flat across the nation. About 50 to 55 million skier visits are recorded annually. Visitor use has also remained relatively flat at most developed ski areas on the Angeles and San Bernardino National Forests over the past several years, with increased use during winters with better than average snowfall. Snowboarding use has dramatically increased at ski resorts across the nation. This is especially true at ski resorts on the Angeles and San Bernardino National Forests, with some areas estimating that over 80 percent of their customers are snowboarders on many days. Developed ski resorts on the Angeles National Forest account for about 700,000 skier visits each winter (Lawler pers. comm.). Mountain High and Ski Sunrise Ski Areas have seen increased use recently. NVUM data indicates that approximately 35 percent of 3,500,000 visitors (1,225,000) said they participated in downhill skiing or snowboarding activities. Developed ski resorts on the San Bernardino National Forest receive about 1,000,000 skier visits each winter season (Bennett pers. comm.). NSRE data for California indicates that downhill skiing decreased about 21 percent and cross-country skiing decreased 14 percent during 1994 to 2001; however, snowboarding increased dramatically, by 178 percent, during that same time.

Trends and Projections

As part of the analysis of recreation supply and demand, use levels are projected into the future to forecast an estimate of future demand. Future demand can then be compared to each alternative's proposed recreation capacity or supply.

Population growth is expected to drive a continued increase in outdoor recreation demand. The current population of the southern California study area (according to the social and economic section of this document and U.S. Census 2000 population projections for July, 2002) is now close to 32 million people and is expected to grow to approximately 39 million people by 2020. This is an increase of 7 million people or 20 percent. Also known is that the four southern California national forests are currently experiencing approximately eight million visits annually (NVUM data; see Appendix L. Visitor Use and Participation (NVUM)).

For the purposes of this analysis, the Forest Service expects that in the next 15 years (by the year 2020) between 9.2 and 9.6 million annual visits to the national forests (or an increase of up to 15 to 20 percent) will be recorded. This estimation is not supported by any specific current research but is made here only to provide an approximation for analysis. Also, activity-specific trends of use have not been predicted for developed or dispersed recreation for the southern California national forests. However, NSRE and other research data lead the agency to believe that recent demand will continue to differ in varying degrees by recreation activity over time, based upon changing demographics, societal preferences, evolving technology and available opportunities. Trends discussed by recreation activity above are generally expected, barring unforeseen circumstances, to continue into the next 15 years. Some use increases and declines may stabilize, while other uses are expected to continue their recent upward or downward trends.

Much of the increase in expected visitation will continue to be concentrated at specific national forests and places and in specific activities as discussed above. An analysis of the potential growth in some of those popular places follows.

Front Country, Upland and High Country Places, Angeles National Forest

Based on data from Los Angeles County, growth is predicted for Los Angeles County (an estimated increase of 1 million by the year 2015), with the largest growth in the Hispanic population (an estimated 17 percent by 2020). The median age is increasing, although not as fast for Hispanics as for other populations. Thus, Places can potentially expect increased use, increased numbers of Hispanic origin visitors and an older visitor population. In Big Tujunga Canyon, the biggest increase in activity is predicted for hiking and walking. In San Gabriel Canyon, the biggest increases in activities are for hiking and walking, mountain biking, fishing, picnicking and day-use. For the Angeles Uplands (East and West) Places, the biggest changes predicted are increases in hiking and walking, backpacking, birdwatching and mountain biking, while decreases are expected for hunting and dispersed camping. For the Angeles High Country Place, the biggest changes predicted are increases in hiking and walking, backpacking, mountain biking, use of visitor centers and picnicking and day-use, while decreases are expected for hunting.

Figueroa/Santa Ynez Place, Los Padres National Forest

Based on data from Santa Barbara County, growth is predicted for Santa Barbara County (an estimated increase of 0.1 million by the year 2015), with the largest growth in the Hispanic population (an estimated 22 percent by 2020). The median age is increasing, although not as fast for Hispanics as for for other populations. Thus, the Figueroa/Santa Ynez Place can potentially expect increased use, increased numbers of Hispanic origin visitors and an older visitor population. In this Place, the biggest increases in activities are predicted for hiking and walking, mountain biking, fishing and picnicking and day-use.

Hungry Valley/Mutau Place, Los Padres National Forest

Based on data from Ventura County, growth is predicted for Ventura County (an estimated increase of 0.2 million by the year 2015), with the largest growth in the Hispanic population (an estimated 11 percent by

2020). The median age is increasing, although not as fast for Hispanics as for other populations. Thus, the Hungry Valley/Mutau Place can potentially expect increased use, increased numbers of Hispanic origin visitors, and an older visitor population. In this Place, the biggest increases in activities are predicted for hiking and walking, backcountry camping, and picnicking and day-use.

Laguna Place, Cleveland National Forest

Based on data from San Diego County, growth is predicted for San Diego County (an estimated increase of 1.4 million by the year 2015), with the largest growth in the Hispanic population (an estimated 13 percent by the year 2020). The median age is increasing, although not as fast for Hispanics as for other populations. Thus, the Laguna Place can potentially expect increased use, increased numbers of Hispanic origin visitors, and an older visitor population. In the Mt. Laguna area, the biggest increases in activities are predicted for hiking and walking, wildlife viewing, birdwatching, mountain biking and picnicking and day-use.

San Bernardino Front Country Place, San Bernardino National Forest

Based on data from San Bernardino County, growth is predicted for San Bernardino County (an estimated increase of 0.8 million by the year 2015), with the largest growth in the Hispanic population (an estimated 19 percent by the year 2020). The median age is increasing, although not as fast for Hispanics as for other populations. Thus, the San Bernadino Front Country Place can potentially expect increased use, increased numbers of Hispanic origin visitors, and an older visitor population. In Forest Falls, the hot issue is snowplay but there is no prediction available for that activity. For Thurman Flats, the biggest increase in activity is predicted for hiking, walking, picnicking and day-use.

The analysis above is by D.J. Chavez, Pacific Southwest Research Station, April 2003, and is based on data from the Socioeconomic Assessment (Struglia and others 2003), compilation of Chavez (2001) data, and NSRE (Cordell and others 2002, based on subset of southern California data from national study).

Conservation Education, Volunteers and Partnerships

Conservation education is a broad category that includes interpretation, environmental education and visitor information. These are communication strategies used to develop public awareness, appreciation and support for conservation issues and policies. Conservation education is a way for the Forest Service to connect people with the environment by providing them with the tools they need to take informed stewardship actions. Because of the increased growth in and adjacent to the urban southern California national forests, conservation education plays an important role in helping the Forest Service reach and deliver the messages about stewardship and the agency's role in the environment. However, managers here face difficult challenges of finding out what diverse, urban visitors want to know, and of delivering complex messages in multiple languages at many locations. Although universally supported, conservation education opportunities are currently limited in size and scope. They are often conducted in partnership with volunteers, interpretive associations and non-profit organizations. Many opportunities exist for the enhancement of existing and new projects and programs. The existing southern California national forest program includes the following brief snapshot of facilities, programs and projects:

- The Angeles National Forest provides four visitor centers (Chilao, Grassy Hollow, Mt. Baldy and Vista del Lago) and four entrance stations (Big Pines, Clear Creek, Crystal Lake and San Gabriel) that serve as the hub for conservation and information messages, as well as interpretive programs for the national forest visitor. Visitor information is also communicated through handouts, brochures and a Web site. The national forest takes advantage of opportunities to interact with the public off-forest in such venues as county fairs, schools and special functions (parades, Earth Day, etc.). Conservation education goals are met through innovative partnerships by national forest employees, community educational institutions, volunteers, interpretive associations, nongovernmental organizations, contractors and permit holders.

- The Cleveland National Forest offers visitor information and assistance at Ranger District Offices and the Supervisor's Office. A visitor center is located on Laguna Mountain and staffed by an active volunteer group, the Laguna Mountain Volunteer Association. A self-guided interpretive trail is located at the Inaja Memorial Picnic Area. Visitor information is also communicated through brochures, handouts, a Web site and a Forest Visitor Guide newspaper. On-site signage is used to present various interpretive topics. In addition, outreach programs exist that offer conservation-based educational opportunities for local youth.
- The Los Padres National Forest (through effective relationships with a number of partners including community organizations, museums, zoos, permit holders, and other agencies) supports conservation education in schools and communities, as well as in the national forest. Together with the Channel Islands National Park and the Channel Islands National Marine Sanctuary, they operate the Outdoor Santa Barbara Visitor Center in Santa Barbara. This center is staffed by volunteers and interprets public lands administered by all of the agencies. In addition to conservation education material and exhibits at Forest Service offices and at the Outdoors Santa Barbara Visitor Center, the Los Padres Forest Association provides volunteer staffing at the Big Sur Station and Wheeler Gorge Visitor Center. Visitor information is also communicated through handouts, brochures and a Web site.
- The San Bernardino National Forest has a large and active conservation education program. Many partnerships are in place with local, regional and national conservation, volunteer and non-profit groups; and with five interpretive associations including the San Bernardino National Forest Association. The flagship of national forest facilities is the Big Bear Discovery Center, open since 1998 and serving 175,000 visitors per year. Other facilities include the Children's Forest Visitor Center, Barton Flats Visitor Center, Heaps Peak Arboretum, seven fire lookout towers, and Forest Service offices. The National Children's Forest is an important environmental education program for youth. Visitor information is communicated by the Forest Visitor Guide, handouts, brochures, and a Web site.

Volunteers help the southern California national forests serve visitors and protect and restore natural resources and recreation facilities. In 1972, the Volunteers in the National Forests law was enacted allowing the recruitment, training and acceptance of volunteer services. Without this volunteer resource, the national forests could not begin to meet the expectations of the public. Successful management of this program helps the public to appreciate and take good care of the national forests. Volunteers are often managed by not-for-profit organizations that coordinate activities with Forest Service personnel. These national forests have some of the strongest not-for-profit and partnership programs in the National Forest System.

The southern California national forests reported that during fiscal year 2002, 4,306 volunteers and hosted programs contributed 196,155 hours of work (109 person years) with an estimated value of $3,026,779. The average volunteer contributed 45.6 hours of work. Volunteer time included these activities: trails maintenance and patrol; campground maintenance; wilderness patrol; area and stream clean-up; noxious weed removal; interpretation and environmental education; heritage resources stewardship; watershed restoration; fish, wildlife and plant habitat restoration and management; graffiti removal; off-highway vehicle trail maintenance, patrol, and damage restoration; search and rescue; and hosting visitor centers and other recreation sites (Forest 1800-6 Annual Reports, Lotus Notes Database).

While this is a good model of the kind of partnerships to managing the national forests, it still does not come close to reaching the stewardship potential offered by active, interested and growing communities. Each dollar invested in this area comes back many times over as money, donated services, and the goodwill of community leaders working closely with the national forests to collaboratively solve problems. One peripheral benefit to the national forests is that volunteers act as national forest liaisons with the surrounding communities. Because these people tend to be active in their communities, as well as having numerous contacts through their work, they are able to reach a large and diverse audience that

Forest Service employees typically cannot. Volunteers become ambassadors for the national forests, not only when they are working with the national forests, but in their daily lives as well.

National forest leadership emphasizes the value of partnerships; the challenges that remain include budget, training field level employees, hiring additional high-leverage resources to focus on partnership coordination, and creating meaningful performance measurements that are reflected in the jobs of field personnel.

The benefits from integrating partnerships into the daily operations of the national forests include:

- Advocacy - the public develops a feeling of ownership in the national forest and wants to support it.
- Revitalized employees - energized by a sense of personal satisfaction and appreciation from their partners and community neighbors.
- More work done - organizations accomplish more by working together and combining resources.
- Improved national forest ecosystem stewardship - obtaining additional resources for monitoring and ecosystem restoration.
- Improved visitor facilities- obtaining resources to aid in the design and construction of facilities.

Wilderness

There are 21 existing wilderness areas, totaling more than 1.1 million acres, on the four southern California national forests (see table 237: Southern California National Forest Existing Wilderness).

Seven wildernesses within southern California are Class I areas as defined by the 1977 Clean Air Act. Air quality and visibility are often a problem for many wilderness areas in southern California, including those within the greater Los Angeles/Orange County/Inland Empire air basin because they are adjacent to the second largest urban area (with the lowest reported air quality) in the United States (McCorison and others 2003).

Wildernesses within southern California national forests include important watersheds for ecosystem and community needs. Some of the wildernesses are watersheds for the greater Los Angeles area, while many other wildernesses are important watersheds for local communities.

Some of the wilderness acreage on the national forests is higher elevation, but locations can vary from near sea level to over 11,500 feet, supporting a diversity of vegetation types including grass-forbs, chaparral, pinyon-juniper, mixed conifer, and alpine.

Table 237. Southern California National Forest Existing Wilderness

Wilderness	Forest	NFS Acreage	Other Acreage	Total Acreage
Agua Tibia +	Cleveland NF	15,933	0	15,933
Bighorn Mountain	San Bernardino NF	11,800	0	11,800
Chumash **	Los Padres NF	38,150	50	38,200
Cucamonga +	Angeles NF	4,200	0	4,200
	San Bernardino NF	8,581	0	8,581
Dick Smith **	Los Padres NF	67,800	200	68,000
Garcia **	Los Padres NF	14,100	0	14,100
Hauser	Cleveland NF	7,547	544	8,091
Machesna Mountain **	Los Padres NF	19,760	240	20,000
Matilija **	Los Padres NF	29,600	0	29,600

Wilderness	Forest	NFS Acreage	Other Acreage	Total Acreage
Pine Creek	Cleveland NF	13,480	206	13,686
San Gabriel +	Angeles NF	36,118	0	36,118
San Gorgonio +**	San Bernardino NF	56,722	1,947	58,669
San Jacinto +	San Bernardino NF	32,248	1,160	33,408
San Mateo Canyon	Cleveland NF	38,484	1,056	39,540
San Rafael +**	Los Padres NF	197,380	190	197,570
Santa Lucia	Los Padres NF	18,679	3,025	21,704
Santa Rosa	San Bernardino NF	13,787	6,016	19,803
Sespe **	Los Padres NF	219,700	0	219,700
Sheep Mountain	Angeles NF	39,482	484	39,966
	San Bernardino NF	2,401	0	2,401
Silver Peak * **	Los Padres NF	31,555	0	31,555
Ventana + * **	Los Padres NF	239,288	3,311	242,599
TOTAL ACREAGE		1,156,795	18,429	1,175,134

Acreages are approximate.
Meaning of Notations:
+ Class I under the Clean Air Act
* 17,055 acres added to Silver Peak and 37,110 acres added to Ventana in December, 2002 Big Sur Wilderness Additions Act
** Acres estimated pending final map compilation
Source: `http://www.fs.fed.us/land/staff/lar/LAR01/table7.htm` and 2002 Big Sur Wilderness Additions Act.
NFS: National Forest System

Current conditions in many areas of southern California wilderness reflect years of wildland fire suppression that has led to higher than normal vegetation densities. The exclusion of fire has resulted in vegetation conditions that are outside of the historical range of variability (see the Vegetation Condition and Forest Health and Wildland Fire and Community Protection sections). Also, recent drought conditions and bark beetle epidemics (especially in the San Bernardino, San Jacinto, Santa Rosa and Palomar Mountains) have led to high levels of tree mortality throughout the wildernesses in those areas.

Opportunities for vegetation management activities in wilderness are limited. The forces of nature (fire, insects and disease) generally are allowed to play a natural role in wilderness without human intervention, as long as they do not threaten resources, public safety, and property outside the wilderness boundary. Prescribed fire may be allowed, but mechanical vegetation treatments normally are not. Recent additions to the Ventana and Silver Peak Wildernesses on the Los Padres National Forest do legislatively allow for pre-suppression vegetation management activities.

There are 66 grazing allotments with 128,109 suitable acres in wilderness, almost all on the Los Padres National Forest. Some of the allotments are vacant or closed. Grazing is permissible when it pre-dates the establishment of the wilderness and is compatible with other uses. Some fencing and water developments have been constructed, and they are being maintained to control and support livestock grazing and to minimize resource impacts.

Wilderness is withdrawn from mineral entry upon designation, subject to valid existing rights. Wilderness within southern California generally is not mineralized and does not contain energy production capabilities, except for oil and gas potential within the Los Padres National Forest.

Less than 2 percent of the land base of National Forest System wilderness in southern California is classified as "other" ownership. Local, county, state or federal agencies manage some of this land, and some of it is privately owned. However, some key parcels of non-federal land within National Forest

System wilderness may include activities that, at some point, may conflict with wilderness values if the parcels are modified or developed.

Wilderness provides relatively large, undisturbed habitat for wildlife, including a number of threatened, endangered or sensitive species. Much of the area is summer or year-round range for big game, but some lower slopes offer important winter range. Big game includes mule deer. Bighorn sheep inhabit the San Gabriel, Sheep Mountain, San Gorgonio, Bighorn Mountain, San Jacinto and Santa Rosa Wildernesses. Predators include coyote, bobcat, mountain lion and black bear. Many small game, non-game and bird species use and live in wilderness, as well as reptiles and amphibians. Hunting opportunities and wildlife watching are popular in wilderness areas. Some wildernesses have native trout and steelhead.

Large wildfires (usually human-caused) regularly burn through wilderness in the southern California national forests. The primary management response to wildfire is and has been suppression, which has led to vegetation conditions that differ from those resulting from natural processes. Managers now recognized that fire benefits ecological and habitat values. Fuel buildups are high in many areas, especially in the drought-stricken San Bernardino National Forest, increasing the potential for severe fires next to developed areas and creating the need for suppression activities to protect private property and watershed values. Vegetation type-conversion has occurred within some wilderness. No southern California national forest wilderness has a wildland fire management plan that would allow wildfire to play its natural role. Further discussion of fire management in wilderness, undeveloped areas, and proposed wilderness is in the Wildland Fire and Community Protection section.

Large stands of dead and dying trees are present in some wildernesses, especially San Gorgonio and San Jacinto, because of the current drought and associated insect epidemic. Because natural processes are generally allowed to function in wilderness, no management actions are planned within those affected wildernesses.

Nonnative invasive species are an increasing problem, and in some areas invasive species are starting to spread. However, in some instances management actions are controlling spread.

Wilderness Recreation

Recreation use in southern California national forest wilderness is increasing and can affect wilderness values and resources, naturalness, wildness and solitude. Without appropriate management, the quality and values of wilderness can be compromised (see table 238: Estimated Wilderness Visitors by Forest).

Table 238. Estimated Wilderness Visitors by Forest

Forest	Visits	Error Rate %
Angeles (CY 2000)	100,000	34.8
Cleveland (FY 2001)	31,616	46.2
Los Padres (FY 2001)	123,139	37.7
San Bernardino(FY 2003)	87,509	40.8
TOTAL	342,264	-

Source: National Visitor Use Monitoring (NVUM) program.
Reference the linked NVUM reports for ANF, CNF, SBNF and LPNF for additional, detailed wilderness use information
CY: Calendar Year
FY: Fiscal Year

Types of recreation use vary by wilderness or terrain. In most southern California national forests, day hiking constitutes the largest portion of total wilderness use. Other activities include, but are not limited to, backpacking, horseback riding, rock climbing and hunting. The National Survey of Recreation and the Environment (NSRE) data for southern California indicates that day hiking and backpacking increased 35 percent and 22 percent, respectively, during 1995 to 2001. NSRE data for southern California indicates that horseback riding increased 45 percent during 1994 to 2001, but rock climbing and hunting decreased in popularity (see the Recreation section). Commercial services are permitted within wilderness to the extent necessary to support activities essential to realizing the recreation or other values of the area. A low level of commercial outfitting and guiding services are currently provided, but they are estimated to constitute small percentage of the total wilderness use on the national forests.

Day-use and overnight capacities are established for some of the wildernesses within the San Bernardino National Forest to help disperse users and maintain the quality of the wilderness experience. All of the wildernesses in southern California (except those within the San Bernardino National Forest) have a group size limitation of 25 people and stock. Sometimes referred to as the "heartbeat" rule, this regulation allows any combination of people and stock totaling 25. The San Bernardino National Forest group-size limitations specify no more than 12 people and 8 animals per permit. Campfires are prohibited within most wildernesses within the San Bernardino National Forest.

Visitors across most of the country are expected to be knowledgeable about and prepared to deal with conditions typically found in wilderness areas. Visitors should expect more difficult travel conditions, few or no facilities, and a high reliance on primitive survival skills and modes of travel. However, many visitors from the diverse, urban population of southern California have limited outdoors skills, especially when the weather abruptly changes, making wilderness management a challenge for national forest staff. The Forest Service (on a case-by-case basis) may authorize motorized equipment and/or mechanical transport where there is a legitimate emergency involving human health and safety. The use of helicopters can be authorized to rescue injured or lost people. Since 1990, there have been approximately 120 approvals for use of motorized equipment on search-and-rescue missions in southern California national forest wilderness (FICC, San Bernardino National Forest).

There continues to be public interest in adding land to the National Wilderness Preservation System, either as additions to existing wilderness or as new wildernesses. Additions satisfy both a need for preserving natural ecological conditions and for public recreation in primitive environments. There is also opposition or lack of support to adding to the wilderness system; in part because people feel that these backcountry areas are needed for mechanical and motorized access, to preserve future management options, and to accommodate a wider range of recreation opportunities. Regardless of the acreage of national forest wilderness, use in these areas is expected to continue to increase as a result of population growth in southern California, the desire to visit areas with primitive characteristics, and the popularity of outdoor recreation.

New technologies are evolving that may alter the primitive recreation experience. For example, cellular phones and global positioning system (GPS) units are changing the sense of challenge, adventure and solitude. Given the reliance on these devices and the urbanization of the population, primitive skills of some visitors could further diminish. These changes may lead to an increase in the number of search-and-rescues needed to save lives.

The availability of land outside wilderness capable of providing high-quality, primitive, wildland recreation experiences has decreased over time. Even small increases of use in pristine portions of wildernesses can diminish opportunities for solitude.

The management of wildernesses is also changing. More agency managers are incorporating capacity determinations, permit systems, designated sites and use restrictions. Another important management instrument is the minimum tool concept, where wilderness and fire managers evaluate planned actions to determine if they are necessary to protect wilderness resources or experiences while still providing for public safety. If the action is determined to be necessary, then it must be accomplished with the least possible impact on wilderness resource.

Human caused sights and sounds are an impact on wilderness experiences (especially southern California), typically disrupting the primitive solitude that visitors seek. These often include the sight and sound of nearby development, highways, management activities (such as tree mortality removal operations), and commercial or military overflights.

There is a need to allow natural environmental processes, especially fire, to play a greater role within wilderness. The challenge associated with this need is the small size of many of the national forest wildernesses and their proximity to urban areas in southern California and the proximity to large areas of dead and dying vegetation (especially in and around the San Gorgonio and San Jacinto wilderness areas).

Finally, peoples perception of wilderness values is shifting. Traditionally, wilderness was viewed primarily as an area to satisfy primitive recreation needs. Currently, many people see wilderness as the highest level of protection biodiversity, ecosystems, plants, wildlife, air resources, and watershed values, in a rapidly growing part of the country. Wildernesses are also valued for environmental education and scientific research opportunities.

Landscape Management

The rugged wildland landscapes of southern California (which visually represent our western frontier heritage) are increasingly valued for the visual contrast they provide in a rapidly urbanizing region. The contrast between the urban and natural settings is the unique characteristic that distinguishes this area from other regions of the country. As the resident population continues to increase, so too will the desire to conserve these remaining vestiges of regional open space and scenic heritage in a natural-appearing condition.

National Forest visitation has increased over the past two decades because of the area's population growth. Driving for pleasure and viewing scenery have become some of the more popular national forest activities. Visitors expect a certain level of 'naturalness' in the recreation and tourism settings they pursue. Even individuals who have never visited these national forests expect a certain level of 'natural intactness' in these landscapes. This natural beauty contributes to their sense of well-being and quality of life. The scenic integrity of national forest landscapes (which measures landscapes' inherent scenic attractiveness and the public's visual expectations for naturalness) is the system by which projected alterations in national forest landscapes are evaluated.

Landscape Attractiveness

National Forest landscapes provide a variety of outdoor recreation settings, ranging from the jagged Pacific Ocean coastline of central California to the high-elevation 'big-tree' conifer forests of the Transverse Range. The most attractive landscapes (or those classified as scenic attractiveness class A (SAC-A)) are located where the highest combination of landform, water form, rock form and vegetation variety occurs. SAC-A landscapes represent approximately 19% of the landscapes within the national forests. The more common landscapes of the region (or those classified as scenic attractiveness class B (SAC-B)) consist of steep chaparral-covered mountains intermixed with foothill and valley areas consisting of oak woodland and grassland. The remaining landscapes (approximately 8 percent of the land base) are less distinctive, or scenic attractiveness class C (SAC-C) (see table 278: Landscape Attractiveness - Acres and Percent of Total Acres, by Class and Forest).

Table 278. Landscape Attractiveness - Acres and Percent of Total Acres, by Class and Forest

Scenic Attractiveness Class	Angeles	Cleveland	Los Padres	San Bernardino
SAC A - Distinctive Landscapes	157,100 24%	66,065 16%	248,670 14%	211,160 32%
SAC B - Typical Landscapes	482,825 74%	329,967 78%	1,497,782 84%	247,418 38%
SAC C - Indistinctive Landscapes	15,930 2%	24, 845 6%	34,925 2%	207,175 30%

Visual Expectations of the Public

National Forest visitors are attracted to a variety of areas for the natural character they possess. Visitors and residents value the forested backdrops that frame the urban complex. The transportation network and associated use areas provide visitors with scenic routes and vantage points to experience the region's seemingly endless expanse of rugged backcountry depicted in American cinema. Adventure seekers particularly treasure the hidden seldom-seen valleys and canyons. The internationally known coastal region of Big Sur provides unique, awe-inspiring panoramic views of the jagged Pacific Ocean coastline.

Table 279. Key Places Valued for Scenic Quality

Forest	Key Place	Acres
Angeles National Forest	Angeles High Country	100,560
	Angeles Uplands West	68,792
	Front Country	101,232
	Liebre-Sawmill	17,094
	Mojave Front Country	52,610
	Santa Clara Canyons	140,824
	Soledad	59,338
Cleveland National Forest	Aguanga	47,895
	Elsinore	46,729
	Morena	49,568
	Laguna	30,183
	Palomar	23,940
	Pine Creek	33,561
Los Padres National Forest	Big Sur	82,718
	Cuesta	42,187
	Highway 33	109,150
	Ojai-Piru Front	59,453
	Santa Barbara Front	57,161
San Bernardino National Forest	Arrowhead	36,663
	Big Bear	39,078
	Big Bear Back Country	63,889
	Front Country	13,079
	Garner Valley	38,451
	Idyllwild	44,361
	Lytle Creek	42,384
	San Bernardino Front	84,566
	San Gorgonio	99,925
	Santa Rosa & San Jacinto Mtns	63,726

National Forest travel routes have been evaluated for the estimated level of public concern for alterations to the landscape. Travel routes classified as concern level 1 (including those routes that are designated state scenic highways or national forest scenic byways) indicate that the public is most concerned about alterations; concern level 3 indicates the least concern. In evaluating landscape visibility, landscape managers have recognized that "distance" is one of the primary perceptual factors for determining whether alterations are visually noticed. Foreground distance zones reveal even the subtlest alterations; background distance zones are able to absorb greater alterations, provided color contrasts are minimized.

Some of the more secluded areas of the national forests are identified as "seldom seen," indicating that they are visible only from aerial viewpoints.

"Key Places" in the planning area represent the most picturesque national forest locations. These Places possess their own distinct landscape character and are particularly valued for their scenic quality. They generally serve as urban backdrops or recreation-destination settings, or they contain scenic features along scenic routes and byways. Table 279: Key Places Valued for Scenic Quality displays the national forest distribution of key Places. Projected alterations in the landscape character of selected key Places will be examined in further detail at the project level.

Scenic Integrity Objectives

Landscape management is used to meet people's scenery expectations for the management of national forest landscapes. To ensure that scenic integrity is maintained, six scenic integrity objectives have been established, derived from the landscape's attractiveness and the public's expectations or concerns. Each scenic integrity objective depicts a level of scenic integrity used to direct landscape management: very high (unaltered), high (appears unaltered), moderate (slightly altered), low (moderately altered), and very low (heavily altered). Generally, landscapes that are most attractive (as classified by scenic attractiveness class) and are viewed from popular travel routes (as classified by concern level) are assigned higher scenic integrity objectives. The methodology for establishing scenic integrity objectives is provided in Forest Service Agriculture Handbook 701 (see table 280: Scenic Integrity Objectives for Alternative 1 - Acres and Percent of Total, by SIO and Forest).

Table 280. Scenic Integrity Objectives for Alternative 1 - Acres and Percent of Total, by SIO and Forest

SIO	Angeles	Cleveland	Los Padres	San Bernardino
Very High	80,284 12%	77,250 18%	828,863 47%	134,662 20%
High	290,775 42%	152,219 35%	270,190 15%	296,425 44%
Moderate	235,760 39%	174,545 41%	497,140 29%	226,555 34%
Low	48,015 7%	28,730 6%	161,415 9%	7,925 1%
Very Low	1,021 > 1%	1,750 > 1%	5,575 > 1%	6,826 1%

In some landscapes, human influence is evident through changes in vegetation patterns, landform alterations or the introduction of structural elements. For the most part, national forest landscapes in the planning area remain natural-appearing in character, with many of the valued landscape attributes still intact. Most of the human-influenced alterations affecting landscape scenic integrity have occurred on the San Bernardino National Forest; the Los Padres National Forest provides the largest area of landscapes that possess an unaltered character. Heavily altered or unacceptably altered landscapes in key Places are the priority areas for landscape restoration.

Law Enforcement

The ability to provide law enforcement services on public lands is an important component in the day-to-day management of the national forests and for the overall success of the Forest Service's mission of resource protection and public service. Crime that occurs on public lands poses a threat to national forest visitors, agency staff, and natural resources. The Forest Service reported that crimes in the national forests increased 200 percent from 1986 to 1996 (Loux 1996). In 2000, the Forest Service dealt with

285,000 incidents nationwide, ranging from car accidents to major drug-related crimes. A study of the types and prevalence of crime occurring on selected national forest sites found that urban crime spillover onto the national forests is common, and that these problems may include arson, body dumping, gang activity, murder, drug activity, and threats against personnel. Although the study concluded that all nationwide study sites faced urban-associated crimes regardless of geographic location, managers reported a higher prevalence of these crimes in areas near cities (Tynon and Chavez 2000).

Law Enforcement Offenses and Incidents

During the time period of 2000 to 2003, the four southern California national forests generated an average of 37 percent of the law enforcement offenses recorded by the 18 National Forests in the Pacific Southwest Region (Region 5, California), varying from 28 percent of the offenses in fiscal year (FY) 2000 (19,160 offenses region-wide) to 47 percent of offenses in FY 2002 (22,633 offenses region-wide) (see table 281: Law Enforcement Offenses from Fiscal Year 2000 through Fiscal Year 2003). Data from the Angeles National Forest show that 1,056 and 1,799 violation notices were issued in 1981 and 1983, respectively, (USDA Forest Service 1987a), and that the number of recorded law enforcement offenses rose to 3,139 in 2002. In 1980, the San Bernardino National Forest recorded approximately 3,000 law enforcement incidents (USDA Forest Service 1989a). During the years 2000 to 2003, there were between 3,466 to 3,765 total incidents recorded annually (see table 442: Number of Incidents from 2000 through 2003, SBNF). Table 442 displays the types and numbers of incidents that were recorded on the national forest. This information offers insight to the magnitude of the law enforcement issue in southern California and is representative of the activity levels on the other three southern California national forests. Although law enforcement incidents are shown as a separate category in table 442, nearly all recorded incidents involve some level of law enforcement either as a direct action, such as a citation or warning, or through an investigative process (USDA Forest Service 2003). In general, there has been an overall increase in the number of offenses and incidents that have been recorded during the last 25 years although the more recent information also indicates that the number of recorded offenses and incidents fluctuates annually. Other factors, including staffing, changes in visitor use, or the introduction of a new activities, can affect the number of offenses or incidents that are recorded during any given time period.

Table 281. Law Enforcement Offenses from Fiscal Year 2000 through Fiscal Year 2003

Forest	2000	2001	2002	2003
ANF	2,820	1,737	3,139	2,541
CNF	480	1,772	5,097	1,332
LPNF	1,299	1,373	1,213	830
SBNF	797	809	1,152	1,623
Total	5,396	5,691	10,601	6,326

(LEIMARS data base, 2000-2003)

Table 442. Number of Incidents from 2000 through 2003, SBNF

Incident Type	2000	2001*	2002	2003
Aircraft Down	0	10	3	8
Emergency Standby	11	20	7	10
Hazmat	0	40	23	10
Law Enforcement	1,610	1,490	1,637	1,250
Medical Aid	241	220	163	166
Miscellaneous	603	730	767	831
Prescribed Fire	0	20	4	2
Public assist	284	250	144	224

Incident Type	2000	2001*	2002	2003
Rescue Order	0	240	222	272
Search and Rescue	0	55	43	44
Smoke Check	60	10	1	18
Structure Fire	59	25	23	17
Traffic Collision	0	400	347	378
Vegetation Fire	556	200	184	195
Vehicle Fire	144	55	31	41
N/A	105	0	0	0
Total	3,673	3,765	3,599	3,466

* Numbers for 2001 are approximate

The national forests are subject to a variety of unlawful actions that often result from a lack of knowledge on the part of the visitor about how the national forests are managed and from a lack of environmental awareness regarding the resources that surround them (Chavez 2001). Some of the more common types of violations that occur are parking violations, unauthorized off-road vehicle use, camping and campfire violations, non-compliance with fee payments in campgrounds or other fee areas, littering, and unauthorized removal of fuelwood or other forest products. Other "visitors" to the national forests are there to purposefully engage in unlawful activities, from the perpetration of minor offenses to more serious misdemeanor and felony actions. Some of the types of more serious violations that occur are: vandalism, theft or destruction of government property; threats, intimidation, and assaults on Forest Service personnel; occupancy trespass; wildland arson; and civil disobedience. Review of the Law Enforcement and Investigations Management Reporting System (LEIMARS) data from 2001 through 2003 indicates that the five most common types of violations deal with occupancy and use, fire, off-highway vehicles, National Forest System roads and trails, and sanitation (see table 459: Predominate Categories of Offense Violations from FY 2001 through FY 2003). These figures indicate that the number of incidents associated with a given violation category also fluctuates annually.

Table 459. Predominate Categories of Offense Violations from FY 2001 through FY 2003

Offense Category	2001	2002	2003	Total
Occupancy and Use	1,398	3,252	2,565	7,215
Fire	956	1,771	970	3,697
OHV	307	875	536	1,718
Forest Roads and Trails	269	515	462	1,246
Sanitation	70	175	114	359

OHV: Off Highway Vehicle
FY: Fiscal Year

Contributing Factors in Southern California

The proximity of large population centers is a contributing factor regarding the amount and type of law enforcement incidents that occur on the national forests. Increased development adjacent to or within national forest boundaries has historically resulted in increased problems including occupancy, trespass, or encroachment. The remoteness of many areas helps to protect resources and property from higher levels of unlawful behavior that are typically encountered in concentrated use areas or areas where access is relatively easy. In contrast with the types of unlawful behaviors usually encountered in the concentrated use areas, the remoteness of some National Forest System land fosters other forms of criminal activities such as smuggling, drug trafficking, methamphetamine production, marijuana cultivation, homicides, assaults, and other crimes. The National Forests are receiving increasing pressure from these types of criminal behaviors, which in turn, compromise visitor and employee safety and have detrimental effects on national forest resources (Anon. 2003, Markey 2003, Roosevelt 2002, Santa Barbara County Sheriff's Department 2003, Stokes 2003, USDA Forest Service 2003).

The statistics for marijuana eradication for the years 1991 to 2004 indicate the effect of illegal activities(see table 551: Marijuana Plants Eradicated from 1991 to 2004). Three of the four southern California national forests ranked respectively, first, fourth, and seventh in the nation for the most marijuana plants seized during this year: Cleveland National Forest, 115,674 plants; San Bernardino National Forest, 44,286 plants; and the Los Padres National Forest, 34,673 plants (USDA Forest Service 2002c). In 2004, Riverside and San Bernardino Counties were ranked number one and number nine, respectively, in the amount of plants that were seized, with the bulk of these plants being grown on National Forest System land (Quintana pers. comm.). Cultivation practices typically degrade the environment; approximately two to five tons of trash, debris and chemicals are currently removed annually from grow sites on the San Bernardino National Forest, and a similar situation exists on the other three southern California national forests (Stokes 2003) (see also the section on Social and Economic Environment under Affected Environment).

Table 551. Marijuana Plants Eradicated from 1991 to 2004

	ANF	CNF	LPNF	SBNF	Total
1991	7,960	4,635	2,237	8,500	23,332
1992	2,680	5,503	4,977	3,360	16,520
1993	2,680	4,777	4,886	5,786	18,129
1994	1,589	5,428	1,364	10,675	19,056
1995	9,373	23,577	1,988	10,765	45,703
1996	3,800	12,078	1,000	10,110	26,988
1997	3,999	4,710	11,000	13,621	33,330
1998	9,660	132	15,000	3,663	28,455
1999	12,250	10,920	10,035	53,394	86,599
2000	*	74,944	15,688	33,556	124,188
2001	*	165,200	5,763	68,000	238,963
2002	*	115,674	34,673	44,286	194,633
2003	6,941	249,350	32,973	86,854	376,118
2004	13,173	22,162	*	139,498	174,833

* No data

Another law enforcement issue faced by the southern California national forests is immigration. Travel patterns of undocumented immigrants in southern California affect all the national forests, but are most relevant to the Cleveland National Forest because of its proximity to the international border with Mexico. The high volume of migrant travel through the national forest during the early and mid 1990s resulted in widespread effects on resources caused by the development of migration routes through the national forest and by the disposal of trash and human waste along highly traveled routes and road corridors (see also the section on Social and Economic Environment under Affected Environment).

Forest Service presence in the field is considered the most significant factor in preventing abusive behaviors from occurring (Chavez and others 2004, Earney pers. comm., San Bernardino National Forest 2002). Law enforcement staffing has been increased over that specified in the previous planning period to better address the situations and problems that were identified in the forest plans. However, current staffing levels are below the projected need for the southern California area, not only for Law Enforcement Officers and Special Agents (who are responsible for the prevention and prosecution of crimes on National Forest System lands), but also for Forest Protection Officers (who have basic law enforcement authorities and constitute the core of the law enforcement cadre on the four southern California national forests) (Angeles, Cleveland, Los Padres, and San Bernardino National Forests' business plans—USDA Forest Service 2003, 2004).

Access to the national forests is an important factor in the development of situations that require law enforcement presence because of the relationship and interdependence among use levels, the types of uses that are occurring, and the ability to access National Forest System lands. The roads and trails sections in this chapter (Roads, Motorized Trails, Non-Motorized Trails) detail the widespread access afforded by the transportation system including the National Forest System roads and trails. Response times to law enforcement incidents can often be between one and two hours depending on the remoteness of a locality where an incident occurs. Similar response times can also be expected from state and local law enforcement agencies when supporting national forest requests for assistance.

The use of volunteer programs and campground host and concessionaire programs to educate and inform national forest visitors regarding the use of public lands has influenced the prevention of unlawful activities on National Forest System lands Angeles, Cleveland, Los Padres, and San Bernardino National Forests' business plans—USDA Forest Service 2003, 2004). In addition, the four southern California national forests have continued to develop strong working relationships with other local law enforcement agencies for the protection of the national forests and the publics that use and enjoy them.

Facility Operations and Maintenence

Administrative Facilities

The southern California national forests maintain 1,102 administrative facilities at 165 sites, excluding recreation facilities. The facilities include office buildings, visitor information centers, fire stations and work centers; these facilities consist of offices, shops, warehouses, dwellings, bunkhouses, remote cabins and storage buildings, as well as the supporting utilities: water, sewer, electricity, gas and telephone. Most of the office and work facilities were constructed in the 1930s and 1960s and are beyond their designated service life. A backlog of deferred maintenance exists and is expected to increase in the future. About 30% of the buildings are more than 50 years old. In addition, in 2002, twenty-four engines and crews, four helitack crews, six water tenders, four bulldozers, thirteen prevention patrols, and six 20-person fire crews were added, requiring more facilities to accommodate the firefighters and their equipment at existing sites. Almost 83,000 additional square feet of engine garages, crew offices, barracks and utility system upgrades are needed.

Accessibility surveys were conducted on administrative sites during 2001. Because most buildings on the national forest predate the enactment of accessibility requirements, an extensive list of retrofits is needed to comply with current regulations. Each national forest has several administrative buildings that are obsolete, no longer in use and designated for demolition and removal. Some abandoned, formerly-used defense sites exist on the national forests and need to be demolished and removed, and the sites need to be restored to natural conditions. Until the sites are restored, no public or administrative use is allowed (see table 282: Administrative Facilities by Forest).

Table 282. Administrative Facilities by Forest

Category	ANF	CNF	LPNF	SBNF	Totals
Number of Sites	55	27	55	43	165
Number of Buildings	350	286	241	225	1102
Square Feet	565,600	375,200	568,300	295,200	1,804,240
Deferred Mtc. Backlog ($ M)	22	13	10.5	3.2	48.7

Roads

The southern California national forest transportation system includes a combination of state, county, and National Forest System roads.

There are 455 miles of state highways (including interstate highways) within southern California national forest boundaries. These highways are owned, operated and maintained by the State of California. The national forests of southern California exist in the context of an urbanized region. The region's highway infrastructure is a component of the linkage between urban centers and the surrounding and interspersed national forests. The relevance of the highway system forms the primary conduit for public access to the national forests and influences the public perception of the overall quality of experience with the national forests. Highways form the logistical and commercial conduits necessary to sustain the population centers within the national forests. Highways through the national forests have become primary commuter arterials between urban centers. Highways enable the deployment of law enforcement and public safety assets to the national forests during adverse circumstances. Highways are also the evacuation routes during those circumstances.

Currently, 41 state highways carry 3.7 million vehicles each day through and adjacent to these national forests. Average daily traffic (ADT) on the highways passing through the national forests (within their boundaries) is approximately 710,000 vehicles per day. If the traffic grows in proportion to the population of southern California, ADT is expected to reach approximately 930,000 vehicles each day in 15 years.

The southern California national forests are located in 10 counties. There are 594 miles of county roads (110 individual roads) within national forest boundaries. These roads are owned, operated and maintained by the counties. The state highways and county roads provide the means for access to recreation opportunities for almost all national forest users; an alternative means of travel between geographic areas and facilitates the effective management of the national forests. Many were constructed prior to the existing freeway system and retain their role as alternative routes when freeways become closed due to events such as earthquakes.

The ADT count for each county road is not available for any of the national forests; however, many county roads in San Diego County are monitored by SANDAG. As an example, the two most-traveled county roads through the Cleveland National Forest (the Sunrise Highway and Buckman Springs Road) carry approximately 3,000 and 4,000 ADT respectively. If each of the 110 county roads passing through the national forests were to have an estimated 1,000 ADT, approximately 110,000 vehicles would be using these roads each day.

Portions of these public roads are operating at design capacity for traffic each day. Proposals to enhance the safety and capacity of these public roads and to add new freeways across the national forests are a direct effect of the population growth, adjacent urbanization, commuting desire and attractiveness of destinations for recreation.

Each of the national forests has examples of expected population growth within or adjacent to National Forest System land, and employment in other locations that results in adding directional commuting traffic to state highways and county roads through the national forests. The public road agencies are planning improvements to increase the capacity of these roads. Improvements generally will require additional rights–of–way width through the national forests.

One example in which the traffic problem is already acute is in Riverside County, which has the fastest growing population in the state of California. Of the links between the two counties, California State Route (SR) 91 is already one of the most congested routes in southern California, and California State Highway 74 (through the national forest) is one of the most congested two-lane state highways. By 2030, the population of Orange and Riverside Counties is expected to grow from 4 million to 6 million people. Traffic on SR-91 is expected to grow 50% from 280,000 to 420,000 vehicles each day and on SR-74 through the Cleveland National Forest, from 12,000 to 15,000 vehicles each day. To address the increased travel demand between the counties, the Riverside County Transportation Commission is working with the Orange County Transportation Authority on a Major Investment Study to analyze improvements to SR-91 and alternate freeway routes across or under the Trabuco Ranger District on the Cleveland National Forest (see `www.rcocconnection.info`). Other areas likely to face similar situations include the areas near the Cajon (Interstate Highway 15) and Tejon (Interstate Highway 5) passes.

National Forest highways are a subset of state highways and county roads. They include a combination of specially designated state highways and county roads that provide safe and effective transportation routes to and through National Forest System lands for visitors. National Forest highways are linked to National Forest System roads (NFSR). Caltrans maintains an inventory of designated national forest highways for the public land highway component of the Transportation Equity Act for the 21st Century (TEA-21). The national forests have approximately 337 miles on 16 designated national forest highways. Of these, nine are state highways (207 miles) and seven are county roads (130 miles). In table 283: Miles of Freeways, State Highways, County Roads, and Forest Highways by Forest, national forest highway miles are shown as a portion of the miles listed under state or county.

Table 283. Miles of Freeways, State Highways, County Roads, and Forest Highways by Forest

Category	ANF	CNF	LPNF	SBNF	Total
Interstate Highways	13	24	0	14	51
State Highways	92	21	72	219	404
County Roads	156	180	271	66	673
Totals	261	225	343	299	1,128
Forest Highways (subset of State and County above)	141	72	22	102	337

All national forest roads are categorized as classified, temporary or unclassified. Classified roads are those needed for motor vehicle access, authorized by the Forest Service and intended for long-term use. Those under jurisdiction of the Forest Service are classified as National Forest System roads. Temporary roads are authorized by contract, permit, lease or emergency operation and are usually not necessary for long-term resource management.

National Forest System roads are operated and managed by the Forest Service but they are not automatically open for public use. While National Forest System roads are generally open and available for public use, they are authorized only for the administration, protection and use of National Forest System land. Through travel management, public access opportunities are provided along with the controls and restrictions that are necessary to achieve land management objectives. National Forest System roads provide access in a branching system of roads that include arterial, collector and local roads. Arterial roads provide access to large land areas, typically linking to county roads, state highways or communities. They have higher standards for construction and maintenance because of the larger volumes of traffic they carry. Collector roads disperse traffic from arterials to large forest areas such as watersheds. Local roads (used to access specific project areas or sites) are usually less than two miles long and of lower standard construction.

The southern California national forest transportation system currently includes 3,780 miles of forest-managed roads that provide access to and through National Forest System land. In contrast, 55 years ago the system included approximately 4,360 miles.

Public Forest Service roads (PFSRs) are a subset of National Forest System roads that have been designated "open to public travel" under 23 USC 101(a). The roads must serve a compelling public need, meet defined safety standards, and will remain open to meet Federal Highway Safety Act requirements. The southern California national forests have identified potential roads for PFSR classification, along with the improvements needed to bring these roads up to the standards necessary for public roads. The potential PFSRs may be designated when funding is available to bring them up to public road standards. The candidate list is subject to change and modification.

Table 284: Miles Of Potential PFSR, Arterial, Collector, And Local Roads By Forest displays the current total miles of NFSRs within the national forests by functional class. The PFSR miles are part of those shown under "arterial" and "collector."

Table 284. Miles Of Potential PFSR, Arterial, Collector, And Local Roads By Forest

Category	ANF	CNF	LPNF	SBNF	Totals
Potential PFSR	156	55	162	65	438
Arterial	121	18	0	2	141
Collector	599	313	76	315	1303
Local	195	86	1100	725	2106

PFSR: Public Forest Service Road

The drought of the late 1990s and early 2000s has led to mature trees dying on approximately 500,000 acres of the national forests. The removal of dead trees and the treatment of remaining stands will require the construction and use of new temporary roads and skid trails in the community protection zones. These temporary roads will be removed and rehabilitated after mortality removal and reforestation are complete. "Unclassified" roads are unplanned roads, abandoned travel ways and off-road vehicle tracks that have not been designated or managed by the national forests. Urbanization adjacent to and within the national forests is expected to continue, resulting in more demand for additional temporary roads associated with special-use proposals. The development of unclassified roads is expected to continue as well.

The road miles included in table 285: Miles of NFSR level 1-5, temporary, and unclassified roads by forest encompass National Forest System land. Table 286: Acres occupied by roads, by forest, and by road category indicates the number of acres occupied by roads located on the national forests.

Table 285. Miles Of NFSR Level 1-5, Temporary, And Unclassified Roads By Forest

Category	ANF	CNF	LPNF	SBNF	Totals
NFSR Levels 1-5	915	418	1177	1270	3780
Temporary	164	178	182	219	742
Unclassified	106	166	325	416	1,013

NFSR: National Forest System Road

Table 286. Acres occupied by roads, by forest, and by road category

Category	ANF	CNF	LPNF	SBNF	Totals
Interstate Freeways	1,560	2,880	0	1,680	6,120
State Highways	1,472	336	1,152	3,504	6,464
County Roads	2,496	2,880	4,336	1,056	10,768
NFSR	5,528	6,096	5,488	6,240	23,352
Level 5	168	175	392	266	1,001
Level 4	609	378	938	154	2,079
Level 3	1,085	126	1,505	1,911	4,627
Level 2	3,085	1,555	3,620	4,325	12,585
Level 1	160	50	240	360	810
Total Level 1-5	5,107	2,284	6,695	7,016	21,102
Subtotal Level 3-5	1,862	679	2,835	2,331	7,707
Subtotal Level 1-2	3,245	1,605	3,860	4,685	13,395
Temporary	1,176	1,288	1,288	1,687	5,439
Unclassified	411	504	1,170	2,013	4,098
Total Acres All Roads	12,222	10,172	14,641	16,956	53,991
Percent of National Forest Acres	1.86%	2.34%	0.83%	2.52%	1.53%

NFSR: National Forest System Road

Table 286: Acres occupied by roads, by forest, and by road category also indicates that state highways and major county roads occupy more land within the national forests than do NFSR roads, which generally are narrow earth-surfaced roads constructed in the 1930s. State and county roads include routes that range from two lanes to multi-lanes to interstate highways.

Road density is measured by the number of miles in each square mile of land (640 acres) and is used to compare the relative presence of roads on the landscape. It is also a way to measure the potential effects of roads on watersheds. Table 287: Road Density by Forest displays the density of roads on the southern California national forests.

Table 287. Road Density by Forest

Category	ANF	CNF	LPNF	SBNF	Totals
Total NFSR	915	418	1177	1270	3780
Rd. Density NFSR Miles/Sq. Mi.	0.88	0.61	0.43	1.21	0.68

NFSR: National Forest System Road

The southern California national forests have 0.68 miles of NFSR per square mile. In general, other national forests in the Pacific Southwest (California) Region have twice the density of maintenance levels 3, 4 and 5 NFSR roads and three times the density of maintenance levels (ML) 1 and 2 NFSR roads.

Road maintenance levels are used to prescribe the upkeep and restoration work required to retain a desired traffic service level for the roads operated and maintained by the Forest Service. These roads were built for national forest management purposes to the standards that were in effect at the time of their construction. Road maintenance levels include:

Level 1: The lowest standard, used to close roads from motor vehicle traffic while preserving an investment in the road structure. Level 1 is assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed one year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. The road is available for future use, such as fire suppression, but would require emergency opening.

Levels 2 through 5: For roads open to full-sized motor vehicle traffic. About 67% of the miles are ML 2, used by high-clearance/four-wheel drive vehicles such as trucks and sport utility vehicles.

Table 288. Miles Of National Forest System Roads By Road Maintenance Levels

ML Category	ANF	CNF	LPNF	SBNF	Totals
Level 5	24	25	56	38	143
Level 4	87	54	134	22	297
Level 3	155	18	215	273	661
Level 2	617	311	724	865	2,517
Level 1	32	10	48	72	162
Total Levels 1-5	915	418	1,177	1,270	3,780

Maintenance levels 3, 4 and 5 roads (including 30% of the total road miles) are the backbone road system for the national forests, providing the primary passenger car access. Roads with a ML of 3, 4 or 5 will be managed for public access with passenger cars. Maintenance level 3 roads are typically unsurfaced roads that can be driven by passenger cars; ML 4 roads are typically single-lane roads with a paved or sealed surface; and ML 5 roads are two-lane, paved roads that serve as arterials or collectors that access recreation and administrative sites. Table 288: Miles of National Forest System roads by road maintenance levels displays the maintenance levels for which the current transportation system is being managed.

Table 289. Road Miles By Objective Maintenance Level (ML) By Land Use Zone

	BC	BCNM	CB	EF	EW	DAI	RW
ML 1	77.9	4.8	1.1	0.0	14.7	29.1	0.0
ML 2	1,404.4	41.3	0.0	22.3	7.9	362.1	0.0
ML 3	534.1	10.7	4.6	0.7	0.2	140.3	0.0
ML 4	118.5	0.8	0.2	1.5	0.1	78.5	0.0
ML 5	30.3	0.1	0.6	0.1	0.1	69.8	0.0
Total	2,165.2	57.7	6.5	24.6	23.0	679.8	0.00

When the land use zones (Alternative 1) are layered over the existing NFSR system, table 289: Road miles by objective maintenance level by land use zone indicates the number of miles in each category of land use zones for each of the four southern California national forests.

Most southern California national forest roads were constructed by the Civilian Conservation Corps (CCC) in the 1930s for fire and watershed protection. Many have historical significance and are narrow, steep, native-surfaced travel ways with few if any turnouts and minimal drainage features. These low standard, high clearance NFSRs are typically categorized as ML 2 roads. They constitute most of the NFSR miles. Neither the amount of use these roads currently receive nor the size of today's wildland fire engines were anticipated in the 1930s. As a result, there is a failure of road maintenance budgets to keep up with inflation and road deterioration, road conditions on the national forests have fallen below the levels necessary for resource protection, and many cannot efficiently support the traffic volumes being carried. About one-third of the total ML 2 road mileage has points of difficulty for the latest generation of wildland fire engines.

The national forests received $3,400,000 in fiscal year (FY) 2002 to maintain the 3,780 national forest-managed road miles, of which 1,100 miles are ML 4 and 5 (paved, higher standard roads). On the average, 35% of the national forests' miles received some maintenance in 2002 but only 20% of the miles were maintained to standard. The deferred maintenance backlog of $82,000,000 represents the dollars needed to bring the ML 2 through 5 roads up to their designated standards in health, safety and protection of resources to enhance the mission of the Forest Service.

Another serious deficiency is the lack of rights-of-way through non-National Forest System lands. Many connections to the public road systems occur at rapidly urbanizing national forest boundaries. As conversion of agricultural land to housing developments proceeds, many previous verbal agreements with rural landowners for access become invalid for new owners and developers. Lack of recorded rights-of-way for access to the national forests was a concern noted in the original forest plans. The southern California fires of October 2003 provide an excellent example of the operational difficulties associated with the lack of rights-of-way. In order to continue post suppression and rehabilitation projects on National Forest System lands, the Cedar Fire in San Diego County required temporary license agreements with 110 landowners on 33 miles of NFSR.

The national forests have approximately 221 roads without recorded access across 510 miles of the 3,780 miles of National Forest System roads. Forest Staff have estimated that nearly 1,300 separate rights-of-way cases would need to be completed to provide full legal access to the current NFSR system. Upon acquisition of needed rights-of-way, the system would increase to 4,290 miles under Forest Service jurisdiction and maintenance. An administrative expense of at least $17,000,000 is estimated for the acquisition, or $1,200,000 annually for 15 years.

Table 290. Road Miles in Inventoried Roadless Areas

Forest	NFSR	Temporary	Unclassified	Totals
ANF	13.4	20.3	9.0	42.6
CNF	3.2	13.2	21.7	38.0
LPNF	128.3	49.2	140.6	318.1
SBNF	16.2	16.5	90.7	123.4
Totals	161.0	99.2	261.9	522.2

The Forest Service Roadless Area Conservation Rule published on January 12, 2001 (66 FR 3244) sets limitations on new construction or upgrading of existing NFSR, as well as on the use of unclassified roads in inventoried roadless areas. Unclassified roads are candidates for motorized or non-motorized trails depending upon the zoning. The rule requires that an existing NFSR that is located in an inventoried roadless area be maintained at the current level but not upgraded. No new roads can be constructed. Table 290: Road Miles in Inventoried Roadless Areas lists the miles of roads affected by limitations in the Roadless Rule. The land management plans for each of the four southern California national forests determine the disposition of the inventoried roadless area acres.

Certain road management actions were exempted from the interim requirements:

- Roads needed for public health and safety in cases of imminent danger of catastrophic events threatening loss of life or property;
- Roads needed to conduct a response action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or to conduct a natural resource restoration under CERCLA, the Clean Water Act, or Oil Pollution Act; and
- Road construction needed in conjunction with the continuation, extension, or renewal of an existing mineral lease or issuance of a new lease upon expiration of an existing lease.

A multi forest scale roads analysis (RAP) was drafted as a component of the Draft Land Management Plans and Draft Environmental Impact Statement for the Angeles, Cleveland, Los Padres, and San Bernardino National Forests. This analysis was used to inform the preparation of the DEIS, the Draft Plans and to inform the decisions in the final forest plans and analysis in the EIS. The thirty-two tables in the EIS related to roads, the environmental risk assessment of roads in the EIS, as well as the Affected Environment and Environmental Consequences based upon the GIS data and mapping were developed during the RAP process.

The issues identified in the RAP were derived from two sources: the Forest Plan Revision public involvement process and internal comments submitted by specialists. In February of 2001, the four southern California national forests began a period of intensive public involvement for the Forest Plan Revision process. An initial round of public meetings focused on introducing the public to the planning process and included a brainstorming session, designed to identify what people value most about the national forests and what their vision for the future of the national forests is. Upon the completion of these meetings, a content analysis clarified and organized the issues raised by the public. The issues were arranged by topic into five main categories: *Public Values and Uses*, *Ecosystem Elements and Function*, *Commodity Uses and Values*, *Urban Development and Forest Linkages*, *and Special Area Designations*. Included in each of these categories were issues specifically pertaining to roads, access, and transportation system management.

The RAP evaluated National Forest System ML 1 through 5 roads for their risk to watersheds and plant and animal species and their benefits to administrative and public uses. Maps and tables were developed that identified segments of roads in the following categories: High Priority for Mitigation, Low Priority for Mitigation, and High Risk Low Importance.

The Roads Analysis followed the process described in Roads Analysis: Informing Decisions About Managing the National Forest Transportation System, FS-643, August 1999. These draft documents were published in May, 2004. All documents were available on the following web site: `www.fs.fed.us/r5/scfpr`.

The Road Analysis is located in the "Reading Room," (`www.fs.fed.us/r5/scfpr/read`) where scientific and technical studies used in the draft environmental analysis were located. The Roads Analysis was also on the R5-MB-052-cd of May 2004 issued to the public upon request, and handed out at the public meetings.

Non-Motorized Trails

The non-motorized trail system is an important part of the Dispersed Recreation Program. These trails provide visitors with an opportunity to access the national forest backcountry, whether for a sedate afternoon nature walk, a vigorous mountain biking adventure or a challenging multi-day backpacking trip. Visitors generally leave from trailheads and participate in trail-based nature viewing, camping, hunting, fishing, snowshoeing, cross-country skiing and birdwatching. Some people use trails just for the challenge and exercise. The southern California national forest non-motorized trail system is generally managed for the multiple uses of foot, equestrian and mountain bike travel. However, not all of these uses are accommodated on all trails at all times.

Some non-motorized trails in the southern California national forests receive very high recreation use, especially those close to communities and popular recreation areas; other more remote and difficult trails receive less use. Access for fire management and resource uses are other administrative purposes for trails. Continued access to well-located and well-maintained trails is important. An increasing demand for trail use places an emphasis on trail system planning, construction/reconstruction and maintenance. In general, most national forest non-motorized trails are native surface backcountry pathways. There are exceptions, though, such as trails near urban areas with limited grades and easy walking surfaces, and nature trails with interpretive panels. One of the most challenging issues for trail managers is how to minimize user conflicts and resource impacts.

The non-motorized trail system on the southern California national forests has evolved over time, with some trails originating from game trails, paths used by Native Americans and early settlers, old fuelbreaks, and historical routes that once connected the inland valleys and coastline to the high country. Many other trails were planned, designed and constructed by the Forest Service. National Forest System non-motorized trails range from primitive, minimal paths that supply opportunities for risk and challenge, to fully developed trails with hardened surfacing and interpretive features. Most trails are concentrated around recreation-destination points and developed recreation areas or in wilderness. Just over 40 percent of the non-motorized trail system is located within designated wilderness. Most of the non-motorized, non-wilderness trail system is managed for shared use and provides the opportunity for a variety of activities (such as hiking, mountain biking, and horseback riding).

Table 106. Miles of Inventoried Trails by Forest

Forest	Miles of System Trails	Motorized Trails	Non-motorized Trails	National Recreation Trails	Pacific Crest Trail	Unclassified Trails
Angeles	648	60	588	63	114	167
Cleveland	320	31	234	11	50	154
Los Padres	1,184	151	1,033	22	0	78
San Bernardino	452	38	414	13	160	52
Total	2,549	280	2,269	109	324	451

The current inventory for the four southern California national forests includes approximately 2,549 miles of non-motorized system trails. Of these, approximately 109 miles are national recreation trails, 324 miles are Pacific Crest National Scenic Trail (PCT), and 951 miles are wilderness trail. In addition, there are approximately 451 miles of unclassified (non-system) trails (see table 106: Miles of Inventoried Trails by Forest).

For the past three years, approximately 10 percent of the trail mileage received annual maintenance such as brushing, trail tread work (culvert cleaning, water bars, etc.), and hazard tree removal. Approximately 5 percent of the trail mileage is maintained to standard. Maintenance accomplishments vary by national forest. Construction and reconstruction are accomplished incrementally as funding through the capital investment program (CIP) allows. Since the last forest plans were written, the network of non-motorized trails has slightly increased.

Hiking (particularly of short duration) is currently one of the most popular recreation activities on the national forests (see Appendix L. Visitor Use and Participation (NVUM)). Participation in trail-based activities has increased in the past 15 years, with sharp increases in the past seven years (USDA Forest Service 2000). Because of increasing population and urbanization in southern California, trail use is expected to increase by at least an additional 20 percent over the next 15 years (see Recreation section). The overall trend in day-use recreation is expected to continue; therefore, the demand for day-hiking opportunities with links between the existing trail network and the urban interface is expected to also increase. In addition, many trails of local and regional importance either cross the national forests or have been proposed to do so. These trails have an important role in supplying trail-related recreation to trail systems that reach beyond national forest boundaries. Conflicts among various visitor groups (such as mountain bikers, equestrians, and hikers) have been reported and are expected to increase with rising demand.

The national forests manage a major portion of the 2,650-mile Pacific Crest National Scenic Trail (PCT). This nationally known and popular trail extends from Mexico to Canada, traversing the Cleveland National Forest (50 miles), San Bernardino National Forest (160 miles), and Angeles National Forest (114 miles) for a total distance of about 324 miles. The PCT links the mountain ranges of southern California (Laguna, San Jacinto, San Bernardino and San Gabriel Mountains). The route highlights the scenic, historical, natural and cultural features of the Pacific Crest watershed divide. The PCT is managed for foot travel and stock use (non-motorized and non-mechanized use) only. The greatest proportion of PCT users are hikers.

The condition of the trail is generally better than the condition of the overall trail network. Volunteer groups play a critical role in the maintenance of the PCT. The non-profit Pacific Crest Trail Association (with the support of the Forest Service) maintains most of the trail. This annual maintenance generally consists of brushing, trail tread work, deadfall removal, water bar repair, boulder demolition, and retaining-wall construction. Reconstruction is accomplished through the CIP process, grants from non-traditional sources, and volunteer labor.

Use of the PCT has increased in the past 15 years. The number of through-hikers that start in Mexico every year and hike the entire trail has increased substantially since the early 1990s. Although through-hikers represent only a fraction of total users, the demand for PCT day-hiking opportunities (with links between the existing trail network and the urban interface) is expected to increase as well. Unauthorized mechanized and motorized use on the PCT has been reported, and conflicts are expected to increase with the rising popularity of mountain biking and off-highway vehicle use.

Non-system trails are referred to as unclassified. These are user-created trails on National Forest System land that are not managed as part of the transportation system. Examples include abandoned travel ways and off-road vehicle tracks or trails constructed by visitors. These routes are not designated and are the source of resource impacts. Many of these routes are old roads and fuelbreaks that no longer serve the purpose for which they were intended and were never properly restored to natural conditions. Many others have been created by recreation use from communities immediately adjacent to or within the national forests.

Approximately 451 miles of unclassified trails are mapped on the southern California national forests. In addition, others exist but are yet to be inventoried. Population growth and increasing urbanization have resulted in the proliferation of unclassified trails within the urban interface, particularly on the Angeles, Cleveland and San Bernardino National Forests. These trails have not been determined to be necessary for the administration of National Forest System lands; however, public comments have indicated that some of the unclassified trails are of interest and value to some national forest visitors. Decisions to designate or eliminate these routes will not be made in this land management plan. However, land use zoning would determine the acreage available for trail use and use type (motorized or non-motorized).

Motorized Trails

The Forest Service's role as a provider of off-highway vehicle (OHV) opportunities is unique in California. National Forests offer long-distance trail touring opportunities and 4-wheel drive (4WD) routes that travel through a variety of vegetation types and terrain features; occur primarily in forested environments; and may provide outstanding natural and cultural resource destination features such as alpine lakes, mountain vistas, or fire lookout towers. The four southern California national forests do not provide all forms of OHV recreation but concentrate on narrow-width trail and 4WD opportunities that provide a diversity of challenges of the type that are found in remote, forested landscapes. Off-highway vehicle activities that are more physically demanding of the ground (such as moto-cross events) often are available elsewhere at state, private, or Bureau of Land Management (BLM) facilities and are not planned for or developed on National Forest System land.

Table 359. Acres Managed for Motorized Uses as Defined by Land Use Zone

Forest	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 4a
ANF	443,202	402,467	273,642	399,444	564,189	202,833	262,718
CNF	260,097	234,473	163,721	236,093	345,263	92,686	120,170
LPNF	759,404	766,855	348,030	776,652	920,703	157,140	392,200
SBNF	394,735	376,199	278,033	409,223	535,390	172,458	229,193
TOTAL	1,857,438	1,779,994	1,063,426	1,821,412	2,365,545	625,117	1,004,281
Percent of NFS land in BC, DAI, and EF	53%	51%	30%	52%	70%	18%	28%

Current forest plans include concepts for the development of approximately 1,200 miles of OHV route. The planned routes were based on the usage of new trail construction in conjunction with the designation of some maintenance level (ML) 2 roads to improve opportunities for OHV use. Since the forest plans were approved in the 1980s, incremental changes have been made towards the development of OHV opportunities and facilities with an emphasis placed on the relocation of routes that were having an adverse effect on other national forest resources. The most change in the development or designation of routes for OHV use occurred on the Los Padres National Forest, small changes occurred on the Angeles and San Bernardino National Forests, and the least amount of change occurred on the Cleveland National Forest.

Table 455. OHV Mileage by Forest

	ANF	CNF	LPNF	SBNF	Total
Roads	306	40	289	160	795
Trails	55	31	151	38	275
Total	361	71	440	198	1,070

OHV: Off Highway Vehicle

The forest plans currently identify approximately 1.9 million acres of National Forest System land where motorized activities are a suitable use and where the designation of additional routes or the development of motorized facilities can take place (see Alt. 1 in table 359: Acres Managed for Motorized Uses as Defined by Land Use Zone). The national forests currently have approximately 1,070 miles of OHV routes, consisting of roads and trails designated for use by non-highway licensed vehicles (see table 455: OHV Mileage by Forest). There are approximately 3,088 acres of National Forest System land designated as open to off-road vehicle travel on the Angeles (447 acres) and Cleveland (2,641 acres) National Forests. The four southern California national forests have approximately 1,767 miles of objective ML 2 roads that are open for use by highway-licensed vehicles. This portion of the National Forest System roads offers access for a wide variety of recreation experiences, but also provides opportunities for 4WD use and operation. All four southern California national forests offer "genuine" 4WD opportunities, where the appropriate type of vehicle combined with driver experience is required to negotiate the difficult driving conditions that may be encountered. Approximately 884 miles of the ML 2 road system are managed to offer 4WD opportunities. Table 456: Miles of ML2 Roads Open to Highway Licensed Vehicle Use and the Mileage Managed as a 4WD Opportunity summarizes the mileage of ML 2 roads available for highway-licensed vehicle use and the mileage that is managed as a 4WD opportunity on the four southern California national forests.

Table 456. Miles of ML2 Roads Open to Highway Licensed Vehicle Use and the Mileage Managed as a 4WD Opportunity

	ANF	CNF	LPNF	SBNF
Miles of ML2 Road	449	219	539	560
Miles Managed as 4WD Opportunity	269	194	309	112

ML2: Maintenance Level 2
4WD: Four Wheel Drive

The national forests' OHV road and trail systems can be generally characterized as an unconnected series of routes with limited mileage and access for non-highway licensed vehicles. In many locations, the existing OHV systems do not meet the needs of OHV enthusiasts primarily as a result of low trail mileage, a lack of long distance riding opportunities that connect OHV systems together, a lack of features such as loop trails that provide a variety of riding opportunities for different experience levels, and limited or non-existent access. The most fully developed OHV route systems and opportunities are located in the following Places:

- Santa Clara Canyons, Mojave Front Country, Soledad Front Country and the San Gabriel Front Country on the Angeles National Forest;
- Ortega/El Cariso and Morena on the Cleveland National Forest;
- Mutau/Hungry Valley, Highway 33 Corridor, Pozo-LaPanza and Rockfront on the Los Padres National Forest; and
- Arrowhead, Silverwood, and Big Bear Backcountry on the San Bernardino National Forest.

Many factors affect the location and designation of OHV routes. The improvement of OHV opportunities depends on the feasibility of developing additional routes and/or augmenting existing systems by addressing conditions that lead to enthusiast dissatisfaction or that are directly related to safety or resource concerns, and improvement is often constrained in a variety of ways that are disclosed during the planning process. Individual routes and trail location/designation requires site-specific NEPA analysis to effect any changes to the designated OHV route system.

Many segments of the designated OHV system are affected by the lack of rights-of-way across private parcels of land within or adjacent to the national forests. For example, the lack of rights-of-way currently affects the Corral Canyon OHV system on the Cleveland National Forest in six separate locations, which in effect fragments the system into separate route sections and affects access into the area. Of the estimated 1,300 individual rights-of-way cases needed to provide full public access to all ML 2, 3, 4 and 5 roads, 95 percent of these are needed for the ML 2 roads (see Roads section, page 275).

Because of the complexities associated with managing National Forest System roads and trails, the national forests can take additional steps to manage the off-highway vehicle activity by further restricting where non-highway licensed vehicle use occurs. This is accomplished by designating specific roads or trails for this use. The agency manages higher maintenance level roads (ML 3, 4, and 5) for use by standard four-wheel passenger cars, and these roads are generally not designated for use by non-highway licensed vehicles. Maintenance level 2 roads are managed for high-clearance vehicles and can be designated for use by non-highway licensed vehicles. Other examples that can limit where OHV use occurs are safety concerns or resource issues associated with the transportation system. In some locations, ML 3 roads have been designated as temporary OHV routes until bypass trails could be constructed or other roads could be designated for use. In other locations, ML 3 roads have been designated for OHV use. Higher maintenance level roads generally do not provide the type of OHV opportunity that enthusiasts are looking for and are more often used to provide a linkage between OHV riding localities. Currently, there are 33 miles of ML 3 roads designated on the Angeles National Forest, and 61 miles of ML 3 roads designated on the San Bernardino National Forest.

There is a growing demand for OHV opportunities within the state of California (California Department of Parks and Recreation 2002a, b). Off-highway vehicle activities will be limited as accessible riding opportunities in southern California continue to decrease, and as populations increase. Statewide, approximately 99 percent of the land available for OHV recreation is provided by the Forest Service and BLM and accommodates approximately four million visitors annually. With nearly 50 percent of California's landscape in federal ownership, the state's partnership with the federal government is important in managing OHV recreation where it actually takes place. The approximately 90,000 acres of state-owned OHV facilities are not expected to accommodate California's existing and future OHV needs. Statewide, 14.2 percent of all households participate in some form of OHV activity (California Department of Parks and Recreation 2002c), which closely mirrors the national figure of 17.5 percent (USDA Forest Service 2000).

Table 316. Off-highway vehicle travel (4-wheelers, dirt bikes, etc.), use by forest

Forest (Year Surveyed)	Number of Visitors	% of NF Visits
Angeles (2001)	210,000	6% of 3.5 million NF visits
Cleveland (2002)	132,000	16.5% of 0.8 million NF visits
Los Padres (2002)	114,000	7.6 % of 1.5 million NF visits
San Bernardino NF (2004)	131,000	6.7% of 1.95 million NF visits

Use figures recorded from the national forests indicate that approximately 587,000 visitors participated in some form of OHV use during the 2001-2004 sampling period (NVUM data; USDA Forest Service 2002, 2003). The percentage of visits to the national forests for OHV travel varied from 6 to 16.5 percent (see table 316: Off-highway Vehicle Travel (4-wheelers, dirt bikes, etc.), use by forest). Recent sampling surveys conducted in support of the Adventure Pass program provide additional information regarding OHV use on the four southern California national forests. Sampling for OHV use was done at OHV staging areas and by interviewing individual operators at selected locations across the four southern California national forests. The figures cited here are taken from the sampling conducted at the OHV Staging Areas (Richer and others 2002b):

- Most OHV enthusiasts are Caucasian (88 percent), males (92 percent), with a median age of 35 years;
- Most respondents stated that they were with friends (61percent) or family (35 percent); 18 percent of the respondents indicated that they were solo; and
- Visits to the national forests by OHV enthusiasts remained more or less constant during the year—winter, January-March, 80 percent; spring, April-June, 76 percent; summer, July-September, 73 percent; and fall, October-December, 81 percent.

Information from the Forest Service's 2005 Forest and Rangeland Renewable Resources Assessment Update Report also identifies that most OHV participants were under 50 years of age, male, white, and from an urban locality; also increasing rapidly were participants who were 30-50 years old, female, and Hispanic from urban areas (USDA 2004a, b, c).

The following information offers a further basis for anticipating trends in OHV use. A recent publication by the State of California titled *Taking the High Road* (California Department of Parks and Recreation 2002d) indicates that:

- Approximately 26 percent of the state's OHV population reside in the Los Angeles basin, where only 4 percent of available OHV acres are located;
- Between 1983 and 2000, off-road motorcycle and ATV registrations have increased 30 percent and 96 percent respectively on a statewide basis;

- There has been a 108 percent increase of non-highway licensed vehicle registrations between 1980 and 2001 in the state of California;
- There has been a 52 percent increase in visitor use at the state vehicular recreation areas since 1985;
- Highway licensed 4WD vehicle registration increased 74 percent between 1994 and 2001, primarily in the sport utility vehicle (SUV) market; and

California has had more than double the growth of off-road motorcycle and all-terrain vehicle sales of any other state in the country between 1998 and 2003. In 2003, 130,635 (ATVs and motorcycles) were sold, which is a 346 percent increase since 1998 when there were only 29,255 units sold in California. In 2002, 117,425 units were sold in California and 52,579 were sold in 2001. The next highest growth state in 2003 was Texas with about half this amout at 61,134.

Nationally, from 1982 to 2001, driving motor vehicles off-road became one of the fastest growing activities in the country, growing in number of participants over 12 years old by over 100 percent. Based on surveying done between the fall of 1999 and 2000, it was estimated that 37.6 million people 16 years or older (17.6 percent of people that age or older) had ridden or driven motor vehicles off-highways at least once in the last 12 months. That number increased to an estimated 49.6 million by the fall of 2003/spring 2004 (rising to 23.2 percent of the population (Cordell and others 2004). As noted in the Recreation section of this document, population growth in southern California is expected to drive a continued increase in outdoor recreation demand. Estimates of future use for a specific activity cannot be directly correlated to the projected 15 to 20 percent increase in population growth for the area; therefore, it is difficult to predict future levels of OHV use, but it is reasonable to expect that OHV use will continue to be a popular activity on the four southern California national forests. Based on the state and national information presented above, Forest Service staff members expect that the demand for OHV opportunities will continue to grow over the course of the planning period.

Commodity and Commercial Uses

Special Forest Products

Special forest products (SFPs) are renewable products derived from biological resources for personal, educational, commercial and scientific uses. SFPs do not include saw-timber, pulpwood, cull logs, small roundwood, house logs, utility poles, minerals, animals, animal parts, rocks, water and soil (USDA Forest Service 2001). Use of these products is diverse but generally falls under five categories: foods, herbs, medicinals, decoratives and specialty items. The use of SFPs (especially in rural communities) contributes to a domestic forest-based economy that provides for cottage industries as well as for critical cultural and subsistence benefits for many groups and individuals.

Historically, groups have always looked to the national forests for plants and materials that were important to their lifeways. American Indian people have used the southern California national forests for thousands of years, including collecting small forest products for their subsistence, trade, tools and ceremonies. In the spring, vegetal resources, such as yucca, were gathered, while in the summer, hard seeds like *Salvia* were gathered, and in the fall, acorn and pine nuts were gathered.

The use of the national forests during the Spanish period centered on non-special forest products, such as water, building materials and labor. Timber was used to build the missions, and grassy areas used for grazing. This trend continued through the Mexican period up to the Anglo-American period, which saw the filing of homesteads where the residents relied on the resources of the national forests, including special forest products for food, fuel and medicine.

Federally recognized and non-recognized Indian tribes as well as other Native American groups and individuals continue to use the resources of the national forests for traditional and contemporary uses.

The increasing number of people (mostly non-Native American) coming to the national forests to collect small forest products is creating competition for resources that may be critical to the preservation of past traditional life ways and ceremonies, as well as contemporary uses.

The uses of SFPs from the national forests are varied and growing. Demand is increasing because of the loss of other open areas to urbanization and population growth. The changing population demographics result in new forest products being sought. Many of the groups and people who collect SFPs have historical and cultural ties to the SFPs and present a management challenge in terms of the diverse languages and cultures of the collectors. While the collection of SFPs has been a lasting historical practice, new uses are constantly being discovered. Various cultural and ethnic groups collect SFPs for social, spiritual, cultural and subsistence values, as well as for market values. Special forest products can be grouped into three groups: sale, free-use and unknown use.

Nationwide, SFPs sold on National Forest System lands include: Christmas trees, special wood product non-convertible, bee trees, transplants (wildlings), limbs and boughs, foliage, needles, bark, cones (green and dry), seed, nuts and seed, fruits and berries, tree sap, roots, bulbs, mushrooms, fungi, mosses, herbs, ferns, wildflowers, grass, aquatic plants, mistletoe, cacti, green biomass non-convertible, other plants, insects and miscellaneous non-convertible products. Table 420: Special Forest Product Revenue FY2002 shows the revenue generated on the four southern California national forests by the sale of special forest products in fiscal year 2002 (October 1, 2001 through September 30, 2002) based on the Region 5 Timber Information Management System (TIMS) Report.

Table 420. Special Forest Product Revenue FY2002

	Angeles	Cleveland	Los Padres	San Bernardino
Poles	$100.00	$0.00	$0.00	$0.00
Fuelwood	$12,595.00	$8,360.00	$7,630.00	$45,026.00
Misc. Convertible	$5,445.00	$815.00	$50.00	$2,351.50
Misc. Non-Convertible	$1,691.30	$120.00	$575.00	$4,332.50
Limb/Bough	$20.00	$0.00	$0.00	$0.00
Cones - Dry	$220.00	$0.00	$0.00	$0.00
Seed	$40.00	$34.00	$0.00	$0.00
Mistletoe/SPMS	$1,215.00	$10.00	$50.00	$40.00
Cacti	$0.00	$40.00	$0.00	$0.00
Christmas Trees	$0.00	$0.00	$570.00	$0.00
TOTAL	**$21,326.30**	**$9,379.00**	**$8,875.00**	**$51,750.00**

As table 420: Special Forest Product Revenue FY2002 indicates, given the population surrounding the four southern California national forests, there is not much revenue generated through the sale of special forest products. Non-convertible products and fuelwood are the major sources of special forest products revenue.

The amount and types of SFPs sold vary among the national forests. Each national forest issued between five and twenty-five free-use permits for the collection of SFPs (including botanical collection permits) in 2002. The permits were issued for purposes of education, scientific research, consultants, Native American and other. The permit system enables the national forest manager to ensure that collection occurs in areas that will not impact resources of management concern such as threatened, endangered, proposed, candidate and sensitive species, and heritage resources.

Some forest products are noted for their ethnobotanical values, such as mushrooms, ferns, yucca stalks, cones, limbs and boughs, needles and leaves, mistletoe, willow, sage, various grasses and/or seeds, mountain mahogany, manzanita and red shank.

The exact amount of SFPs collected by tribal members is not known. The means of authorization to Native Americans for the collection of special forest products varies by national forest. Local Indian tribe members may be issued an administrative pass for collection for personal use. Non-local tribal members are issued a free-use permit; although they are encouraged to contact local tribes to ensure there is no conflict with tribal member needs. Traditional gatherers may not be required to have a permit, while Native Americans gathering for non-traditional reasons need a permit. Collection permits that track the type, amount and location of materials collected (for example, botanical) may be made available.

The largest collector of SFPs is the casual national forest visitor. National Forest visitors are known to take flowers, pine cones, mistletoe, manzanita limbs and other items as a memento of their visit. The impact of their collection is unknown in terms of location, material and amount. Generally, one shopping bag full of material is considered the limit for personal use although some national forests have a lower threshold for personal collection.

Livestock Grazing

Livestock grazing pre-dates the establishment of the National Forest System. Spanish missionaries brought herds of cattle, sheep and horses from Mexico in the early 1800s and began propagating them to supply the missions. The herds proliferated rapidly. By the early 1860s, range managers have estimated that there were approximately 3.5 million animal units on all California ranges, heavily concentrated in the coastal counties. Maps show that these ranges must have been overstocked at this time.

Prior to establishment of the Forest Service, grazing on what was to become the four southern California national forests was typically uncontrolled and excessive, with little order in the assignment of areas to be grazed. The first grazing plan for the Forest Reserve was developed in 1906. Early Forest Service grazing management included reducing use to coincide with the capability of an area. A system for the orderly assignment of grazing areas was also established.

Since the early 1940s, cattle have been the principal livestock animals. Today, grazing within the four southern California national forests occurs mainly in and adjacent to the Los Padres National Forest, and to a lesser extent, in and adjacent to the Cleveland, San Bernardino and Angeles National Forests, respectively.

Livestock numbers have been declining. For example, on the Los Padres National Forest in 1936, 54,000 animal unit months (AUMs) of livestock grazing were permitted on the national forest. In 1982, the use was approximately 40,000 AUMs, a reduction of 26 percent. This trend is considered to be similar for the Angeles, Cleveland and San Bernardino National Forests (see table 178: Historical Grazing Use Trends for the Los Padres National Forest).

Table 178. Historical Grazing Use Trends for the Los Padres National Forest

Year	Number of Permittees	Number of Cattle and Horses	Number of Sheep and Goats	Number of Hogs
1910	285	10,913	6,903	285
1926	182	8,798	4,278	0
1941	141	5,978	25	0
1981	83	5,711	7	0
1998	80	3,860	0	0
2002	58	3,226	0	0

Besides past mandated reductions in livestock numbers to coincide with the capability of the national forest, several other influences have tended to reduce more recent grazing use. These include: increased labor costs; increased suppression of wildland fires; increased recreation use; increased reservoir construction; increased protection of threatened and endangered species and heritage resources; increased urbanization, industrialization and intensification of farming on some adjacent and intermingled private ranch lands. The ranches adjacent and in some cases within the national forests contribute to open space and the rural and rustic heritage of the four southern California national forests. There are benefits to wildlife and equestrian users of the national forests through the maintenance of water developments, roads, and trails by livestock grazing permittees.

All livestock grazing is administered through various forms of grazing permits or special- use authorizations. Grazing allotments (also defined here as grazing areas) are categorized into three types. Allotments are generally referred to as grazing areas designated for commercial livestock operations with, in most cases, intermixed private lands. Special-use livestock areas are designated on small areas adjacent to private land. Administrative Pastures are areas set aside for use by Forest Service horses and pack stock.

Table 179. Acres Within Grazing Areas by Forest

	Angeles	Cleveland	Los Padres	San Bernardino
Total Acres*	693,667	567,372	1,964,440	818,999
Total Grazing Area Acres*	52,298	161,746	873,162	206,192
Total NFS Acres	662,983	420,877	1,781,380	665,753
Total NFS Grazing Area Acres	50,862	126,696	756,669	184,925
Percent NFS In Grazing Areas	8%	30%	42%	28%

* Includes private land intermixed within the National Forest boundaries.NFS: National Forest System

Table 179: Acres Within Grazing Areas by Forest displays the acres within grazing areas, by national forest. Grazing land acres on private land outside the national forest boundaries are not shown.

There are 207 livestock grazing areas within the four southern California national forests. Of the 207 livestock grazing areas, there are 151 allotments, 23 livestock areas, and 33 administrative pastures within the national forests. Table 180: Number of Grazing Areas by Forest displays the current number of designated grazing areas by national forest.

Table 180. Number of Grazing Areas by Forest

National Forest	Allotments	Livestock Areas	Administrative Pastures	Totals
Angeles	6	1	0	7
Cleveland	28	5	0	33
Los Padres	102	12	27	141
San Bernardino	15	5	6	26
Total	151	23	33	207

Table 107: Designated Grazing Areas Status, Acreages, and Permitted AUMS by Forest displays summaries, by national forest, of livestock grazing areas and permitted use on those areas. The status column displays whether a permit has been issued (active) or not (vacant). All "total" acreage figures include intermixed private land acres within the national forest boundaries. Capable acres are areas where livestock can be controlled or sustained within a designated area and management system. The animal unit months (AUMs) by land ownership column indicates number of permitted AUMs. The "percent AUMs" column displays the percent AUMs for National Forest System permitted grazing on active grazing areas.

Table 107. Designated Grazing Areas Status, Acreages, and Permitted AUMS by Forest

2002	Status		Total Acres By Land Ownership		Capable Acres By Land Ownership		AUMS By Land Ownership		% AUMS
National Forest	Active	Vacant	Total	NFS	Total	NFS	Total	NFS	%NFS
Angeles	5	2	52,298	50,862	23,631	23,291	2,983	2,983	100
Cleveland	25	8	161,746	126,696	108,143	47,401	20,483	9,030	44
Los Padres	95	46	873,162	756,669	481,960	407,736	70,202	40,302	57
San Bernardino	16	10	206,192	184,925	181,802	123,794	5,109	3,747	73
Totals	141	66	1,293,398	1,119,152	795,536	602,222	98,777	56,062	

AUM: Animal Unit/Month
NFS: National Forest System

Cattle (and to a lesser degree horses) account for the majority of the AUMs, with a small amount of sheep permitted on the Angeles National Forest to maintain and reduce the quantity of fuel and to maintain fuelbreaks.

Listed in table 107 (under the vacant status column) are newly designated grazing areas from recent land acquisitions on the Monterey Ranger District of the Los Padres National Forest. All six areas were grazed prior to acquisition. The total and capable acres are 100 percent National Forest System land (see table 181: Land Acquisitions Analyzed as Grazing Areas, Los Padres National Forest).

Wild horses and burros are managed on the national forests under the Wild Horse and Burro Act of 1971. The Big Bear Ranger District on the San Bernardino National Forest manages a wild burro territory for 50 to 60 burros, and the Santa Lucia Ranger District on the Los Padres National Forest manages the Black Mountain Wild Horse Territory for 20 horses.

Table 181. Land Acquisitions Analyzed as Grazing Areas, Los Padres National Forest

Acquired Lands	Total Acres	NFS Capable Acres
Baldwin	2,370	608
Brazil	1,200	850
Cozy Cove	333	246
Sea Vista	154	89
Sur Sur	1,697	1,375
Williams	739	606
Totals	6,493	3,774

Note: Total Acres taken from land record, not GIS.
NFS: National Forest System

Condition and Trend

Traditional concepts of range condition and trend are not applicable to California annual grasslands. Variations in precipitation and temperature cause far more variation in species composition and production than does grazing. Productivity fluctuates from the driest to wettest years by more than 400 percent (Bently and Talbot 1951). The Mediterranean climate in southern California (with its cool, moist winters and warm, dry summers) has resulted in a stable herbaceous plant community intermixed with oaks and chaparral that is largely annual vegetation species. These are very productive and relatively easy to manage for a variety of resource outputs including livestock grazing (George and others 2001).

Long-established annual grassland management practices have been verified by range research and detailed in the current Forest Service Region 5 Range Analysis Handbook (USDA Forest Service 2001).

Rangeland management for sustainability is achieved by maintaining moderate utilization levels that maintain forage, cover and habitat requirements for wildlife; and maintain soil productivity, water quality and ecosystem health. Moderate use is defined as leaving adequate residual dry matter (RDM), acting as mulch, that provides favorable microenvironments for early seedling growth, soil protection, adequate soil organic matter and a source of low-moisture fall forage for livestock (Bartolome and others 1980). Many allotments incorporate units or pastures to control the distribution of livestock, season of use, and help ensure protection of sensitive resources including riparian areas.

Rangeland management in the national forests includes but is not limited to: regulating livestock numbers and distribution; the season and degree of use; the placement of structural improvements; seasonal and permanent exclosures; and salt placement locations. Livestock grazing can occur year-round in grasslands, openings in chaparral and scrub, and foothill savannas. It is important to note that authorized and actual use differs from the permitted numbers in response to annual fluctuations in weather and forage production. During drought cycles, many grazing areas are placed in full or partial non-use due to the lack of sufficient forage quantity and/or quality, and for resource protection.

Table 109: Vegetation (Uplands) and Riparian Conditions displays the 2002 acreage and status of designated grazing areas, by national forest, with respect to land management plan and livestock grazing area desired conditions. Generally, rangeland conditions within the national forests are satisfactory and meeting or moving toward land management plan desired conditions, with no areas of major deterioration. For areas moving toward or not meeting desired conditions, site-specific management actions are utilized and will not be discussed at the land management plan level; however, the land management plan Part 3 contains design criteria for meeting or moving towards desired conditions and for help in providing protection of resources.

Table 109. Vegetation (Uplands) and Riparian Conditions

2002	Vegetation - Desired Condition				Riparian - Desired Condition			
National Forest	Meeting	Moving Towards	Not Meeting	Undetermined	Meeting	Moving Towards	Not Meeting	Undetermined
Angeles	14,710	0	0	0	25	0	0	0
Cleveland	11,713	71,123	1,858	26,904	182	2,370	378	50
Los Padres	190,794	12,256	4,131	5	5,621	940	387	30
San Bernardino	22,192	3,545	6,600	100,480	22	14	84	2,694
Totals	239,409	86,924	12,589	127,389	5,850	3,324	849	2,774

The four southern California national forests continue to support viable livestock operations as one of the multiple uses on the national forests. However, a moderate decline in active grazing areas is expected over the life of this forest plan. This is likely to be a result of continued private land development, rising property values, and a reduction in livestock grazing suitable acres. The reduction in suitable acres is driven by the need for increased protection of recreation values, threatened and endangered species, heritage resources, other resource values, and increased urban development in and around the four southern California national forests. Consequently, some grazing areas will no longer support viable operations. In the rural communities surrounding the national forests, the current level of use is expected to continue throughout the life of the plan.

Minerals and Energy

The Forest Service supports the goals of the Multiple Use Sustained Yield Act and the National Energy Plan to supply resources for minerals and energy development, where it can be demonstrated, after complete environmental analysis, that development can be done in an environmentally sound manner.

This section describes the types of minerals and energy resources that occur on the four southern California national forests and the regulatory framework that governs their management.

Southern California is one of the most diverse geologic regions of the United States, and that diversity is responsible for the wide variety of minerals resources found in the region. The southern California national forests have a long history of prospecting for and developing precious minerals (such as gold, silver, gem quality colored stones and others); energy resources (oil and gas); high-quality metallurgical, chemical and cement grade carbonate rocks; and mineral materials (crushed sand and gravel). Many of these types of rocks and minerals (such as calcium carbonate) have industrial and commercial applications that are subject to market demands, which change with time. Calcium carbonate deposits have been mined predominantly for the production of cement, lime, and ground calcium carbonate used principally for fillers, extenders and pharmaceutical uses.

Mining claim records, which are managed by the Bureau of Land Management (BLM), currently show an estimated 1,650 unpatented mining claims in the four southern California national forests. The Forest Service has the responsibility for the management of surface resources on claims which are "unpatented," although the recording of claims is managed by the BLM and also filed at the county. The Forest Service has no authority on "patented" claims. Patented claims are held in private ownership. Like other deeds, patented records are maintained by the county recorder. Discussion of "claims" in the FEIS and forest plans generally refers to unpatented claims unless otherwise noted.

The number of unpatented claims on National Forest System lands changes from year to year. Mining claims are approximately 20 to 160 acres each, and ownership may include more than one person. Most claims are owned by individual prospectors or major mining companies. The number of active mines is a small fraction of the number of unpatented mining claims. Other than small occasional operations, there are currently three active mines (gold) on the Los Padres National Forest, five on the Angeles National Forest, four on the San Bernardino National Forest, and one on the Cleveland National Forest, totaling approximately 2,000 acres.

The limestone mines on the north side of the San Bernardino Mountains and the gravel mines on the Angeles National Forest are some of the largest and most productive in the United States. The carbonate minerals (limestone) are deemed vitally important in national and international economies (Daniel 2003). The limestone mining companies employ more than 100 people, and the revenue to the county is in the millions of dollars. The product value of the carbonate resource derived from National Forest System lands is approximately $150 million annually (Daniel 2003).

Historically, lode gold and placer mining was a mainstay on the four southern California national forests from about 1860 to 1930, especially the Holcomb Valley and Blackhawk areas on the San Bernardino National Forest. The Los Burros gold district on the Los Padres National Forest was historically the principal source of gold mining, both lode and placer, in the Coast Ranges. The entire area is now withdrawn from mineral entry, which precludes any new mining claims. However, unpatented claims with prior existing rights may still operate, subject to environmental restrictions. At present, there are less than half a dozen approved plans of operation for gold mining on the southern California national forests. Most of these are small-scale operations that are active on weekends. Mercury and chromium minerals were mined at many sources along the serpentine outcrops on the Los Padres National Forest early in the 20th century, but none of those mines are still active. Most of the tourmaline mining on the Cleveland National Forest is on private land. All other mining has been small scale.

Energy minerals (primarily oil and gas) have been important products from the Los Padres National Forest for more than 100 years. Oil and gas production is expected to continue on the Los Padres National Forest, could increase slightly, and could be expanded onto the Angeles National Forest, depending on demand and political climate.

Renewable energy resources (primarily solar, wind and hydroelectric) have mostly been developed on non-Forest Service lands; however, the potential exists (as energy demands increase) to consider development of these resources on public lands, after appropriate environmental analysis.

Minerals Management

The federal government's policy for mineral resource management (as expressed in the Mining and Minerals Policy Act of 1970) reads: "foster and encourage private enterprise in the development of economically sound and stable industries, and in the orderly and economic development of domestic resources to help assure satisfaction of industrial, security, and environmental needs." Within this context, the national forests have an essential role in contributing to an adequate and stable supply of mineral and energy resources while continuing to sustain the land's productivity for other uses and its capability to support biodiversity goals.

Withdrawals

Unless withdrawn from mineral entry, or otherwise restricted by forest orders or closures, National Forest System lands are open to location and mineral claiming under the General Mining Law of 1872 (as amended) and the Mineral Leasing Act. The Forest Service requests withdrawals when necessary to protect capital investments, natural resources and unique natural features in areas where impacts from mining cannot be mitigated. The Forest Service only proposes lands for withdrawal; the Department of the Interior (through the BLM) and Congress have the actual authority to withdraw National Forest System lands from locatable mineral entry, as specified in the mining laws. For withdrawals larger than 5,000 acres, congressional approval is required. The Department of the Interior can approve withdrawals larger than 5,000 acres for a limited period of time (for example, for 20 years). Withdrawals do not guarantee that mining will not occur, because National Forest System lands are subject to valid existing rights at the time of a withdrawal. The forest plan revision process does not take away valid existing rights.

Table 310. Acres Currently Withdrawn From Mineral Entry

	Total Acres Withdrawn From Mineral Entry (as of 2003)	Wilderness Acres Withdrawn From Mineral Entry
ANF	394,547	81,924
CNF	87,865	75,523
LPNF	957103	860647
SBNF	147,430	130,362
Total	1,586,960	928,293

On the four southern California national forests, approximately 45 percent (1,586,960 acres) of the land is withdrawn from mineral entry. Of this area, approximately 26 percent (928,293 acres) is withdrawn because of currently designated wilderness (see table 310: Acres Currently Withdrawn From Mineral Entry). Wilderness is withdrawn from mineral entry; therefore, no mining, leasing, nor drilling will occur within wilderness boundaries, except in those few areas with prior existing rights. Non-wilderness withdrawals are associated with watershed protection, developed recreation sites and administrative sites. All withdrawals are subject to valid existing rights. When a record of decision is issued for the selected alternative, the Forest Service may request that the BLM withdraw certain management areas from all forms of mineral entry.

Locatable Minerals

Mineral resources are classified into three categories: locatable minerals, leasable minerals and mineral materials (or saleable minerals). Locatable minerals include rare and uncommon mineral types such as gold, silver, copper, lead and zinc, and some varieties of stone, pumice and cinder deposits that have distinct and special properties making them commercially valuable for use in manufacturing, industrial or processing operations. In determining a deposit's commercial value, the following factors may be considered: quality and quantity of the deposit, geographic location, accessibility to transportation, proximity to market or point of use and profitability.

The General Mining Law of 1872 (as amended) provides the rights to prospect for valuable minerals and to locate and develop mining claims on public domain lands open to mineral entry and unappropriated. A mining claim is considered real property, protected by constitutional rights. The Forest Service (under 36 CFR 228, Subpart A) has the authority to manage the impacts of mining on surface resources. The responsibility for management of mineral resources is under the Secretary of the Interior through the BLM.

Gold has been found in many areas on and surrounding the four southern California national forests:

- Angeles National Forest: Big and Little Tujunga Canyons, San Gabriel and San Francisquito Canyons, Aliso Canyon, and other areas.
- Cleveland National Forest: Temescal and Trabuco Canyons, the Julian area, the Pauma Valley, and other areas.
- Los Padres National Forest: Upper Piru Creek, La Panza and Los Burros Mining District, and other areas.
- San Bernardino National Forest: Blackhawk mining district, Cactus Flats, Holcomb Valley, Deep Creek, the southern San Jacinto District, and probably other smaller creeks on a limited basis.

A potential for uranium has been identified on the Los Padres and San Bernardino National Forests, but no applications for permits currently exist and there have been no indications of change in the foreseeable future.

Around the 1870s, suction dredging occurred in Lytle Creek of the San Bernardino National Forest but none has occurred recently. Sluicing occurred on Piru Creek, but none has occurred recently because of a temporary withdrawal.

Four federally listed plant species are found on the north slope of the San Bernardino Mountains on soils derived from limestone, and another six species (one of which would be covered by incidental take permits) occur in this area near Lucerne Valley. Most species occur at higher elevations on lands administered by the Forest Service and range in lesser numbers onto the BLM and private lands north of the San Bernardino National Forest boundary. The San Bernardino National Forest has worked with the mining community and other cooperators to develop the Carbonate Habitat Management Strategy for the expressed purpose of protecting biological resources from harmful effects of limestone mining.

Leasable Minerals

The 1920 Mineral Leasing Act (as amended) and the 1970 Geothermal Steam Act govern leasable minerals, which include oil, gas, phosphates and geothermal resources. The law provides for the leasing of the public mineral estate by a prospector or a corporation, provided that the lands are open for mineral leasing and not reserved or withdrawn for other purposes.

The only leasable minerals presently leased on the southern California national forests are oil and gas on the Los Padres National Forest. There are 22 oil and gas leases on 15,000 acres, which contain about 180 wells and associated facilities. The Sespe, Upper Ojai and Cuyama oil fields are historical and currently active producers of more than 500,000 barrels of oil per year from Los Padres National Forest land. According to the Final Environmental Impact Statement (FEIS) for Oil and Gas for the Los Padres National Forest, the Sespe Oil Field and Ojai areas have 96 percent of the wells; the South Cuyama Oil Field has 4 percent. The FEIS also identifies approximately 140,000 acres characterized forest-wide as high potential for oil and gas occurrence that have not yet been developed. The FEIS re-evaluated existing leases. When leases expire and where adverse impacts cannot be mitigated, those leases will not be renewed.

The decision made in the Oil and Gas FEIS for the Los Padres National Forest (signed June 2005) makes portions of the Sespe, San Cayetano, and South Cuyama High Oil and Gas Potential Areas (HOGPAs) available for oil and gas leasing, and it authorizes BLM to lease certain lands in these HOGPAs in accordance with identified stipulations. The remainder of the HOGPAs studied and the non-HOGPA area would not be available for leasing.

Of the 52,000 acres that are available for leasing in the three HOGPAs, 4,000 acres would be subject to development. The remaining 48,000 acres could be leased with a no surface occupancy stipulation.

On the approximate 4,000 acres subject to development in the three HOGPAs, the reasonable foreseeable development scenario (RFDS) projects the drilling of a potential 25 wells on five well pads along with the construction of one mile of new road and two miles of pipeline. These activities are expected to result in the initial disturbance of 20.5 acres of land, with 14.5 acres remaining developed after rehabilitation of construction activities. The RFDS also projects the production of 17 million barrels of oil equivalent (BOE– a combination of crude oil and natural gas).

This decision amends and is incorporated by reference into the Los Padres National Forest Land and Resource Management Plan in accordance with regulations for oil and gas leasing found at 36 CFR 228, Subpart E – Oil and Gas Resources. Subsequently, the Regional Forester will authorize the BLM to offer specific National Forest System lands for lease.

Approximately 51,200 acres of high mineral potential (for oil and gas) have been identified by the BLM in portions of the Angeles National Forest. Of that acreage, approximately 410 acres are non-Forest Service lands within the national forest boundary, leaving 50,790 acres of National Forest System lands. Of that, over 23,000 acres are classified as Back Country Non-Motorized zones at present (see table 549: Acres of High Oil and Gas Potential by Land Use Zone on Angeles National Forest). These areas are mostly along the western side of the national forest, within the "Ventura Basin," a known geologic structure with a long history of commercial oil and gas developments (mostly to the west in Ventura and Santa Barbara Counties).

Table 549. Acres of High Oil and Gas Potential by Land Use Zone on Angeles National Forest

Land Use Zone	Acres
BC	13,010
BCMUR	4,960
BCNM	23,183
CB	448
DAI	9,190
Total	50,791

Within the 51,200 acres, it is reasonable to assume that between five to twenty-five wells could be drilled in the next 15 years, with associated disturbance of 35 to 175 acres (primarily for well pads, roads and pipelines). Although there have been past indications of interest, no leases have been issued on the Angeles National Forest (see Appendix I. Oil and Gas Potential).

Before any leases can be issued, a complete environmental analysis to determine suitability for leasing is required, and leases will be subject to the restrictions on surface disturbance in existing inventoried roadless areas, as well as to other stipulations to be developed during environmental analysis.

A small area of moderate oil and gas potential was identified on the San Bernardino National Forest during land management planning in the 1980s, but the area has been inactive and has been reclassified by the BLM to be low or no potential (see Appendix I. Oil and Gas Potential). The data used for analysis of the reasonable future development scenario by the BLM and Forest Service was much more extensive for the Los Padres National Forest than for the other southern California national forests because of the Los Padres National Forest's long history of development of oil and gas resources and the backlog of lease applications. The entire Cleveland National Forest was also reclassified by the BLM to be low or no potential.

Some areas of geothermal potential were identified by the state on all four southern California national forests; however, there has been no commercial interest in development. "Although the geothermal resources of the Transverse Ranges [as well as the Coast and Peninsular Ranges] are unspectacular compared to those of some other provinces of California … they do provide some opportunities for alternative energy development" (Grove 1982). "…[N]one of the geothermal systems in the Transverse Ranges [and probably the Coast and Peninsular Ranges] have reservoir temperatures capable of supporting electrical generation..." (Brook and Server 1982).

Although there are no geothermal leases on any of the four southern California national forests, potential for occurrence exists along the San Andreas, Santa Ynez, Pine Mountain, San Jacinto and Elsinore fault zones, and possibly others. On the San Bernardino National Forest there is one identified geothermal hot water convection system at Arrowhead Springs, and four low-temperature thermal wells are located along the fault within the San Bernardino National Forest boundary. One low-temperature well is on National Forest System land and the rest are located on private lands. Past applications lapsed and none are currently on file.

There have been no applications for permits to drill for geothermal resources on the Angeles or Cleveland National Forests. Some potential for geothermal resources on the Los Padres National Forest was indicated by the state in the 1970s, but no applications for permits to drill have been submitted. Low-temperature hot springs are present on or adjacent to all four southern California national forests, but no interest has been shown recently in exploration or development. Any decision to lease would still have to go through an analysis for availability and suitability.

A potential for phosphates has been identified on the Los Padres National Forest, but no applications for permit currently exist and there have been no indications of change in the foreseeable future.

Reserved and outstanding mineral rights refer to split-estate land where the subsurface minerals resource is privately owned while the surface estate is publicly owned. There are approximately 610 acres of reserved or outstanding rights on the San Bernardino National Forest, unknown acreage on the Angeles National Forest, 283 acres on the Cleveland National Forest, and about 4,000 acres on the Los Padres National Forest. No applications have been received for access to and exploration of reserved and outstanding minerals on the four southern California national forests, and no new applications are anticipated in the near future.

Saleable Minerals (also called Mineral Materials or Common Variety Minerals)

This class of minerals includes petrified wood and common varieties of sand, gravel, stone, pumice, pumicite, cinders, clay and other similar materials used primarily for agriculture, animal husbandry, building, abrasion, construction, landscaping and similar uses. Disposal of these minerals to the public may be made by sale or free-use permit, or by special agreement to government entities, as governed by the 1947 Mineral Materials Act and other laws.

Industrial mineral mining (particularly construction material, such as sand and gravel or rip-rap) is very important to the Forest Service, counties and local municipalities, as well as for commercial purposes. The Forest Service uses these and other rock products for road construction and maintenance and for stream bank reinforcement/erosion control.

Because communities surrounding the four southern California national forests are experiencing rapid growth, managers have anticipated that the national forests will receive future requests for the extraction of sand, gravel, clay and stone resources. National Forest lands continue to be available for the development of mineral resources in many areas. There is some potential for mineral materials development on National Forest System lands. In 2002, the Angeles National Forest processed 122 permits: 120 for landscape rock, one for dimension stone, and one for crushed stone. The Cleveland National Forest processed no mineral material permits; the Los Padres National Forest processed 27 permits for landscape rock and one for jade; and the San Bernardino National Forest processed 10 permits for landscape rock.

Southern California national forests saleable minerals resources include:

Angeles National Forest: Sand and gravel, flagstone.

Cleveland National Forest: Some potential for sand, gravel and stone.

Los Padres National Forest: Some potential, due to alluvial deposits and sedimentary rock formations, but low likelihood of significant development because of high percentage of withdrawn lands. Some limestone and clay is saleable.

San Bernardino National Forest: Sand and gravel, building stone.

Rock collecting occurs on a scale ranging from picking up a few small rock or mineral specimens for personal use, to collecting larger quantities for collections, barter and sale, to gathering truck loads for landscaping and other uses.

Renewable Energy Resources (Wind, Solar, Hydro)

Wind Energy

Wind is a form of solar energy. Winds are caused by the uneven heating of the atmosphere and earth's surface by the sun, the irregularities of the earth's surface and rotation of the earth. Wind flow patterns are modified by the earth's terrain, bodies of water, and vegetative cover.

The terms wind energy or wind power describe the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water), or a generator can convert the mechanical power into electricity to power homes, businesses, schools and the like. This wind flow, or motion energy, when "harvested" by modern wind turbines can be used to generate electricity.

Since earliest recorded history, wind power has been used to move ships, grind grain and pump water. There is evidence that wind energy was used to propel boats along the Nile River as early as 5,000 B.C. and to pump water in China around 2,000 B.C.

In the U.S., millions of windmills were erected as the American West was developed during the late nineteenth century. Most of the windmills were used to pump water for farms and ranches. By 1900, small electric wind systems were developed to generate direct current, but most of these units fell into disuse as inexpensive grid power was extended to rural areas during the 1930s. By 1910, wind turbine generators were producing electricity in many European countries.

California has been the historical leader in wind energy development, both in the U.S. and internationally. Wind energy investment began in earnest in the early 1980s, and the industry grew substantially during the decade, resulting in a total installed capacity of about 1,880 MW by 1990. However, more recent development has spread from California into a broader cross-section of the country. The key factors driving development in new states include renewable portfolio standards (RPS) and other forms of renewable energy mandates, state tax and financial incentives, consumer demand for green power, the improving economics of wind generation and market rules that are favorable to wind.

Although development slowed greatly in the 1990s and some projects ceased operation, California still has the most wind energy capacity, with 1,822 MW installed as of the end of 2002. Initially, California's wind energy industry emerged as a result of state and federal tax incentives and the 1978 Public Utility Regulatory Policies Act (PURPA), combined with strong implementation of PURPA by the state's public utility commission. More recently, new and existing projects have been supported by production incentives and other financial incentives funded through a systems benefits charge on electricity sales created under California's electric industry restructuring law.

In the United States, there has been an average of 24 percent annual growth of wind energy projects since 1997. Wind installations currently exist in about half of all U.S. states. This helped place the U.S. third in the world for total wind power capacity (Germany is first and Spain is second).

The quality of the wind resource determines, in large part, the cost of producing electricity from wind power. In states with high-quality wind resources, relatively modest financial incentives may be effective in driving significant wind development, in the absence of other constraints.

Likewise, wind developers would need large incentives in states with poor wind resources to be economically competitive with other resources. Thus, the wind resource may determine the magnitude of the policy incentives needed. However, the existence of strong wind resource and policy incentives may not be sufficient to stimulate investment if other barriers exist, such as transmission constraints.

Within the broad context of wind resources, transmission availability, federal policies and other considerations, incentives and other state policies are important and can in many cases be instrumental in making some wind projects economic.

Solar Energy

Sunlight (solar energy) can be used to generate electricity. Solar technologies use the sun's energy and light to provide heat, light, hot water, electricity and even cooling for homes, businesses and industry.

In the U.S., nearly 50 percent of retail electricity customers currently have the option to purchase renewable energy directly from their utility or from a competitive green power supplier. Solar power from both utility-scale and small, distributed systems has been a feature of many green power products offered to consumers. While green power markets are still developing, participation in these programs is supporting a significant amount of new solar energy capacity; as of the end of 2002, nearly 5 megawatts (MW) of new photovoltaics development had been funded, in part through green power marketing.

Photovoltaic (PV) solar cell systems (which are made of semiconducting materials) convert sunlight directly into electricity. The simplest cells power watches, calculators and the like, while more complex systems can light houses and provide power to the electric grid.

A solar or PV cell consists of semiconducting material that absorbs the sunlight. Solar energy knocks electrons loose from their atoms, allowing the electrons to flow through the material to produce electricity. PV cells are typically combined into modules that hold about 40 cells. About 10 of these modules are mounted in PV arrays, which can be used to generate electricity for a single building, or in large numbers, for a power plant. A power plant can also use a concentrating solar power system, which uses the sun's heat to generate electricity. The sunlight is collected and focused with mirrors to create a high-intensity heat source. This heat source produces steam or mechanical power to run a generator that creates electricity.

Solar water heating systems for buildings have two main parts: a solar collector and a storage tank. Typically, a flat-plate collector (a thin, flat, rectangular box with a transparent cover) is mounted on the roof, facing the sun. The sun heats an absorber plate in the collector, which, in turn, heats the fluid running through tubes within the collector. To move the heated fluid between the collector and the storage tank, a system either uses a pump or gravity, as water has a tendency to naturally circulate as it is heated. Systems that use fluids other than water in the collector's tubes usually heat the water by passing it through a coil of tubing in the tank.

Forest Service Wind and Solar Energy Management Process

The Forest Service addresses the potential for renewable energy development on National Forest System lands through the land management plan and special-use authorizations.

Wind and Solar energy project activities include:

- Preliminary site testing and monitoring;
- Road building and maintenance;
- Construction activities for turbine and pole placement (wind), or panel placement (solar); and
- Supporting infrastructure of buildings, power lines, substations and other ancillary facilities.

If the proposed wind or solar energy project location is consistent with the provisions of the land management plan, then environmental reviews and NEPA compliance govern the procedures.

If the proposed wind or solar energy project location does not conform to the land management plan, then a land management plan amendment is required prior to addressing the proposed project, or the project is rejected.

Hydro-power Generation, Impoundments and Diversions

Hydro-electric power generation facilities in southern California in 2003 had the capacity to supply over 3.6 percent of California's total electricity generating capacity (U.S. Department of Energy 2005). In Los Angeles and San Bernardino Counties hydropower generation capacity is over 13 percent of the total county generation capacity. Two of the twenty largest hydropower generation facilities in California are on or near National Forest System land in southern California, at Castaic Lake and Devil Canyon. The Castaic Lake facility is the second largest in the state, after the Helms pump storage facility in Fresno County. Castaic alone has a nameplate generation capacity of 1,329 megawatts, over 82 percent of the total hydropower capacity for Los Angeles County.

Most of the hydropower facilities initially came on line during two periods, either prior to 1940 (25 percent of the facilities) or during the 1980s (34 percent of the facilities). Almost one-half of the Los Angeles county facilities came on line during the 1980s.

Under natural conditions, riverine aquatic and riparian habitats form a longitudinal continuum from headwaters to mouth (ridge to ocean). Impoundments (for hydropower generation and other uses) and diversions along with channelization break this continuity, alter hydrologic regimes, and fragment habitats.

Dams and reservoirs are ubiquitous in southern California. One classification of impoundments separates them as hydroelectric-power and non-hydro power facilities. The hydroelectric-power impoundments are typically associated with Federal Energy Regulatory Commission (FERC) projects. Non-hydroelectric facilities are often constructed for flood control, irrigation or water retention. FERC impoundments on or very near National Forest System lands generate more Forest Service involvement than non-FERC facilities, and typically offer more options for Forest Service input to the dynamics of impoundment operations through 4(e) license conditions. Table 561: Summary statistics of reservoirs and impoundments on National Forest System land lists selected characteristics of the largest impoundments and reservoirs on the four southern California national forests and summarizes attributes of impoundments listed by the California Department of Water Resources. Many of these larger impoundments incorporate hydro-electric power generation.

All major mountain streams in southern California have dams or diversions along them (Stephenson and Calcarone 1999). Many impoundments are on National Forest System lands, typically at relatively low elevations in front country topography. Some dams exist at higher elevations, particularly in the Mountain Top area of the San Bernardino National Forest. Besides facilities on major rivers, numerous springs and small streams are diverted or dammed, often for water supply and/or flood control (Stephenson and Calcarone 1999).

Table 561. Summary statistics of reservoirs and impoundments on National Forest System land

Forest	No. in Forest	Capacity (acre-ft)	No. with >50,000 acre-ft Capacity	No. with >20,000 acre-ft Capacity	Drainage Basin Area (sq miles)	No. with Basin Area > 10 sq mi	No. with Basin Area > 100 sq mi
Angeles National Forest	18	673,355	2	6	1,198	12	4
Cleveland National Forest	7	203,334	2	5	762	6	3
Los Padres National Forest	9	109,137	1	1	493	3	1
San Bernardino National Forest	16	421,989	4	5	410	5	1

Source: Information Center for the Environment (1997)

The Angeles and San Bernardino National Forests have the greatest number and total capacity of reservoirs. Although the Los Padres National Forest generally has less reservoir capacity than any of the other four southern California national forests, water from the national forests feed downstream reservoirs that are often hydropower generators. Limiting consideration of hydropower generation solely to on-forest facilities neglects an important component of the role the national forests play in hydropower generation in southern California.

Five impoundments are listed in the California Rivers Assessment (Information Center for the Environment 1997) as being "owned" by the USDA Forest Service. Two of these are on the Angeles National Forest, two on the Los Padres National Forest, and one on the San Bernardino National Forest. The capacity of the reservoirs behind these dams ranges from 15 to 600 acre-feet and total 815, and they drain a total of 17.3 square miles. In combination, these impoundments are minor in comparison to the totality of impoundments existing on the national forests.

One ramification of the damming and diversions is reduction in the extent and distribution of native freshwater habitats. Faber and others (1989, cited in Stephenson and Calcarone 1999) estimated damming and diversions have eliminated over 95 percent of the riparian habitat in floodplain zones in southern California. Most of this is presumably at urbanized lower elevations. Habitat is lost directly to inundation by reservoirs created behind impoundments.

Flow modification has a variety of impacts. Diversions remove water, with a variety of consequences to riverine systems, including potential narrowing of wetted channels and alteration of hydraulic forces that maintain channel systems in a natural form. Reservoirs also typically retain or reduce the magnitude of flood flows, thereby changing the magnitude and timing of downstream flows (Coastal Conservancy 2001). One common result is the near-total depletion of sand and fine gravel immediately downstream of the impoundment. Lack of sediment can influence the reproductive success of aquatic organisms and alter channel maintenance capabilities. Sudden, large water releases can wash and scour away an entire year's reproductive effort for native fish and amphibian species. On the other hand, long-term, low-magnitude releases tend to increase the likelihood of introduction and maintenance of habitats for exotic predators like bullfrogs and sunfish, habitats that historically would have dried up completely in summer (Sweet 1992, cited in Stephenson and Calcarone 1999).

The modified flows stemming from diversions and impoundments seldom match the natural regimes that biota evolved under. Winter and spring flood peaks are not re-created and therefore channel scouring and sediment transport is minimized. Although relatively constant flows typically degrade downstream habitats, Stephenson and Calcarone (1999) identified situations where biotic survivorship increased when flows on Piru Creek were shifted to constant releases during summer and spring months, as opposed to natural flows that fluctuated dramatically on a daily or weekly basis.

Non-Recreation Special Uses

Special use authorizations allow occupancy, use, or rights and privileges on National Forest System land by federal, state and local agencies, private industry, and individuals. Special use authorizations may include permits, leases, or easements. Non-recreation special uses vary from low-intensity, often short-term actions such as filming or locations for scientific instruments, to major developed facilities such as radio and television transmission sites, oil and gas pipelines, dams and high voltage power transmission lines.

The national forests have authorized approximately 2,250 non-recreation special use authorizations to use and occupy nearly 37,000 acres of National Forest System land. Non-recreation special uses are divided into eight categories: agriculture, community and public information, feasibility and research, industry, energy generation and transmission, transportation and roads, communications, and non-power generating uses of water. A summary of the existing non-recreation special-use authorizations is displayed in table 306: Non-Recreation Special Use Authorizations, Number of Authorizations and Acres by Forest.

Table 306. Non-Recreation Special Use Authorizations, Number of Authorizations and Acres by Forest

Category of Use	ANF		CNF		LPNF		SBNF		Total	
	#	Acres	#	Acres	#	Acres	#	Acres	#	Acres
Agriculture	40	72	16	335	23	1,066	13	276	92	1,749
Community	50	701	15	21	32	1,301	46	369	143	2,392
Research, etc.	48	166	8	157	30	14	30	723	116	1,060
Industry	29	1,577	7	155	13	40	47	166	96	1,938
Energy Trans.	46	7,320	85	527	50	1,463	52	1,127	233	10,437
Roads & Trails	149	5,338	86	2,269	162	1,821	204	1,649	601	11,077
Communication	164	448	87	205	118	201	59	762	428	1,616
Water	216	5,324	58	923	118	263	149	242	541	6,752
TOTAL	742	20,946	362	4,592	546	6,169	600	5,314	2,250	37,021

Data as of June 2003

The number of non-recreation special use authorizations and the acres authorized has declined since the original national forests' land management plans because of a number of factors, including elimination of authorizations that are no longer used, non-renewal of authorizations that do not comply with land management plans, and implementation of the Telecommunication Act of 1996.

Designated Corridors and Sites

Suitable areas for utility corridors are designated for location of major facilities related to energy transmission, telephone, oil and gas pipelines, and water transmission. Not all utilities and major transmission lines are in corridors. For example, distribution lines are usually located outside of corridors.

Major highways associated with commuter traffic, commerce, or interstate travel are designated as transportation corridors. Transportation corridors are suitable locations for mobile telephone sites and underground utilities including fiber optic communication lines.

Communication sites are designated for the location of facilities related to radio, television, and other wireless telecommunication uses.

Table 307: Utility and Transportation Corridors and Communication Sites (Currently Designated) summarizes site and corridor designations on the national forests. A specific inventory of these designations can be found in the Other Designations section in Part 2 of the forest plans.

Table 307. Utility and Transportation Corridors and Communication Sites (Currently Designated)

National Forest	Utility Corridors	Transportation Corridors	Communications Sites
Angeles	12	30	27
San Bernardino	1	0	14
Cleveland	1	2	9
Los Padres	1	0	23
Total	15	32	73

The Angeles National Forest has identified several sediment placement sites where public agencies may place excess earth material from roads and flood control debris basins on the national forest. A list of these sites can be found in the Other Designations section in Part 2 of the forest plan for the Angeles National Forest.

Suitable Land Use Zones

The forest plans identify specific areas or land use zones suitable for consideration of non-recreation special uses and identification of utility corridors and communication sites. The Developed Area Interface, Back Country, and Back Country Motorized Use Restricted zones are suitable areas for these uses. Low-intensity non-recreation special uses may also be considered in Back Country Non-Motorized areas. Occasionally, a non-recreation special use proposal is considered in other land use zones by act of law.

In the existing forest plans, the land area suitable for consideration of non-recreation special uses and identification of utility corridors and communication sites (those areas zoned as Developed Area Interface, Back Country, or Back Country Motorized Use Restricted) totals 1,857,436 acres. Suitable acreage for consideration of non-recreation special uses by national forest are shown in the Environmental Consequences section, table 308: Acreage Suitable for Consideration of Non-Recreation Special Uses (page 65).

Lands (Real Estate)

The Congressional boundaries of the national forests enclose more than four million acres of land. Approximately 87% of this gross land area is National Forest System land. (See table 239: Official Land Ownership. Analysis acres may vary.)

Table 239. Official Land Ownership

National Forest	Gross Acreage*	National Forest System Acreage*	Non-Fed Ownership (% of Gross Acreage)
Angeles	693,667	655,387	6%
Cleveland #	567,372	434,480	23%
Los Padres @	1,964,440	1,762,679	10%
San Bernardino	818,999	671,686	18%
Total:	4,046,480	3,526,234	13%

Notes:
* As of September 2002
\# Includes Guatay Purchase Unit
@ Includes Big Sur Purchase Unit

The principal lands activities are: (1) land ownership adjustment with private parties and non-federal government entities; (2) acquisition of rights-of-way for administrative and public access; (3) property line management; and (4) maintenance of mineral withdrawal status.

Land Ownership Adjustment

Since approval of the original land management plans (1986 - 1989), the national forests have completed more than 60 land adjustment cases for a net increase of almost 36,000 acres of land to the National Forest System. These land adjustments have reduced total property lines between National Forest System land and lands of other ownership by nearly 400 miles.

Fluctuations involving policy, funding, donations, availability of appropriate lands and opportunities for exchange all influence the rate of accomplishment. On average, the national forests complete six to ten adjustment cases per year for an annual net gain of about 2,000 acres to the National Forest System. Some noteworthy adjustments for their contribution to management efficiency, public benefit, and ecosystem habitat preservation are listed in table 240: Important Land Adjustments.

A landownership adjustment guide of current ownership and desirable areas for acquisition or exchange is available at the Forest Supervisor offices. This guide map serves as a visual display of the future desired ownership condition of the national forests, which is to reduce the complexity of the landownership pattern through consolidation.

Table 240. Important Land Adjustments

National Forest	Adjustment Case	Acres Acquired	Year
Angeles	City of Monrovia III	335	1996
	Reece-Dupont I & II	118	1999
	Horse Canyon	169	2001
	Chaney Trail	14	2003
Cleveland	Guatay Mountain	400	1993
	Roberts Ranch	765	1995 -1997
	Rutherford Ranch (I thru VII)	2578	1997 - 2003
	Freemont Exchange	324	2003
Los Padres	Sea Vista Geiger	211	1999
	Baldwin Ranch I & II	1387	1996 - 1997
	City of Santa Barbara	642	1999
	San Carpoforo	783	2000
	Bixby (I, II, III, IV)	1220	2002
San Bernardino	Garner Family (13 Phases)	1306	1990 - 1997
	Upper Deep Creek (I thru IV)	620	1996 -1998
	Pinewood	240	2001
	Lion Peak	640	2001
	Healy II	674	2002

Source: Region 5 Land Adjustment Annual Accomplishment Reports.

Rights-of-Way (R/W) Acquisition

The lack of recorded rights-of-way through non-National Forest System lands for access to the national forests was a concern noted in the original land management plans and remains a concern today. Rapid development within and along the national forest boundaries has reduced historical access to National Forest System roads and trails. Many connections to the public road systems occur at the rapidly urbanizing boundary. Conversion of agricultural land to housing developments negates verbal agreements with prior owners for access. The national forests have approximately 221 roads without recorded access across 510 miles of a 3,780-mile National Forest System of roads. Forest Staff have estimated that nearly 1,300 separate rights-of-way cases would need to be completed to provide full legal access to the current National Forest System of roads on the national forests. During the previous planning period, nearly all road and trail rights-of-way were acquired as the result of land ownership adjustments (see table 241: Roads Rights-of-way Needs Summary).

Table 241. Roads Rights-of-way Needs Summary

National Forest	Number of Forest Roads Without Recorded R/W	Miles of Forest Roads Without Recorded R/W	Estimated Number of R/W Cases Needed for Full access to Forest Roads
Angeles	37	59	213
Cleveland	94	165	400
Los Padres	36	135	500
San Bernardino	54	151	187
Total:	221	510	1300

Sources: INFRA Travel Routes.

Property Line Management

There are approximately 4,500 miles of property lines between National Forest System land and lands of other ownership. Substantial portions of the original property surveys have been lost because of natural disturbance, deterioration, and human activity. Portions of the national forests have never been surveyed, including property lines adjoining private parcels. The national forests have surveyed approximately 20% of the total boundary. The current annual rate of boundary line survey is approximately 10 miles per year for the national forests and is completed to support land adjustment and resource programs (see table 242: Property Lines Surveyed).

Table 242. Property Lines Surveyed

Forest	Total Miles of Property Line in 1990	Total Miles of Property Line in 2001	Miles of Property Line Surveyed as of 1997	Percent of Forest Surveyed
Angeles	712	590	108	18
Cleveland	1,060	1037	347	33
Los Padres	1,945	2000	208	10
San Bernardino	1,180	867	253	29
Total	4897	4494	916	20

Sources: Pacific Desert Divide Project, October 1997; Region 5 Attainment Reports.

Growth rates within southern California communities continue to outpace the national average, with rapid development occurring adjacent to National Forest System lands. While overall property lines have decreased because of land adjustment, the amount of urban interface boundary continues to increase because of development.

The occurrence of occupancy trespass or the unauthorized use of National Forest System land is closely related to urban development, mixed ownership, and unidentified property lines. Property line surveys have revealed hundreds of unresolved occupancy trespasses. Typically, new property line surveys reveal several occupancy trespasses per mile. These unapproved occupancies may range from minor uses such as fences, to major occupation such as buildings.

Table 243. Mineral Withdrawal Status

National Forest	Acres of Withdrawals
Angeles	394,547
Cleveland	87,865
Los Padres	957,103
San Bernardino	147,430
Total	1,586,960

Withdrawal Status

Approximately 1.6 million acres of the national forests have been withdrawn from mineral entry and mineral development to protect and reserve wilderness, wild and scenic rivers, research natural areas, experimental forests and other areas of special interest (see table 243: Mineral Withdrawal Status).

Wildland Fire and Community Protection

The Federal Wildland Fire Management Policy of 2001 requires that a full range of fire management activities be used to achieve ecosystem sustainability including its interrelated ecological, economic and social components. Fire as a critical natural process will be integrated into land and resource management plans (forest plans) and activities on a landscape scale and across agency boundaries. Response to wildland fires is based on ecological, social, and legal consequences of the fire.

Southern California is one of the most dangerous wildland fire environments in the United States. This region has had the most firefighters killed in action and residential structures lost of any region of the country. Some of the structural losses and most of the fatalities have occurred on National Forest System lands. In addition, a significant portion of past flood damages to low-lying communities have occurred as a result of debris flows and debris torrents coming from burn areas on the national forests; there have also been numerous fatalities associated with these flooding events (Wells 1987a, b). The fires of October 2003 resulted in fatalities of both civilians and firefighters, and additional civilian fatalities from down stream flooding several months after the fires.

Median fire size has varied among the southern California national forests in the recent past. For example, between 1950 and 1989, the median fire size on the San Bernardino National Forest was 161 acres (mean 1,554), but it was 2,786 acres (mean 3,507) on the much smaller Cleveland National Forest (Weise and others, in press). Chaparral normally does not burn until it reaches approximately 25 years of age, but in southern California all but the very youngest age classes will burn at times of low fuel moisture and extreme fire weather (Keeley and others 1999a).

Since 1910 and the advent of fire suppression, the number of fires per decade has increased in southern California; increases have been most pronounced in counties where human populations have exploded (Keeley and others 1999a). Interestingly, although the number of fires in chaparral has increased, mean fire size has remained the same over the roughly 90-year period (Conard and Weise 1998). This is largely due to successful suppression of fires that start in more moderate weather conditions and in more accessible locations, such as along roads. It also reflects the effectiveness of using fixed-wing aircraft and helicopters in extinguishing fires quickly in more remote locations (Moritz 1997). On the other hand, the frequency of large fires (greater than 50,000 acres) in chaparral apparently has not changed for centuries, through several distinct fire regimes: the Native American (before 1792), Spanish-Mexican (1792 to 1848), Anglo (1849 to 1929), and recent (1930 to present) periods (Mensing and others 1999).

Table 458. Acres Burned by Wildfire Annually

ANF	10,011
CNF	11,931
LPNF	37,148
SBNF	6,489

Based on analysis of fire records from 1970 to 1999, an average of 564 fires start annually in the four southern California national forests, and they burn on average of 57,160 acres per year (table 458: Acres Burned by Wildland fire Annually). Considering all jurisdictions regarding the same fires, slightly more than 87,000 acres per year burn in wildland fires on and directly adjacent to these national forests. Eighty-four percent of the fires are human-caused; the rest are caused by lightning. Most are controlled at 100 acres or less.

In reviewing Forest Service fire history records since 1910, there is little variation in average patch size of large fires on the landscape. For southern California as a whole, 79 percent of the acres burned in only 10 percent of the fires. However, there continues to be a proliferation of small fires, with fire occurrence increasing in southern California counties every decade since 1910 (Keeley and others 1999a). Suppression has effectively limited the spread and impacts of these smaller fires. In the high-elevation mixed conifer vegetation where fire suppression has been most successful, the resulting denseness of stands has contributed to the current tree mortality and stand-replacement fire issues. This densification of forested areas due to past fire suppression is well documented (McKelvey and Johnston 1992, Minnich and others 1995, 2000; Stevenson and Calcarone 1999).

Table 110. Cause of Fire Occurrence 1970-1999, by Forest

Cause	Angeles	Cleveland	Los Padres	San Bernardino
1970s				
Human Caused	1,073	948	807	1,769
Lightning	191	116	171	551
Total	1,264	1,064	978	2,310
1980s				
Human Caused	1,213	804	513	1,844
Lightning	169	101	185	485
Total	1,382	905	698	2,329
1990s				
Human Caused	1,980	921	497	1,807
Lightning	210	75	143	370
Total	2,190	996	640	2,177

In southern California, fire suppression plays an extremely important role containing the ever-increasing frequency of human ignitions. Indeed, fire suppression may play a key role in maintaining these ecosystems closer to their natural fire regime than would be the case in its absence (Keeley and others 1999a). It is the relatively few fires that escape initial attack that account for the majority of the burned area and most of the suppression costs on the national forests. For the period of 1991 to 2000, suppression costs for the four southern California national forests averaged nearly $32 million per year.

For the period of 1970 to 1999, fire occurrence has increased only on the Angeles National Forest. Total acres burned (on the four national forests) have increased during the past three decades, mostly because of large fires on the Los Padres National Forest. Many of the statistical fires originate outside the national forests and spread upslope on to National Forest System land from the urban interface. In other cases, fires originating on National Forest System land immediately threaten communities both within and along the edge of the national forests. Approximately 16 percent of all fires originate from lightning. Human-caused fires from campfires, recreational target shooting, smoking, vehicle fires, equipment use and arson account for most of the damaging wildland fires (see table 110: Cause of Fire Occurrence 1970-1999, by Forest).

Wildland/Urban Interface

Because of the urbanization in and adjacent to the national forests in southern California, most of these national forests are viewed as part of the Wildland/Urban Interface (WUI) environment, and fires continue to be aggressively suppressed. Wildland/Urban Interface is defined as the area where dense development meets the wildlands. In the land use zoning concept related to the alternatives, these areas are identified as Developed Area Interface (DAI), defined as a mixture of developed and undeveloped lands. For general discussion these areas are referred to in this section as the interface/intermix. The interface/intermix areas are a source of substantial human-caused fire occurrence.

Complex land ownership patterns can lead to an increasing miles of future Wildland/Urban Interface as inholdings are developed. There are currently about 1,700 miles of Wildland/Urban Interface with developed areas on the four southern California national forests. Table 313: Ownership Complexity (page 81) displays the number of miles of perimeter per square mile of ownership. This is a measure of complexity of the current land ownership pattern. The table shows that the Los Padres National Forest has the least complexity while the Cleveland National Forest has the most. Land adjustment is a management tool that forest staff can use to reduce land ownership complexity and therefore the future amount of Wildland/Urban Interface.

Resource managers have shown resistance to managing fires for "resource benefit" as "wildland fire use" wildland fires because of concerns related to air quality and government liabilities related to the proximity of interface/intermix land. Prescribed fires are conducted in place of fire use. Most burning is conducted in the months of January through March to reduce social effects, because smoke dispersal is much more effective in the winter than during the months of July and August (when most lightning ignitions occur) and September (when most of the largest fires occur).

The majority of fires on National Forest System land pose an imminent threat to communities within and along the periphery of each national forest. This threat is magnified during periods of high wind, high temperatures combined with low humidity and drought. For example, the Copper Fire on the Angeles National Forest consumed 24,000 acres in a single afternoon on June 5, 2002. With a burning index of 260, it had the most rapid spread of any fire in the history of the national forest, and although it started outside the national forest boundary it burned through the national forest in a single afternoon. Similar high rates of fire spread were observed on the Curve Fire (August 2002) and on the Williams Fire (September 2002). The severity of these fires was attributed to the effects of drought, resulting in record low percentages of moisture in living chaparral (Feser pers. comm.).

Even fires that start in relatively remote areas can threaten communities within the first 24 hours of ignition. For example, within 24 hours of ignition, the Williams Fire spread from the interior of the Angeles National Forest to the communities of Azusa, Glendora, San Dimas, LaVerne and Claremont causing structural losses within the national forest by consuming an entire special-use cabin tract. Another type of fire that may start in remote areas but can spread quickly across the national forest to communities is the Santa Ana wind-driven fire, which typically starts in the fall and early winter months. These examples make it clear that in the four southern California national forests, all wildfires may pose threats to communities and public safety, including those that originate in remote areas.

Table 533: Wildland Fire Spread Documentation summarizes the spread of a substantial number of fires that threatened communities during the first 24 hours of a wildland fire. This table illustrates that all of the Angeles, Cleveland, San Bernardino, and the southern half of the Los Padres National Forests are part of a Wildland/Urban Interface environment.

Table 533. Wildland Fire Spread Documentation

Fire Name	Forest	Fire Date	24-Hour Spread Distance	Communities Threatened First 24-hours	Comments
Stables	Angeles	13-Oct-02	5.1 miles	Santa Clarita	
Copper	Angeles	5-Jun-02	10.2 miles	Santa Clarita, Green Valley	
Bouquet	Angeles	13-May-02	6.1 miles	Santa Clarita, Green Valley	
Kinneloa	Angeles	27-Oct-93	4.9 miles	Sierra Madre, Arcadia, Altadena, Pasadena	Initial attack IC narrative
Pine	Angeles	12-Jul-04	3.6 miles	Lake Hughes, Three Points	
Crown	Angeles	20-Jul-04	4.6 miles	Acton, Littlerock	
Foothill	Angeles	17-Jul-04	7.2 miles	Santa Clarita, Sylmar	
Canyon II	Angeles	2-Jul-97	2.4 miles	Azusa	
Williams	Angeles	23-Sep-02	4.9 miles	San Dimas, La Verne, East Fork, Glendora	
Narrows	Angeles	13-Aug-97	3.8 miles	Wrightwood	

Fire Name	Forest	Fire Date	24-Hour Spread Distance	Communities Threatened First 24-hours	Comments
Cedar	Cleveland	25-Oct-03	29.1 miles	Ramona, Lakeside, Santee, San Diego , Barona Reservation, Julian, Fernbrook, Poway, Alpine	
Paradise	Cleveland	26-Oct-03	9.4 miles	Lake Wohlford, Valley Center, Rincon Reservation	
Viejas	Cleveland	3-Jan-01	10.9 miles	Alpine Heights, Viejas Reservation, Glen Oaks	
El Monte	Cleveland	27-Aug-95	1.4 miles	Finn Springs, Glen Oaks	29-Aug-01 - 24 hour spread distance of 3.9 miles
Green	Cleveland	9-Feb-02	1.9 miles	Corona	No scale on progression map - distance calculated from TOPO!
Pechanga	Cleveland	30-Jul-00	3.1 miles	Pechanga Reservation, Aguanga	
La Jolla	Cleveland	30-Sep-99	1.8 miles	Lake Henshaw, La Jolla Reservation, Palomar Mtn.	
Old	San Bernardino	25-Oct-03	8.0 miles	Skyland, Rimforest, Cedar Glen, Northshore Lake Arrowhead, East Highland, Patton, Del Rosa, Arrowhead Springs, Devore Heights, Big Bear	
Blue Cut	San Bernardino	22-Jun-02	4.9 miles	Hesperia, Summit, Cajon	
Louisiana	San Bernardino	26-Jun-02	6.5 miles	Cajon, Mormon Rocks, Summit, Devore Heights	
Grand Prix/Padua	San Bernardino	24-Oct-03	5.0 miles	Rancho Cucamonga, Fontana, Etiwanda, San Antonio Heights, Upland, Claremont, San Bernardino, Laverne, Mt Baldy, Lytle Creek	
Lytle	San Bernardino	6-Oct-03	2.0 miles	Lytle Creek	Two mile spread occurred during first 6 hours of the initial burning period
Wolf	Los Padres	1-Jun-02	8.5 miles	Ojai, Meiners Oaks	
Painted Cave	Los Padres	27-Jun-90	5.0 miles	Santa Barbara, Goleta, Montecito, Trout Club, Painted Cave	

Fire Name	Forest	Fire Date	24-Hour Spread Distance	Communities Threatened First 24-hours	Comments
Gaviota	Los Padres	5-Jun-04	6.3 mile	Gaviota, Tajiguas, Lento	Distance determined from South Ops incident intelligence - Spread distance calculated by DeLorme
Piru	Los Padres	23-Oct-04	1.3	Piru, Fillmore	26-Oct-04 fire spread 5.5 miles in a 24-hour period
Ranch	Los Padres	22-Dec-99	4.3 miles	Ojai	

Source: USFS Adaptive Management Enterprise Team February 2005

In most of central and southern California, fire suppression operations are extremely complex and expensive to initiate and manage. Fire suppression needs in the interface/intermix typically result in a multi-agency fire-fighting response that involves hundreds of firefighters participating in well-coordinated air and ground operations. Typically, initial attack forces dispatched to a multi-agency fire include 10 or more engines, several dozers, four handcrews, between two and five helicopters and a minimum of two airtankers.

Structure protection needs, evacuation contingencies, coordination with other government agencies (including law enforcement agencies), and management of intense media involvement are components of the immediate suppression complexities involving fires, especially those that start in the urban interface. As a result of the evolution of successful firefighting techniques in chaparral vegetation and structure protection, one-third of all Forest Service fire engines (103) in California are located on the southern California national forests. For the same reason there is an equal commitment of firefighting aircraft to support ground operations.

Suppression Effectiveness and Firefighter Access

Even on severe fires such as the Wheeler Fire of 1985 on the Los Padres National Forest, fuelbreaks, past burns, and roads have been an effective combination in helping limit wildland fire size. Approximately 19 miles of the 96-mile fire perimeter were located on fuelbreaks and 15 miles of the final fire perimeter were located on roads. In addition, the Wheeler Fire did not burn through the Romero Burn of 1971 and the Howard Creek prescribed burn of 1984 (Salazar and Gonzalez-Caban 1987). The desire to use roads and fuelbreaks to contain fires relates to the difficulty of cutting fire line in chaparral. The National Wildfire Coordination Group Fireline Handbook 3 indicates that hand construction of fire line in chaparral requires six times the personnel than required to cut a fire line in grass or timber.

Historically, large fires are common during two times of year. Most fires exceeding 20,000 acres burn between July and September during periods of high temperatures and low humidity. High rates of fuel consumption result in towering plumes of smoke that reach altitudes of 20,000 to 30,000 feet. These updrafts draw in air from the periphery of the fire, generating winds that further accelerate spread rates. In effect, these plume-dominated events create their own fire weather that results in large burn areas. During the past three decades, this type of fire has resulted in most of the acres burned on the national forests.

On large fires burning under severe conditions, firefighters typically take an indirect approach to fire suppression, often using firing (back-burning) tactics from roads and fuelbreaks. Bulldozers are often used to create wide fire lines on fuelbreaks to serve as containment lines. As many as 20 fixed-wing and rotary-winged aircraft may be assigned to such a fire in support of the ground forces involved in fire suppression. Because of the urban nature of the southern California environment, fires that rapidly expand in size result in substantial structure protection needs in multiple jurisdictions. Large numbers of fire engines and other suppression resources are used to protect structures.

Perimeter control operations are sometimes abandoned because of the numbers of structures in need of protection, resulting in larger fires than would be the case in a remote area. On small fires burning under more moderate conditions, aircraft drop fire retardant on fuelbreaks and ridgetops to halt the spread of the fire, while ground forces take the opportunity to build a containment line around the fire. On most fires, containment is achieved using the philosophy of direct attack, and the fires are contained using crews to build hand line along the edge of the fire with support from fire engine crews and helicopter water drops.

The other category of large fires burn from late September through February, when Santa Ana wind patterns follow the passing low-pressure systems and cold fronts. While fires that start in these wind patterns are normally of short duration (2 to 3 day fire events) and often produce fires in the 5,000 to 10,000-acre range, there have been historical fires attributed to Santa Ana winds that have burned more than 100,000 acres. There have also been a few cases of these winds lasting for extended periods. Firefighter fatalities and structural losses have been associated with both of these types of fires, with most of the historical structural losses in the region associated with Santa Ana winds.

The Cedar Fire of October 2003 burned 265,000 acres, resulting in the largest wildland fire in modern-day California history. Started on the Cleveland National Forest under a Santa Ana wind pattern, the fire burned for two days, spreading westerly under Santa Ana winds; then it reversed course and spread easterly for four additional days. This fire illustrates that both weather patterns associated with large fires can occur on a single wildland fire incident.

Wind-driven fires are suppressed less effectively than other large fires because spot fires can break out several miles in front of the main fire, and because aviation resources have limited value once winds exceed 35 miles per hour. Tactical operations involve the assignment of engines and handcrews to the flanks of the fire to try to keep the head of the fire narrow. Special attention is given to structures out in front of the fire, and evacuations are difficult on fires where winds typically blow at wind speeds of 40 to 60 miles per hour. Winds exceeding 100 miles per hour have been recorded on several of the southern California national forests. These fires are controlled when they run out of available fuel or the weather changes. Special attention is given to defensible space, and firefighters are often assigned structure protection responsibilities at the head of the fire. Hand crews line the point of origin and the flanks of the fire so that when the weather changes, the fire is unable to reverse course.

The Angeles National Forest has an extensive system of fuelbreaks, designed to assist suppression forces in limiting wildland fire size under normal burning conditions. The other three national forests have less extensive networks of fuelbreaks. These fuelbreaks have contributed to firefighter safety and have been used to control wildland fire perimeters throughout southern California (Green 1977). They have proven most valuable where there is road access to numerous points of the fuelbreak or when a road runs parallel to the fuelbreak and serves as part of the fuelbreak.

National Forest System fire roads are also essential to successful suppression operations in southern California (Gucinski and others 2000). These roads have begun to deteriorate because of inadequate road maintenance budgets and the introduction of larger engines to fight fires. As a result, safety concerns for firefighters have increased. The fuelbreak and National Forest System fire roads represent a long-term investment related to minimizing wildland fire size and downstream flooding that may result from these fires. The evolution of fire suppression in chaparral has produced a firefighting culture that uses large numbers of fire engines to hold fires on roads and fuelbreaks under normal burning conditions and to protect large numbers of structures within and adjacent to Forest Service jurisdiction during extreme burning conditions typical of late summer and fall wildland fires. Table 314: Estimated Percent of Forest

Accessible by Road illustrates the percentage of each national forest that is accessible from the various road systems that are currently inventoried.

Table 314. Estimated Percent of Forest Accessible by Road

	Other Roads	Added by NFS Roads	Add by Permitted Roads	Added by Unclassified Roads	Forest Total
ANF	21	29	2	1	53
CNF	32	12	4	5	53
LPNF	12	16	1	3	31
SBNF	28	27	2	5	62

NFS: National Forest System

In southern California shrublands, fire suppression plays an extremely important role containing the ever-increasing frequency of human ignitions. Indeed, fire suppression may play a key role in maintaining these ecosystems closer to their natural fire regime than would be the case in its absence (Keeley and others 1999a).

Transportation Corridors and Recreation Use.

The highest concentration of human-caused fires, and a large portion of those chaparral lands degraded by high fire frequencies, are directly adjacent to major transportation corridors, such as county, state, and federal highways passing through or near the national forests, and privately owned areas in the interface/intermix. Electrical distribution systems and railroads have been linked to fire occurrence in the corridors, in addition to the vehicle fires along major transportation routes.

Fire occurrence data in the form of maps suggest that, over the region as a whole, fires that start outside the national forests, on private land inside the national forests, and along major transportation routes passing through the national forests account for a majority of human-caused fire occurrences. National Forest System roads are not a major concern from a fire occurrence perspective, with notable exceptions in the vicinity of Big Bear Lake and Lytle Creek on the San Bernardino National Forest, and the recreational target shooting areas on the Angeles and Cleveland National Forests. The Los Padres National Forest has a very sparse pattern of human-caused fires along National Forest System roads.

Target shooting as a recreational activity is a fire management concern based on historical fire occurrence and fire suppression costs. Unmanaged shooting areas have resulted in a number of large, expensive, wildland fires on each of the national forests during the past decade. Since the Angeles National Forest converted to permitted shooting area operations that are managed, there has been a reduction in suppression costs associated with recreational target shooting.

Environmental Consequences

Direct, Indirect and Cumulative Effects of Forest Plan Decisions

This section identifies the types of environmental effects that can be expected as a result of the forest plan decisions. It is organized according to the Natural, Social or Economic element of the environment that is being affected. Each of the national forest activities that is likely to have an affect is discussed in general terms followed by an analysis of how these effects are expected to vary due to the forest plan decisions described in Chapter 2 for each alternative.

For example, livestock grazing is an activity that is likely to affect several different environmental elements. Grazing is concentrated in specific vegetation types due to high forage productivity and other environmental conditions as discussed in the Affected Environment (Vegetation Condition) section of Chapter 3. This concentrated use is likely to have an effect on the condition of these specific plant communities and effects of grazing; therefore, it is discussed in the Vegetation Condition section of the document for the vegetation communities that are likely to be affected. Grazing may also affect the social environment where conflicts between recreation users and livestock can be an issue. The effect of grazing on the recreation user is discussed under the recreation element. This general pattern of discussing the effects of a given activity on each of the affected environmental elements is repeated throughout the Environmental Consequences section of Chapter 3.

It is important to keep in mind that this Environmental Impact Statement is programmatic in nature and the environmental effects of specific actions or activities are not discussed. Future, project specific environmental analysis will disclose the specific effects of each project. The general type of effects that may occur during plan implementation are discussed here along with an analysis of how the six types of forest plan decisions may influence future trends in these activities. As an example, the various ways that grazing may affect water resources are discussed in general. Analysis of the many site-specific variables that could affect the level of effect on any given stream is beyond the scope of this programmatic analysis. Rather, a discussion of how the forest plan decisions including specific resource protection measures (i.e., Design Criteria) may affect future trends in livestock grazing is the focus of the environmental effects discussion.

Cumulative effects (or the effects of all past, present and likely anticipated future activities) are addressed under a separate heading for each environmental element. Again, the cumulative effects discussions are focused on how the alternative forest plan decisions may influence activity trends not specific effects of future projects.

Effects on Natural Resource Environment

Effects on Vegetation

Direct and Indirect Effects

The three activities most likely to affect vegetation and forest health that were identified in the affected environment are:

- Vegetation and Fuels Management
- Livestock Grazing
- Research Natural Area Recommendations

Chapter 2 provides a detailed comparison of how these activities are expected to vary in each alternative.

Effects of Vegetation and Fuels Management on Vegetation Condition and Forest Health

The type and intensity of treatments is expected to vary by vegetation type and by proximity to human developments. The most intensive treatments would occur within the Wildland/Urban Interface (WUI) Defense zone, which is described below, in Chapter 2, and in Part 3, Appendix K of the revised forest plans. The WUI Defense zone is the area immediately adjacent to communities. In shrubland types, this zone varies from 100 to 300 feet in width. In forested types, however, it is wider and may extend up to 1,500 feet from developments (see forest plan standard S-7). Vegetation in the WUI Defense zone would be heavily modified, since it must safely accommodate firefighters and their equipment. Tree thinning and moderate-to-heavy removal of understory shrubs and ground fuels are typical treatments. For this analysis, we assume that the maximum area of the WUI Defense zone will be treated (3rd column, table 555: Acres of Forest Types in WUI).

Table 555: Acres of Forest Types in WUI

Mixed conifer

Forest	Total Area	WUI Defense zone	Defense zone within DAI	WUI Threat zone
ANF	31,815	1,278	938	24,039
CNF	813	54	40	713
LPNF	34,187	771	566	11,429
SBNF	106,340	12,036	8,834	47,139
Total Area	173,155	14,139	10,378	83,320

Serotinous pines

Forest	Total Area	WUI Defense zone	Defense zone within DAI	WUI Threat zone
ANF	4,386	260	191	2,861
CNF	2,731	59	43	2,014
LPNF	49,207	97	71	9,249
SBNF	12,786	809	594	8,785
Total Area	69,110	1,225	899	22,909

Bigcone Douglas-fir

Forest	Total Area	WUI Defense zone	Defense zone within DAI	WUI Threat zone
ANF	40,399	1,015	745	21,063
CNF	5,922	29	21	3,752
LPNF	18,255	2	1	3,063
SBNF	16,298	318	233	9,117
Total Area	80,874	1,364	1,000	36,995

Hardwood forests and woodlands

Forest	Total Area	WUI Defense zone	Defense zone within DAI	WUI Threat zone
ANF	56,063	1,140	837	37,697
CNF	26,145	902	662	16,215
LPNF	204,166	791	581	48,247
SBNF	40,214	1,577	1,158	21,612
Total Area	326,578	4,680	3,238	123,771

Jeffrey and ponderosa pines

Forest	Total Area	WUI Defense zone	Defense zonewithin DAI	WUI Threat zone
ANF	25,578	752	552	20,951
CNF	7,873	2,547	1,869	5,248
LPNF	52,922	333	244	14,804
SBNF	47,725	4,876	3,579	20,019
Total Area	134,098	8,508	6,244	61,022

Desert conifer and scrub

Forest	Total Area	WUI Defense zone	Defense zone within DAI	WUI Threat zone
ANF	55,025	470	345	35,226
CNF	433	13	10	365
LPNF	209,515	1,342	985	50,529
SBNF	125,014	1,215	892	49,482
Total Area	389,987	3,040	2,872	135,642

WUI: Wildland/Urban Interface

In addition, approximately 1,100 acres per year of WUI Defense zones in all vegetation types on the four southern California national forests likely would require herbicide treatment in the initial stages of Defense zone construction. Where and when these treatments will be applied as yet cannot be determined (see Appendix O. Pesticide Risk Assessment for a risk analysis of pesticide use).

The WUI Threat zone extends up to 1.5 miles from the outer edge of the Defense zone and is designed to change fire behavior (e.g. reduce flame lengths and rate of spread) before it reaches the Defense zone. In both shrubland and forested types there are 26 acres of Threat zone for each acre in the Defense zone. Compared to the Defense zone, WUI Threat zone fuel treatments would be less intensive. Vegetative treatments in the WUI Threat zone target the reduction of excessive fuels rather than heavy vegetation modification. For example, Threat zone treatments may be designed to rejuvenate (e.g. via prescribed burning) native plant communities to make them more fire-resistant.

For this analysis we assume that, on average, up to 25 percent of the shrubland WUI Threat zone (about 6.5 of the 26 acres) and up to 50 percent (13 acres) of the forested Threat zone would be treated. It is important to note, however, that both percentages are averages for the four southern California national forests. Threat zone treatments would be site-dependent. As a result, treatments would be unlikely to occur on every acre, and the percentage of each acre treated would vary considerably.

Fuelbreak construction and maintenance (table 534: Average Annual Hazardous Fuels Program) usually would occur outside the Defense zones, in both the WUI Threat zone and in the WUI environment (a distance of up to 7.5 miles from developments, or the distance that fires may burn in a 24-hour period during normal summer conditions). We estimate that herbicides would be applied to 600 acres/year on the four southern California national forests in the initial phase of fuelbreak construction. Fuelbreak maintenance, however, would depend heavily on the use of prescribed fire rather than herbicides (see Appendix O for the details of pesticide use).

Table 534. Average Annual Hazardous Fuels Program

(Budget displayed in thousands)

Alternatives 1-5 (includes 4a)

Forest	Mortality	Defense/ Threat Zones	Fuelbreak Maintenance	Fuelbreak Construction	Thinning	Rx Fire	Total
ANF							
Acres/Yr	1,000	1,500	500	50	600	5,000	8,650
Budget/Yr	$3,000	$1,800	$125	$60	$720	$1,000	$6,705
CNF							
Acres/Yr	400	1,500	1,000	400	200	2,000	5,500
Budget $/Yr	$1,200	$1,800	$250	$480	$240	$400	$4,370
LPNF							
Acres/Yr	100	3,500	1,000	400	400	10,000	15,400
Budget $/Yr	$300	$4,200	$250	$480	$480	$2,000	$7,710
SBNF							
Acres/Yr	0*	6,500	1,000	500	0*	2,000	10,000
Budget$/Yr		$16,250	$250	$600		$400	$17,500

*San Bernardino N.F. mortality removal and thinning projects are incorporated into other project categories.

Alternative 6

Forest	Mortality	Defense Zones	Fuelbreak Maintenance	Fuelbreak Construction	Thinning	Rx Fire	Total
ANF							
Acres/Yr	1,000	1,883	100	0	600	3,500	7,083
Budget/Yr	$3,000	$2,240	$25	0	$720	$700	$6,705
CNF							
Acres/Yr	400	2,100	200	50	200	1,500	4,450
Budget/Yr	$1,200	$2520	50	60	240	$300	$4,370
LPNF							
Acres/Yr	100	4,789	250	100	400	5,000	10,639
Budget/Yr	$300	$5,747	63	$120	$480	$1,000	$7,710
SBNF							
Acres/Yr	0	6,916	200	100	0	1,000	8,216
Budget/Yr	0	$17,130	50	120		200	$17,500

The way in which fuels treatments would be allocated among the vegetation types will vary by national forest. For example, the San Bernardino National Forest will focus much, but certainly not all, of its treatments on at-risk montane conifer forests near mountain communities. In contrast, the other three national forests likely will devote much of their work to hazardous chaparral in the WUI Defense and Threat zones.

Because of forest-to-forest variability in vegetation types selected for treatment, this analysis must be viewed in the broadest terms. Many factors enter into site-specific and forest-specific decisions concerning where and when treatments will occur, including vegetation type and age; the presence of threatened, endangered and sensitive species; the degree of cooperation with local fire-safe councils and landowners; and the risk of catastrophic fire based on vegetation structure and age.

In discussing the effects of silvicultural treatments on montane conifer forests, it is important to note that historical logging and current forest health practices differ considerably in their effects on forest structure, species composition, and functioning. Past harvests, particularly in the San Bernardino and San Jacinto Mountains, removed large, old trees, with ponderosa, sugar and Jeffrey pines incurring the highest losses. Selective removal (high-grading), compounded by the later effects of fire suppression and air pollution, has contributed to an increase in the abundance of shade-tolerant white fir and incense cedar (Stephenson and Calcarone 1999).

Present-day national forest management projects focus on removal of small-diameter, high-density, understory trees, as well as on dead and diseased overstory trees (mortality column in table 534). The focus now is on the creation of forests with a preponderance of large trees that are relatively unstressed by competition and are more resistant to insect and disease outbreaks, periodic droughts, and wildfires. These forests would be more likely to develop the late-seral, old-growth characteristics valued both by people and the biota.

There are approximately 306,275 acres of montane conifer forests (yellow pine, eastside pine, and mixed conifer) on the four southern California national forests, of which 153,360 (50 percent) are on the San Bernardino National Forest. By July 2003, drought-caused mortality affected approximately 20,500 acres of mixed conifer forests and nearly 20,000 acres of yellow pine forests (the total of both is 26.3 percent) on the San Bernardino National Forest. Nearly all the mortality in these forests occurred in overly dense stands delineated by Stephenson and Calcarone (1999). Although above-average precipitation in 2004-2005 almost certainly will slow further mortality, a second or even third year of average or above-average precipitation may be needed to end the drought completely.

As destructive as the October 2003 wildfires were, most of the montane conifer forests did not burn and continue to be at risk of similar types of fires. For example, 90 percent of drought-affected ("dead-tree") forests were not burned. A key goal for managing montane conifer forests is to alleviate fire risks through vegetation treatments. Yet another goal is to restore severely burned forests through reforestation (for planned acreage see table 534: Average Annual Hazardous Fuels Program). Long term management goals for at-risk montane conifer forests are (1) to create forests resistant to drought, insect and pathogen outbreaks, and stand-killing crown fires; (2) to encourage stand structures that develop and retain healthy, large-diameter (old) trees; and (3) to encourage recruitment that maintains a mix of tree species with higher representation of shade-intolerant pines.

The National Fire Plan emphasizes protection of communities within or near the national forests, which is why 75 percent of current (2005) funding is directed toward modifying fuels in the WUI Defense and Threat zones and WUI environment. There are 20,800 acres of montane conifer forests in the WUI Defense zone that fall within Developed Area Interface (DAI) land use zoning on the four southern California national forests under all alternatives; 15,650 acres (75 percent) are on the San Bernardino National Forest (table 555: Acres of Forest Types in WUI, page 314). These areas would have the highest priority for treatment because they are nearest to human development. The San Bernardino National Forest plans to treat 2,000 acres/year (a subset of the 6,500 acres/year in the Defense/Threat zone column in table 534) in forested types in the WUI Defense zone. At this rate, and after including 50 percent of the Threat zone, it would take more than 100 years to treat montane conifer forests posing the highest risk to communities, assuming that wildfires do not reduce this total and that funding levels for this work remain at or near current levels. Even if the entire San Bernardino National Forest program of 6,500 acres/year were devoted to the WUI Defense and Threat zones within DAI zoning, it still would take between 30 and 40 years to complete fuels reductions in montane conifer WUI zones.

Stephenson and Calcarone (1999) estimated that 108,000 acres (35 percent) of montane conifer forests on the four southern California national forests were overstocked and in need of thinning. Once again, the majority of these acres (81,000 or 50 percent) are on the San Bernardino National Forest. If the proposed treatment rate of 2,000 acres/year in forested types is maintained over the life of the plan, none of the three management objectives outlined above can be met in forests outside the WUI Defense and Threat zones. Therefore, for the majority of montane conifer forests, the threat of stand-replacing wildfires and drought-caused mortality would remain high well into the future, and outside of the WUI, little progress would be made in changing the composition and stand structure of forests at risk. The trade off, of course, is that significant progress could be made toward protecting communities from the kind of devastating fires that occurred in 2003.

Unlike other alternatives, Alternative 6 would limit the amount of prescribed burning of chaparral that would be done outside of the WUI Defense and Threat zones. However, analysis of effects of Alternative 6 does assume some limited prescribed burning of chaparral outside of WUI zones for habitat improvement or for protecting bigcone Douglas-fir (see below). As a result, there would be a high rate of treatment in the WUI Defense and Threat zones, around 7,920 acres/year (Defense and Threat zone treatments plus prescribed burning, in Table 534) on the San Bernardino National Forest alone. Still, even at this higher rate, completion of fuels treatments in the WUI Defense and Threat zones would take from 25 to 30 years on the San Bernardino National Forest. Thus, like the other alternatives, Alternative 6 would not change montane conifer forest conditions outside the WUI zones.

Unlike the other alternatives, Alternative 6 permits wildland fire use, but only in remote areas (termed non-WUI) of the Main Division of Los Padres National Forest. Fires originating from natural ignitions would be permitted to burn in this area of the national forest, but would be suppressed if they approached the WUI environment. In this portion of the Los Padres National Forest, montane conifer forests (15,300 acres) occur as relatively small islands confined to steep, north-facing slopes of the higher mountains (e.g. Big Pine Mountain, Madulce Peak). Because most of these island forests have not burned since fire suppression began in the early 1900s, the first unsuppressed fires could result in higher-than-normal conifer mortality until a new fire regime brings fuel loading into a dynamic equilibrium. Over the long term, however, montane conifer forests on Los Padres National Forest likely would benefit from wildland fire use and therefore would meet the three national forest management objectives listed above.

The desired condition for lower montane forests is to perpetuate them in their current aerial extents. In the case of bigcone Douglas-fir, vegetation management will focus on strategically reducing chaparral fuel loading around populations to reduce the risk of forest-killing crown fires. Nevertheless, due the heavy focus on vegetative treatments in the WUI Defense and Threat zones, relatively little direct treatment of bigcone Douglas-fir is expected to take place in Alternatives 1, 2, 4, 5 and 4a. Compared to the other alternatives, Alternative 3 would pursue a more active program to protect bigcone Douglas-fir. For example, in this alternative there would be a greater emphasis on the acquisition of cooperative funds for vegetation treatments and an increase in staffing to work with fuels' managers to protect bigcone Douglas-fir outside of the WUI zones.

Of the approximately 80,875 acres of bigcone Douglas-fir on the four southern California national forests (table 555: Acres of Forest Types in WUI, page 314), only 2,758 acres are in the WUI Defense zone. Seventy-one percent of this area is in the Angeles National Forest. If the Angeles National Forest were to treat 2,100 acres/year (thinning plus treatments in the Defense and Threat zones) bigcone Douglas-fir in the WUI Defense and Threat zones could be treated in 9-12 years. Nevertheless, because a much larger area of the WUI on this national forest is in shrubland types (see chaparral and coastal sage scrub below), it is unlikely that bigcone-Douglas fir would be treated in this time period.

The 19,000 acres/year of prescribed burning in the WUI environment on the four southern California national forests (table 534: Average Annual Hazardous Fuels Program, page 316) would be primarily in support of WUI protection. As a result, protection of bigcone Douglas-fir populations in the WUI environment would be of secondary importance in these alternatives. Thus, the distribution of bigcone Douglas-fir would continue to be affected by the vagaries of the chaparral fire regime. The best opportunities to protect bigcone Douglas-fir populations likely would take place during wildland fire suppression through the creative use of confine, contain and control strategies. Overall, however, the total area of bigcone Douglas-fir either wwill remain static or more likely will decline during the life of the plan; how great any decline in this forest type might be, however, is not known.

Finally, the unprecedented drought-caused tree mortality on the San Bernardino National Forest presents an anomalous situation with respect to bigcone Douglas-fir management. By July 2003, 27 percent of the bigcone Douglas-fir on the San Bernardino was dying or had succumbed to the drought, especially at the lower elevations of the San Bernardino Mountains. By 2004 mortality had increased to 50 percent. Because this species grows in steep, inaccessible sites, dead and dying trees are unlikely to be removed; thus, some percentage of these moderate- to high-mortality populations almost certainly will burn in wildfires, causing losses of residual live trees or perhaps even population extinctions.

In Alternative 6, all the area of bigcone Douglas-fir in the WUI on the Angeles, San Bernardino and Cleveland National Forests could be treated within 5 years. Following completion of the WUI treatments, prescribed burning in the WUI environment could be used to protect bigcone Douglas-fir stands that are the highest quality California spotted owl habitat. Although less than 1,000 acres/year of this habitat would likely be treated, protecting bigcone Douglas-fir stands would have a positive effect on spotted owls and other species that depend on these lower montane forests.

There are several reasons why prescribed burning chaparral around bigcone Douglas-fir could offer them added protection. Because bigcone Douglas-fir usually occurs as isolated, small colonies (less than 10 acres) in a matrix of flammable chaparral or canyon live oak, populations usually are not treated as separate units in prescribed burns. Since fire intensities in surrounding shrubland burned by prescription usually range from low to moderate, with localized pockets of high-intensity fire, mortality in bigcone Douglas-fir populations, if trees burn at all, is likely to be low for mature trees and low-to-moderately high for saplings.

Once burned, chaparral and canyon live oak remains relatively fireproof for at least a decade, except in severe fire weather conditions (e.g. Santa Ana winds). Thus, for bigcone Douglas-fir stands that do not burn, or burn in low-intensity surface fires, the interval between wildfires likely would increase—an important prerequisite for successful establishment and growth of seedlings and saplings (Minnich 1977). By prescribed burning flammable vegetation around or within bigcone Douglas-fir stands, as proposed in this alternative, both regeneration and adult survival would benefit, at least for another fire cycle.

The closed-cone conifers have in common varying degrees of fire-dependency. Fire opens closed cones, triggering massive seed releases that usually produce abundant late-winter and early-spring recruitment (Borchert and others 2004). Although all of these species exhibit closed-cone behavior, each has a unique set of life history attributes that dictate species-specific fire management. For example, both Tecate and Cuyamaca cypresses require several decades to accumulate cone banks of sufficient size to replace mature, fire-killed trees (Zedler 1981). Others, like knobcone pine, produce cones at an early age (sometimes as early as 2 years; Keeley and others 1999b) and, compared to the cypress species and Coulter pine, are more resilient to short-interval fires (e.g. 15 to 20 years).

Coulter pine is the most widespread serotinous conifer on the four southern California national forests, covering 65,680 acres. This pine exhibits wide cone-habit variation, ranging from near complete serotiny where it grows in highly flammable chaparral and canyon live oak forests to mostly open cones in forests and woodlands subject to infrequent, low- to moderate-intensity surface fires (Borchert 1985).

Prescribed burn treatments on the four national forests likely will have minimal effects on closed-cone conifers like Coulter and knobcone pines. Much of the prescribed burning in chaparral would be in support of the Wildland/Urban Interface, and the inclusion of closed-cone conifers in these burns would only be incidental to burning to meet that objective.

Closed-cone conifer forests cover 69,110 acres of the four southern California national forests. Where closed-cone species like Coulter and knobcone pines grow in chaparral, the modern chaparral fire regime generally is within the historical range of variability for these species, and their persistence on the landscape is, for the most part, not in jeopardy. This is not true, however, for several of the rarer closed-cone cypresses, which have limited distributions and require specific fire regimes to maintain viable populations. These species require special fire management measures to assure their continued viability.

In chaparral, covering 2,016,432 acres of the national forests, there would be an emphasis on fire suppression as a way to counteract ever-increasing human-caused ignitions and to protect communities via fuels treatments in the WUI zones and in the WUI environment. In Alternatives 1-5 and 4a, 32,000 acres/year would be treated (table 534: Average Annual Hazardous Fuels Program, page 316) on the four national forests, most of which will take place in the WUI Defense and Threat zones, beginning with 7,300 high-hazard acres of the WUI Defense zone that fall within DAI land use zoning (table 554: Acres of Shrubland Types in WUI). However, when 25 percent of the WUI Threat zone is added to the Defense zone, the total is 54,700 acres within DAI zones that are in need of treatment. At a treatment rate of 19,000 acres/year for all four southern California national forests, it would take three to five years to complete WUI high-hazard fuels reduction and prescribed burning in support of the WUI Defense and Threat zones.

Table 554. Acres of Shrubland types in the WUI

Chaparral

Forest	Total Area on each Forest	WUI Defense zone	Defense zone within DAI	25 % of the WUI Threat zone to be treated
ANF	379,363	3,221	2,302	14,963
CNF	330,039	3,035	2,500	16,250
LPNF	1,001,847	1,333	850	5,525
SBNF	271,403	2,585	1,642	10,673
Total area	1,982,652	10,174	7,294	47,411

Coastal Sage Scrub

Forest	Total Area on each Forest	WUI Defense zone	Defense zone within DAI	25 % of the WUI Threat zone to be treated
ANF	49,001	1,173	1010	6,565
CNF	24,177	403	381	2,476
LPNF	138,033	549	277	3,601
SBNF	9,741	359	316	2,054
Total Area	220,952	2,484	1,984	14,696

In Alternative 6, 26,670 acres would be treated, but this work would focus almost exclusively on the WUI Defense and Threat zones, except for some limited prescribed burning to protect bigcone Douglas-fir (see above). If the proposed treatment level in this alternative can be sustained, WUI treatments of chaparral could be completed in 2 to 3 years.

One of the desired conditions for chaparral is to reduce wildfire size. A total of 830,260 acres of chaparral are presently greater than 20 years of age on the four southern California national forests. At present, 84 percent of chaparral wildfires exceed 5,000 acres. Over time, the desired condition would be to increase the percentage of fires in the less than 5,000-acre category. Nevertheless, at the level of prescribed burning proposed in all alternatives, it is unlikely that enough acres could be treated in the WUI environment to alter the current distribution of large fires.

Coastal sage scrub covers 204,022 acres of the national forests. The desired condition for coastal sage scrub is to increase the interval between fires and reduce fire size through prevention, suppression, and judicious prescribed burning. Increasing the interval between fires reduces the likelihood that coastal sage scrub will type-convert to annual grassland. While fuels reduction in the WUI Defense and Threat zones would reduce the threat of fires burning into communities, it also would mean a loss or significant alteration of coastal sage scrub.

All alternatives emphasize a suppression strategy in coastal sage scrub to counteract human-caused ignitions. In Alternatives 1-5 and 4a 32,000 acres and in Alternative 6 26,670 acres would be treated annually (table 534: Average Annual Hazardous Fuels Program, page 316). In coastal sage scrub most of this work would take place in the wildland/urban interface (2,000 acres of Defense zone within DAI zoning plus 14,700 acres in the WUI Threat zone; table 554: Acres of Shrubland Types in WUI) or would be in support of it (i.e. prescribed burning in the WUI-environment). Thus, protection of the wildland/urban interface could be completed within several years. Of the 221,000 acres of coastal sage scrub on the four southern California national forests, only 0.8 percent (2,000 acres) would be heavily modified by treatments to protect communities.

Because prescribed burning would not be likely to affect the age-class distribution of coastal sage scrub relative to the influence of wildfires, every effort would be made to prevent fires from burning at short intervals throughout the range of coastal sage scrub, but particularly on the Angeles, Cleveland and San Bernardino National Forests, where short-interval fires are most likely to continue type conversion of sage scrub.

Currently 42 percent of coastal sage scrub is less than 20 years of age, most of which is on the Cleveland National Forest, where sage scrub is at high risk of type conversion. The desired condition for coastal sage is to decrease the percentage in this age class by increasing the interval between fires. Nevertheless, even with aggressive fire prevention and suppression measures, areas of coastal sage scrub likely will be degraded by short-interval fires as urbanization continues to encroach into this vegetation, especially on the Cleveland National Forest.

Effects of Livestock Grazing on Vegetation Condition

Livestock grazing has taken place on all the national forests for well over 150 years. As a result, major alterations to the vegetation occurred long ago, and current vegetation make-up reflects the effects of decades of grazing. Because livestock grazing is concentrated in areas where forage and water are abundant, oak savannas, woodlands and forests, annual grasslands (including montane meadows), coastal sage scrub and riparian habitats are most affected by this use. Thus, this analysis will focus on these four vegetation types.

Of the approximately 204,000 acres of coastal sage scrub on the four national forests, 93,500 acres (45 percent) are in grazing allotments. Perhaps the greatest impact of livestock grazing on coastal sage scrub is the introduction and spread of highly flammable, invasive nonnative grasses. Compared to chaparral, sage scrub often has a well-developed herbaceous understory. If grazing reduces the cover of this component, coastal sage scrub becomes more vulnerable to invasions by nonnatives. The spread of nonnative grasses (particularly *Bromus* spp.) can increase the frequency of fires and can convert sage scrub to grasslands, especially the inland sage scrub (Riversidian sage scrub) types (Minnich and Dezzani 1998).

Table 550: Acres Expected to be Grazed by Key Vegetation Types

Alternative	Coastal Sage	% reduced from Alt. 1	Meadow/ grassland	% reduced from Alt. 1	Oak woodlands	% reduced from Alt. 1	Riparian	% reduced from Alt. 1
1	92,960	0	28,866	0	67,266	0	2,930	0
2	67,959	27	26,805	7	61,232	9	1,703	42
3	63,844	31	24,221	16	57,486	15	1,626	45
4	67,747	27	26,639	8	60,557	10	1,681	43
4a	67.747	27	26,639	8	60,557	10	1,681	43
5	81,933	12	28,632	1	66,137	2	2,648	10
6	62,364	33	24,291	16	53,990	20	1,614	45

Acres available for livestock grazing in coastal sage scrub, meadow/grasslands, oak woodlands and riparian areas. Total acres of potential grazing are shown for each alternative including the percent reduction in acres from alternative 1.

To varying degrees, the total area of grazed coastal sage scrub would decrease in all alternatives from the current level in Alternative 1. Alternatives 1 and 5 retain the highest level of grazing (0 and 12 percent reduction, respectively). Nevertheless, both alternatives would establish suitability criteria that exclude livestock from California gnatcatcher habitat. Alternatives 2, 3, 4, and 4a are expected to reduce grazing in coastal sage scrub by approximately 27 to 31 percent from Alternative 1. Because Alternative 6 would exclude grazing from slopes greater than 20 percent, it would produce the largest (33 percent) decrease in grazing of this vegetation type (table 550: Acres Expected to be Grazed by Key Vegetation Types).

Alternatives that reduce livestock grazing in coastal sage scrub, especially Alternative 6, would decrease the likelihood of continued introductions and spread of undesirable species and perhaps allow some sage scrub stands to recover from grazing-caused changes. Recovery rates, however, would depend on the individual site and the level of degradation that has already taken place, as well as on the any effects of changes in fire frequency.

Of the total of 106,300 acres of oak savannas, woodlands and forests, approximately 68,300 acres (64 percent) are in allotments. Alternative 5 would see a relatively small (2 percent) decrease in livestock use from Alternative 1, with the largest reduction (20 percent) in Alternative 6. Alternatives 2, 3, 4, and 4a would show reductions of 9 to 15 percent (table 550: Acres Expected to be Grazed by Key Vegetation Types).

The role of livestock grazing in oak regeneration is complex. For example, in blue oak woodlands and forests, the regeneration bottleneck is in the transition from saplings into one-inch d.b.h. (diameter at breast height) individuals that have the canopy above the browse line. Livestock browsing slows the transition from browsed, shrubby saplings to small-tree individuals (Borchert and others 1993). Nevertheless, even in the absence of livestock, deer browsing has the same effect. For instance, removal of cattle from similar habitats from the University of California Hastings Reservation near Carmel and Sequoia-Kings National Park has not increased oak recruitment success. Thus, a reduction in livestock grazing, even the large one in Alternative 6, may not translate into an increase of recruits into the oak overstory.

As aging oaks die without replacement, some areas of oak woodlands and savannas likely will convert to annual grasslands, especially in savannas of Engelmann oak, valley oak, and blue oak dominated by old trees with little or no natural regeneration. However, before a program of reforestation can be implemented, the aerial extent of woodlands and savannas in danger of conversion needs to be inventoried. Without restoration, some savannas and woodlands gradually would become grasslands or other vegetation types. The rate of conversion, however, is not known, but conversions are unlikely to be permanent and could be reforested. Alternatives 3 and 6 are most likely to carry out inventories of oak woodlands in need of reforestation as well as carry out seedling plantings. The other alternatives, however, likely will not pursue these objectives. As a result conversion of oak woodlands to grasslands would be most likely to occur in Alternatives 1, 2, 4, 4a and 5.

Of approximately 41,950 acres mapped as meadow habitat and annual grasslands in our GIS database, 29,957 acres or 71 percent are within grazing allotments. Grazing in these vegetation types is expected to decrease slightly in all alternatives, ranging from just 1 percent in Alternative 5, to 7 to 8 percent in Alternatives 2, 4, and 4a, and up to 16 percent in Alternatives 3 and 6 (table 550: Acres Expected to be Grazed by Key Vegetation Types).

Meadows would benefit from reduced livestock use, since recovery of the natural vegetation and positive changes in hydrogeomorphic conditions are likely to ensue. Nevertheless, for some meadows in which the lowering of the water table now is permanent, recovery of wet-meadow conditions are unlikely. These meadows will require active restoration to return them to their former state. Others would recover slowly depending on the level of livestock reductions and changes in season of grazing.

The desired condition for riparian habitats is to protect and maintain water quality, site productivity, channel stability, riparian vegetation, and habitats for riparian-dependent species through the designation of riparian conservation areas (RCAs). Watercourses should remain in proper functioning condition and support healthy populations of native and desirable nonnative species and other riparian-dependent resources.

Of the 18,440 acres mapped as riparian, only 2,930 acres (16 percent) are in allotments. However, as explained in the affected environment of this chapter, much of the riparian vegetation has not been mapped on the four southern California national forests. An evaluation of riparian conservation areas is presented in the watershed function section. Alternative 5 would have the smallest (10 percent) reduction in grazing from current levels. Alternatives 2, 3, 4, 4a, and 6 would have the highest reductions in grazing, ranging from 42 to 45 percent (see table 550: Acres Expected to be Grazed by Key Vegetation Types).

A reduction in livestock use in riparian habitats likely would lead to significant improvements in this type (Nagle and Clifton 2003). The degree of improvement, however, would depend on the type of riparian vegetation (e.g. willow, white alder, coast live oak-western sycamore, or other) and its inherent rate of recovery. Nevertheless, improvements would depend not only on a reduction in the numbers of livestock but also on a shortening of the seasonal length of use or by preventing access to some areas for a number of years so they can recover. Allotment-specific recommendations are being addressed in allotment renewal environmental assessments carried out by each national forest. Overall, where grazing is a factor, Alternatives, 2, 4 and 4 a, and 3 and 6 would provide the greatest progress towards meeting the desired conditions for riparian habitat.

Effects of Research Natural Area Recommendation

The primary goal of the Research Natural Area (RNA) program is to establish RNAs representing all the major vegetation types in each of California's physiographic/floristic regions (identified in Hickman 1993). Failure to establish RNAs during the planning period will perpetuate gaps in the Region 5 RNA target system (see the alternative comparison section in Chapter 2). The following discussion focuses on several unique plant communities which may be most affected by RNA recommendations.

Alternative 6 recommends carrying forward the greatest number of RNAs—15 areas totaling 32,100 acres—and would make the greatest contribution to the Region 5 and national RNA network. Alternative 3 recommends the next highest number of new RNAs (hereafter referred to as RNAs), 14, encompassing 29,876 acres, and Alternative 2 proposes 12 with 28,798 acres. Alternative 4a recommends 10 areas (18,731 acres), and Alternative 4 recommends five areas, a total of 11,141 acres. Alternative 1 recommends four areas at 9,037 acres, and Alternative 5 recommends only one new RNA with 2,220 acres (see Appendix F. Research Natural Areas).

Gabbro plant communities are recommended for RNAs in Alternatives 2, 3 and 6, which would establish both Viejas and Guatay RNAs. Thus, protection of gabbro plant communities and opportunities carry out research would be provided under these three alternatives. On the other hand, these two RNAs are not recommended under Alternatives 1, 4, and 5. Under Alternative 4a the Cleveland National Forest would decide in the next three years whether to recommend Guatay and Viejas RNAs, so they are not included in the recommended RNA acreage given above (see table 318: Cleveland National Forest Candidate Research Natural Areas Recommended By Alternative). If they are not recommended in this time period, the opportunity to include them as Region 5 target elements could be lost.

Table 318. Cleveland National Forest Candidate Research Natural Areas Recommended By Alternative

CRNA Name	Acres	Primary Vegetation Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
San Diego River	5,965	Inland coastal sage scrub	N	5,965	5,965	N	N	5,965	N*
Viejas Mountain	3,182	Chamise chaparral	N	3,182	3,182	N	N	3,182	N*
Guatay Mountain	1,337	Tecate cypress	N	1,337	1,337	N	N	1,337	N*
Pleasants Peak	661	Knobcone pine, serpentine vegetation	N	N	661	N	N	661	N

*San Diego River, Viejas Mountain, and Guatay Mountain candidate RNAs would be evaluated further and a decision made within 3 years under Alternative 4a.

Alternatives 3 and 6 recommend Pleasant's Peak knobcone/serpentine chaparral as a RNA; the other alternatives do not make this recommendation. In the absence of establishment, Pleasant's Peak could be lost as a target element in the future. The San Diego River RNA represents some of the best examples of inland coastal sage scrub and is recommended in the same alternatives as the gabbro RNAs, with the same provision for recommendation within 3 years (table 318: Cleveland National Forest Candidate Research Natural Areas Recommended By Alternative).

The Wildhorse Meadow and Arrastre RNAs both contain pebble plain habitat and are recommended for establishment in Alternatives 2, 3, 4a, and 6. On the other hand, Alternatives 1, 4, and 5 do not recommend these two areas. Therefore, if conditions in these areas change significantly during the planning period, the opportunity to include these unusual habitats as Region 5 RNA target elements could be lost under Alternatives 1, 4, and 5.

Finally, Blackhawk RNA is the only representative of carbonate habitat in the list of RNAs. Like the pebble plain RNAs, it is recommended in Alternatives 2, 3, 4a, and 6 but not in 1, 4, and 5.

Cumulative effects

Effects of Land Development on Vegetation Condition

Loss of vegetation (and, therefore, habitats) was identified as a key indicator for several habitat groups. There are approximately 6.1 million acres within the planning area; of this, 58 percent is National Forest System (NFS) land, and most of the remainder is private. Of the non-NFS lands, 24 percent is currently developed. However, to understand threats to specific habitats and their associated vegetation communities, the pattern of land ownership is as important as the total acres in each ownership.

Early homesteading focused on more productive lands that provided water and forage for livestock. This ownership pattern is still apparent today and has created an uneven distribution of habitats across land ownerships. For example, coastal sage scrub has been greatly reduced on non-NFS lands by conversion to agricultural, industrial and residential uses, flood control projects, rock quarries, and other projects (Davis and others 1994, Hanes 1976, O'Leary 1995). As human populations in southern and central California continue to grow, the loss and fragmentation of coastal sage scrub on private lands may spread to National Forest System lands.

The following list identifies affected habitat groups, their total acreage within the planning area, and the percentage on private lands:

- Coastal sage scrub: 320,000 acres, 62 percent non-NFS.

  Estimates of the reduction in the historical extent of southern coastal sage scrub range as high as 90 percent (Westman 1981a). Much of the remaining sage scrub has been fragmented or degraded (Minnich and Dezzani 1998, O'Leary 1995). As of 1994, only about 7 percent of coastal sage scrub was on public lands, with most of the rest on private lands (Davis and others 1994). Some counties are now acquiring private lands for multi-species habitat preserves to offset losses to other land developments. Still, habitat loss and fragmentation of coastal sage scrub on private lands makes the remaining sage scrub on the national forests that much more critical to the conservation of regional biodiversity.

- Meadows and grasslands: 341,000 acres, 88 percent non-NFS.
- Oak woodlands and savannas: 467,000 acres, 63 percent non-NFS.

  In recent decades an increasing number of foothill ranches have been subdivided into ranchette-style housing developments. This trend is expected to continue and even intensify in the coming decade, particularly in San Diego, Riverside, Ventura, and Santa Barbara Counties (Stephenson and Calcarone 1999). More recently, significant areas of oak savannas and woodlands have been converted to vineyards, particularly in Santa Barbara and San Luis Obispo Counties. While individual patches of oak woodland are often conserved, wildlife habitats inevitably become increasingly fragmented and isolated.

- Riparian: 35,000 acres, 51 percent non-NFS.

  Land ownership patterns and threat factors differ dramatically with elevation. While 74 percent of stream miles above 3,000 feet (914 meters) are on public lands, this proportion drops to 50 percent between 1,000 and 3,000 feet (305 and 914 meters), and down to 17 percent below 1,000 feet (305 meters) (Stephenson and Calcarone 1999).

  Land outside of the control of the Forest Service is likely to undergo additional development in the future.

Effects of Hazardous Fuel Reduction on Vegetation Condition

Direct protection of communities through treatments within the WUI will occur throughout the planning area. These treatments will be much greater on developed private lands (24 percent of the non-NFS lands within the planning area). On the national forests, heavy fuels modifications and sometimes type conversions for up to 300 feet in shrubland types and 1,500 feet in forested types adjacent to communities will heavily modify or remove approximately 12 to 36 acres of vegetation per mile of the Wildland/Urban Interface.

Effects of Long-term Climate Change on Vegetation Condition

Alpine plants and the treeline have received considerable scientific attention because they are barometers for changes in climatic conditions. On other mountain ranges in California, there is evidence of krummholz tree dieback and the lowering of the upper treeline during recent cooler climatic periods. As the climate has become warmer during the twentieth century, there is also evidence of upslope movement of treelines, the transformation of krummholz into forests, and an increasing density and vigor of alpine plants. Because plant growth in alpine and subalpine habitats appears to be highly sensitive to small changes in climate, these habitats are important proxies to assess long-term changes in temperature and precipitation (Anderson 1990, Graumlich 1993, Holtmeier 1994, Jennings and Elliott-Fisk 1993, LaMarche 1973, LaMarche and Mooney 1967; Scuderi 1987, 1994).

Effects of Special Area Designation on Vegetation Condition

As more Research Natural Areas are added to the system and the total acreage and number of ecosystems protected grows, opportunities would increase to study ecosystems that are minimally disturbed by human activities. Thus, knowledge would grow about the functioning of an array of ecosystems, many of which occur nowhere else except on National Forest System lands. In addition, the inherent biodiversity of National Forest System lands, especially those outside designated wilderness, would be protected in perpetuity.

Special interest areas, wilderness, Wild and Scenic rivers, and the San Dimas Experimental Forest all allow vegetation management. Naturally, treatments are subject to the constraints associated with the particular designation and site-specific planning. For example, fuels treatments in RNAs are permitted so long as they maintain the vegetation types for which the area was established.

While restrictions on management activities and developments along Wild and Scenic rivers may benefit the vegetation in terms of reducing losses or disturbances, some restrictions inhibit management activities that could have long-term benefits, such as achieving the desired range(s) of disturbance and/or species composition.

The return of fire into some wilderness areas (on the Los Padres National Forest under Alternative 6) as a natural ecological process could be a positive development. It could reduce to an acceptable level the risks and consequences a catastrophic wilderness wildfire might have on critical habitat for threatened, endangered and proposed wildlife and plant species and return montane conifer forests to the historic fire regime.

Effects of Air Pollution on Vegetation Condition

Several long-term studies have examined the effects of air pollution on montane conifer vegetation in the San Bernardino and, to a lesser extent, the San Gabriel Mountains. Prevailing climatic conditions transport most of the air pollution from the South Coast Air Basin into the eastern Transverse Ranges and northern Peninsular Ranges. Eastern Los Angeles County and western San Bernardino and Riverside counties receive the highest concentrations of air pollutants. In the mountains, the coastal side of the eastern San Gabriel Mountains and western San Bernardino Mountains are the most polluted (Stephenson and Calcarone 1999).

The two components of air pollution that have the greatest effect on ecosystems are ozone, a powerful oxidant, and nitrogen oxides (NOx). Ponderosa and Jeffrey pines, and to a lesser extent bigcone Douglas-fir, are susceptible to damage from ozone. Symptoms include leaf discoloration, slow growth, and decreased stature (Barbour 1988). Other tree species are considerably more tolerant of ozone. Chronic ozone injury to ponderosa pines was first identified in the San Bernardino Mountains in the 1950s. Mortality and damage of ponderosa and Jeffrey pines peaked with high ozone concentrations in the 1970s and have declined with improving air quality since 1976 (Stephenson and Calcarone 1999).

Ozone damage renders trees more vulnerable to other stressors, such as drought and bark beetle infestations. Pine mortality has been highest during extended droughts. Trees with chronic ozone injury enter periods of drought without the reserves required to withstand bark beetle infestations (Stephenson and Calcarone 1999).

In the San Bernardino Mountains, there is a clear west-to-east gradient in both ozone levels and tree damage. Forests on the western side of the range are exposed to high levels of ozone and are experiencing the most damage. Monitoring in the westside forests over a 14-year period (1974-1988) found that ponderosa and Jeffrey pines were losing basal area compared to species that are more tolerant of ozone, specifically white fir, incense cedar, and black oak. The accumulation of more ozone-tolerant understory species creates fuel ladders that increase risks of catastrophic losses from wildfire (Stephenson and Calcarone 1999) as well as unwanted changes in forest species composition.

Quantitative information on ozone damage is scarce for other mountain ranges in southern California. However, given the location of major pollution sources and prevailing wind patterns, areas of high potential damage continue to be confined to the eastern San Gabriel Mountains and western San Bernardino Mountains (Stephenson and Calcarone 1999).

The effects of NOx deposition are not as well documented as those of ozone deposition. High rates of NOx deposition have increased soil fertility and surface litter decomposition rates in some montane conifer forests in the San Bernardino Mountains. However, excessive NOx inputs can lead to various negative effects, including nutrient deficiencies, soil acidification, altered species composition, decreases in mycorrhizal root symbiosis, and elevated concentrations of nitrates in soil, groundwater, and streams. In montane conifer forests, the fertilizing effect of NOx may be accelerating understory development of white fir and incense cedar, thereby elevating fuel loads and potentially increasing the risk of stand-replacing fires (Stephenson and Calcarone 1999).

Effects on Biological Diversity

Introduction

Virtually all uses and activities that may be permitted to occur on National Forest System lands can have effects, positive or negative, on biological diversity. Site-specific analysis of biological effects must be conducted whenever new projects or modifications of existing authorized uses are proposed. Projects and activities must comply with the Endangered Species Act of 1973, as amended, including the preparation of a biological assessment and consultation, as necessary, with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service (NOAA Fisheries) on effects to threatened, endangered and proposed species if any are present in the project area. In addition, a biological evaluation must be written for any new project or activity with the potential to affect Forest Service sensitive species. The section General Direct and Indirect Effects to Plants and Animals in Appendix B describes the potential effects of a variety of activities that occur on National Forest System lands.

For the most part, the potential impacts of activities or projects on biodiversity and species-at-risk are a function of the extent, intensity and timing of disturbance created by the activity or project. With the possible exception of fuel treatment projects in Wildland/Urban Interface (WUI) Defense and Threat zones, newly proposed projects on National Forest System lands in southern California could generally be designed to avoid or minimize direct impacts on habitat for plant and animal species-at-risk. The use of forest plan standards, species guidance documents, pre-project surveys, biological assessments and biological evaluations, and project monitoring all would serve to reduce the impacts that newly proposed site-specific projects could have on species-at-risk and others, especially those projects that affect only a small and discrete area of land.

The likely effects of each alternative on the diversity of plant and animal species in a collective way (including threatened, endangered, proposed, candidate, and sensitive species affected by Forest Service management) are evaluated in this section. At the scale of the southern California national forests (the planning area), the Forest Service acknowledges the limitations of assessing the consequences of forest plan decisions on biological diversity in general and on 482 species of concern in particular. Species may be rare because of evolutionary history, basic population ecology, historical or current human activities or, more likely, a combination of these factors. Human activities may or may not be responsible for the current distribution and abundance of rare species. Specific impacts associated with various Forest Service program areas are described primarily for species-at-risk and management indicator species, because they describe patterns and considerations that are similar for other terrestrial and aquatic species, including other rare species and game species. All aquatic and riparian dependent species would receive protection and management through the land use zoning, standards, and design criteria associated with riparian conservation area (RCA) management found in the revised forest plans.

The expected consequences for conservation of species and habitats under each alternative expressed below rely on the assumption that management direction will be implemented consistently across the southern California national forests under all alternatives and will generally be effective in mitigating impacts (see forest plan, Part 3, Monitoring). The following management direction would be included in all alternatives:

- Conduct field surveys for species-at-risk early enough in the project planning that the project can be designed to conserve or enhance habitat for those species.
- Mitigate adverse impacts to threatened, endangered, proposed and candidate species. Mitigation measures include: (1) avoiding the impacts altogether by declining to take an action or part of an action; (2) minimizing impacts by limiting the degree or magnitude of an action or its implementation; (3) rectifying the impact by repairing, rehabilitating or restoring the affected environment; (4) reducing or eliminating the life of an action; and/or (5) compensating for the impact by replacing or providing substitute resources or environments.
- Forest Service, Region 5 Native Plant Policy (1330/2070, June 30, 1994).
- Forest Service southern California national forests' weed strategies.
- Implement species and habitat management guides, species conservation strategies, and recovery plans as funding permits.
- Use species guidance documents to determine potential project effects and develop project-specific conservation measures for threatened, endangered, proposed, candidate and sensitive species, as well as other species-at-risk.

To help recover federally-listed species, prevent listing of sensitive species, maintain the viability of other species-at-risk, and sustain populations of species not currently at risk, habitat of sufficient quality, distribution, and abundance must be available to help ensure these species remain distributed across their existing range in the planning area. The Forest Service's strategy for accomplishing this mission during the planning period, and especially over the next 3 to 5 years, consists of: education and interpretation programs; species and habitat inventory; habitat restoration and/or improvement; resource protection measures associated with land use zones and land management goals and strategies; site-specific project surveys; project impact analysis and development of project-specific standards and conservation measures to mitigate direct and indirect impacts; and monitoring and evaluation. The extent to which the Forest Service would use or emphasize these conservation tools varies by alternative (table 202: Comparison of Conservation Emphasis in Alternatives, page 79). Consideration is given to how biodiversity would be affected by various mixes of resource outputs and uses, including proposed management practices.

The general outlook of each alternative for habitat and biodiversity sustainability is described briefly below, as well as in Chapter 2. These alternative themes were kept in mind while analyzing the effects of various Forest Service programs and activities on biodiversity in general and species-at-risk in particular.

Alternative 1 would continue current management. This includes implementing the existing land management plans as modified by the 2001 programmatic biological opinion from the U.S. Fish and Wildlife Service and the terms and conditions from other biological opinions. Alternative 1 would continue to apply the Interim Riparian Guidelines that were jointly developed with the U.S. Fish and Wildlife Service. The focus of current management is to provide for recreation use and goods and services while maintaining biological diversity and ecological integrity. Although management direction is generally strong, it is scattered in various documents and complex for administrators and project leaders to implement.

Alternative 2 emphasizes maintenance of biodiversity and ecological integrity while accommodating an increase in recreation opportunities. Land use zoning remains essentially the same as at present with a few new special areas proposed for designation. There is substantial recommended wilderness in this alternative that would benefit biodiversity. This alternative provides for a modest growth of the transportation system to improve the effectiveness. A moderate level of emphasis is provided for species conservation.

Alternative 3 is focuses on natural resource protection and species conservation largely through special area designation and wilderness recommendations. It includes restrictions on recreation use, modification of facilities to favor sensitive resources, an emphasis on conservation education directed toward biodiversity and land stewardship, and a high level of emphasis on species conservation. Recreation use areas that are causing problems for biological diversity would, through time, have restrictions placed on them to eliminate conflicts or, if necessary, be decommissioned. Habitat improvement and restoration are an important aspect of this alternative.

Alternative 4 emphasizes accommodating greater recreation use with intensive levels of management control to mitigate effects on biodiversity and ecological integrity. Few acres are recommended for wilderness or special area designation in order to maximize management flexibility. The alternative includes a large amount of Back Country zoning, which allows the possibility of expanding the road and motorized trail systems. It attempts to provide for the projected increase in recreation demand with a focus on sustainable recreation at developed sites. Dispersed recreation management would have a lower priority. There is a moderate level of emphasis on species conservation in general, with a high level of emphasis in heavily used developed recreation areas.

Alternative 4a incorporates elements from the other alternatives to produce a balanced mix of goods and services with a high degree of protection and conservation of biodiversity. Land use zoning reflects current management intent—that is, reflects the way land use is authorized or intended at present. The Back Country Motorized Use Restricted zone was added to this alternative to allow for needed administrative access for management purposes (including fuels treatment) while prohibiting motorized vehicle use by the public in areas where it is currently not allowed or cannot be feasibly managed. It provides for limited expansion of the road and trail system to make logical connections that better serve the public and protects natural resources. A low level of recreation growth would be accommodated in this alternative, managed to maintain the natural setting, biological diversity and ecological integrity. There is an emphasis on improving management of dispersed recreation areas where use may cause resource damage.

Alternative 5 would emphasize increasing development and commodity production, providing infrastructure for adjacent communities, providing increased motorized access for national forest users, and placing fewer user restrictions. This alternative would have the least wilderness and special area designation and the most Back Country zoning, which would allow expansion of the road and motorized trail systems. Non-motorized land use zones, which tend to better protect biological diversity and ecosystem integrity, are minimal in this alternative. Protection of biological diversity would be mostly reactive in nature via mitigation of impacts from proposed new uses and activities or expansion of existing uses.

Alternative 6 was developed to emphasize protection of national forest natural resources, with biodiversity and ecological integrity as a main focus. This alternative has the most Back Country Non-Motorized land use zoning and proposed special designation areas. Alternative 6 provides for a low level of growth for recreation uses that have minimal environmental impact, while restricting uses that could adversely affect ecosystem health. The transportation system open to the public would be reduced over time to a core system with highly maintained roads and an emphasis on decommissioning of unclassified roads. Conservation education, habitat restoration, and habitat improvement are an important focus of this alternative.

The likelihood of maintaining viable populations of individual species-at-risk was evaluated by considering each alternative's theme and emphasis, the mix of land use zones and suitable uses, the number and types of special designations, and predicted outputs (see Chapter 2 and descriptions above). Information about the extent, duration and timing of expected activities and uses in each species' habitat was considered. The process used to evaluate the effects of alternatives on species-at-risk is described in Appendix B (Species Viability Evaluation Process). The projected outcomes of the alternatives on the stability and persistence (viability) of individual species-at-risk are disclosed in the species accounts found in the Reading Room (`www.fs.fed.us/r5/scfpr/read`), and their implications are discussed toward the end of this section (under Combined Effects of Forest Plan Decisions on Biodiversity).

In addition to the analysis of the effects of various program areas on biological diversity discussed in this chapter, biological assessments of the effects of the selected alternative on federally-listed and candidate species were submitted to the U.S. Fish and Wildlife Service and National Marine Fisheries Service (NOAA Fisheries) on March 18, 2005 (see description in Appendix B, Federally-Listed Species Assessment). Biological opinions are expected by the time this FEIS is published; they will be available at the national forest headquarters offices. For Forest Service sensitive species, the analysis in this chapter and in the individual species accounts represents a biological evaluation of effects of the revised forest plans, as described in Appendix B, Sensitive Species Evaluation. A separate letter to the file summarizes the results of the biological evaluation.

Effects of Vegetation Management

The overall objective of vegetation management is to increase the amount of forest, shrubland and grassland restored to or maintained in a healthy condition with reduced risk of damage from fires, insects and diseases, and invasive species (see alternative descriptions in Chapter 2 for Vegetation Management emphasis by alternative). The effects of vegetation management activities on major habitat types are discussed in the section Effects on Vegetation.

Vegetation management emphasizes the creation of fuel modification zones, primarily located near communities within the Wildland/Urban Interface (WUI) Defense and Threat zones. The nature of these treatments and their goals are described in Part 3 of the revised forest plans, Appendix K: Guidelines for Development and Maintenance of WUI Defense and Threat Zones. WUI Defense zone treatments in chaparral and coastal sage scrub would basically consist of type conversion of shrubland vegetation to low profile fuels, such as herbaceous plants, within most of the zone. This would result in loss of habitat for species dependent on mature chaparral or coastal sage scrub. The overall amount of habitat lost would be small in relation to the total amount of chaparral on National Forest System lands in southern California, as Defense zone width is only 100 to 300 feet from structures. The loss of mature vegetation would have a more substantial impact on some species because so little coastal sage scrub occurs on National Forest System lands, especially south of the Los Padres National Forest. Due to wildfires during the 1990s and in 2003, much of the coastal sage scrub on the Cleveland and San Bernardino National Forests is already in young age classes (see Effects on Vegetation section). Thus species dependent on mature coastal sage scrub have already been displaced from large areas of National Forest System lands.

Within forest and woodland ecosystems, WUI Defense zone treatments would greatly reduce surface fuels—including shrubs, herbaceous plant cover, and downed dead wood—and thin tree canopies to no more than 40 percent crown closure, mainly by removing small-diameter trees. Thus habitat for plants and animals would be greatly altered, and species requiring mature, dense forest vegetation would likely be displaced from WUI Defense zones. Many areas in need of treatment in this vegetation type suffered considerable mortality of canopy trees due to the drought and bark beetle outbreaks in 2002-2004 (see Effects on Vegetation section for more information). WUI Defense zone treatment in these areas may not require removal of much living tree canopy. Habitat for species that depend on understory shrubs or fallen logs would be largely eliminated in WUI Defense zones. However, herbaceous plants that require light could colonize the more open forest floor created in treatment areas; if they do not produce significant amounts of flashy fuels (that can be quickly consumed by fire), some species could remain in this newly created habitat.

Within WUI Threat zones vegetation alteration would be less intense, but species requiring dense mature vegetation would still be likely to be displaced. The nature of the habitat would be altered more substantially in shrubland vegetation than in forest and woodland, at least for canopy-dependent species. Reduction in fallen log habitat would be less than in WUI Defense zones. Early seral species—those requiring high light levels—could benefit from WUI Threat zone treatments as well.

The major components of vegetation management with the potential to affect biodiversity, particularly species-at-risk, include prescribed fire, mechanical fuel treatment (including chemicals), and forest thinning. The primary effects of prescribed fire and forest thinning are described in Appendix B in the section General Direct and Indirect Effects to Plants and Animals. An analysis of the potential effects of herbicide use is included in Appendix O, Pesticide Risk Assessment. The effects of vegetation management have been identified as threats to 33 plant and 10 animal species-at-risk (table 367: Plant Species-At-Risk, page 160; table 370: Animal Species-At-Risk, page 173). Species-at-risk would be affected when vegetation management occurs in occupied habitat and organisms are damaged or killed by burning, the staging of vehicles and equipment, or by foot, tire and tractor traffic. Felling trees, cutting brush, piling and burning slash, displacement of soil and associated vegetation, and introduction of nonnative plants may also affect species-at-risk.

Under all alternatives, reduction of fuels in WUI Defense zones would take priority over the habitat needs of species-at-risk (see Part 3 of the forest plans, standard S8). The less-intense fuel treatments in WUI Threat zones would be designed to minimize negative effects to federally-listed and sensitive species, as required by a number of standards (see Part 3 of the forest plans). Biological assessments (for federally-listed species) and biological evaluations (for Forest Service sensitive species) to analyze potential effects would be necessary before treatment could occur in habitat for these species under all alternatives. If potentially negative effects on federally-listed species were expected, consultation with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service (NOAA Fisheries) would be necessary.

The opportunity for vegetation management varies substantially among national forests. Assuming a constrained budget, the treatment of fuels on the four national forests of southern California would, over a 10-year period, affect a total of about 28,500 acres. This is less acreage treated than what has been accomplished in the previous 10-year period (average annual amount of land treated from 1981 to 1994 was about 8,000 acres [Conard and Weise 1998]). This budget scenario represents a very small program for the treatment of hazardous fuels. It is more likely that a less-constrained budget would be available under all alternatives for the treatment of vegetation, especially hazardous fuels; therefore, the remainder of this analysis assumes that an unconstrained (or at least less constrained) budget will be available for the treatment of vegetation for fuels reduction. The types of treatments that would be conducted vary by alternative (see table 534: Average Annual Hazardous Fuels Program, page 316).

Nearly all the plants identified as species-at-risk are adapted to fire, but they are adapted to specific fire regimes. Fire regimes include components of fire intensity/severity, fire size, frequency of burning (fire return interval), and season of burn. Prescribed fire is seldom applied during the "natural" fire season of summer or fall; instead, winter and spring burning is conducted for reasons of fire control and air quality (see Wildland Fire and Community Protection section in the Affected Environment for more information). The effects of out-of-season burning are difficult to predict and may vary by species, depending on growth form and type of seed germination stimulus (reviewed in Beyers and Wakeman 2000). Burning over wet soil has been shown to have negative effects on seed germination of chaparral species. Seeds of species that require heat to break the seed coat may not get hot enough to stimulate germination during a cool season fire. Conversely, seeds of many other species have lower tolerance for heat when the soil and seeds are damp. Late spring burning may reduce post-fire sprouting in some shrub species, because internal carbohydrate stores have been depleted. Conducting burns during winter but when surface soil is dry may minimize these effects (Beyers and Wakeman 2000). In addition to effects on plants, spring burning can destroy bird nests or larvae of rare butterflies.

The effects of out-of-season prescribed fire would occur under all alternatives, although they would be distributed differently. Under Alternatives 1 through 5 (including 4a), about 75 percent of the effects from prescribed burning would occur within WUI Defense and Threat zones; these alternatives would not vary substantially in their expected fuels treatment programs. The remainder would likely be burning of chaparral in strategic locations away from communities designed to protect communities from advancing fires (see section on Wildland Fire and Community Protection). These treatment areas may be near fuelbreaks to enhance their effectiveness. If some degree of native fire-follower regeneration failure occurs due to out-of-season burning, nonnative plants from existing fuelbreaks could spread into treated areas. Fuelbreaks in chaparral and oak woodlands, in particular, have been found to contain high numbers and abundance of nonnative species (Merriam and others submitted) that could spread into adjacent areas after prescribed fire. Under Alternative 3, with the emphasis on biological diversity, there will be a greater opportunity to conduct prescribed burning for species-at-risk and important habitats through partnerships and increased coordination between fuels management and resource management programs. High priority resource management objectives would include mule deer and bighorn sheep habitat improvement and protection of California spotted owl nesting areas and bigcone Douglas-fir stands.

Under Alternative 6, closer to 90 percent of prescribed fire would occur within the WUI Defense and Threat zones, with the remainder targeted for burning chaparral near bigcone Douglas-fir stands to reduce the risk of crown fire in this ecosystem (see Effects on Vegetation section) and in areas where vegetation regeneration would benefit species such as bighorn sheep. Nonnative species invasion of prescribed burns would be less likely to occur if the burns were not conducted adjacent to already-invaded areas (Beyers, personal observation).

Aside from the effects of fire itself, the construction of control lines for prescribed fires has the potential to negatively affect rare plants, animals and their habitats, though the impacts would be localized.

The potential benefits to species-at-risk from prescribed fire include creation of vegetation age class mosaics in chaparral, providing areas with younger vegetation that many species prefer, and opening up the understory in forested stands, creating regeneration opportunities for many forest herbaceous plants and, thus, food for animals that feed on them. Many game species would benefit from these effects of prescribed fire as well. In addition, prescribed fire under controlled conditions can reduce the threat of large high intensity wildfires and loss of conifer forest habitat due to stand replacing crown fires. These positive effects would be more widely distributed under Alternatives 1 through 5 than under Alternative 6.

Alternative 6 also allows limited application of a “wildland fire use” policy on remote portions of the Los Padres National Forest, where allowing natural fire ignitions to burn would not immediately threaten human life or property. These fires would presumably burn during the natural summer fire season, eliminating the potential negative impacts associated with winter or spring prescribed fire. Most of this burning would occur in chaparral. The implications of this policy for species-at-risk are discussed further in the section on Effects of Wildland Fire and Community Protection on biodiversity.

The consequences of mechanical vegetation management would not vary substantially between Alternatives 1 through 5 (including 4a). In each of these alternatives the management practices likely to be used to reduce the amount of live and dead fuel would present some degree of threat to species-at-risk. The total area to be mechanically treated over a 10-year period is potentially (depending on budget) around 170,500 acres, or 4.8 percent of the National Forest System lands base in southern California (see table 534: Average Annual Hazardous Fuels Program, page 316). Similar acreage would be treated under Alternative 6, but the treatment types would be in different proportions. Alternative 6 would concentrate treatments near communities, while Alternatives 1 through 5 would strategically place some treatments at a distance from communities to enhance natural breaks in fuels. Thus, different species-at-risk could be affected by treatments under Alternative 6 compared to Alternatives 1 through 5.

The fuels and vegetation management proposed under the Healthy Forest Restoration Act will benefit many species (including game species) by creating openings in the chaparral and densified forest stands and by reintroducing fire to the ecosystems to reduce the potential for stand-replacing wildfires. Insufficient water and a lack of age-class diversity in chaparral can have an adverse impact on species like quail, dove, and mule deer. However, most of the fuel reduction and forest thinning will occur in fairly close proximity to communities because of the huge area that needs to be treated. Within the 15-year planning period, relatively little thinning of forested stands outside of WUI Defense and Threat zones is expected to occur. Thus the threat of stand-replacing fire in overly dense conifer stands will remain severe for most species, including species-at-risk, under likely treatment levels. The sections Effects on Vegetation and Effects on Wildland Fire and Community Protection contain further discussion of the consequences of likely fuel treatment efforts. The section Effects on Watershed Conditions discusses the impacts of fuel management on water and riparian resources.

Herbicides may be used to help establish or maintain WUI Defense and Threat zone fuel modifications and fuelbreaks located further away from communities. On the national forests of southern California, herbicides have not been used in rare plant habitat, but it is conceivable that under all alternatives herbicides could be used to control. Inadvertent effects to unknown occurrences of rare plants could result from herbicide application. The risks of herbicide use are disclosed in Appendix O, Pesticide Risk Assessment.

The use of carbaryl to control bark beetles and insects that move into the weakened or dead tree areas on the national forests has been carried out recently near high-value sites, such as campgrounds and picnic areas, and may be used again. Prevention and control of insect and disease outbreaks could benefit forest species-at-risk such as California spotted owl and bald eagle. The use of pesticides (including herbicides) would be subject to site-specific analysis. Experience has shown that impacts on a species or group of species can often be avoided or reduced through the proper selection of chemical and surfactant and by considering the season of use and application methodology (Appendix O. Pesticide Risk Assessment).

Management Indicator Species

Mule deer populations would likely benefit from well-distributed burning projects in chaparral and the reintroduction of natural fire regime in pine and mixed conifer summer range, which would stimulate growth of preferred deer browse and herbaceous species. Alternatives 1 through 5 would conduct more prescribed burning outside of the WUI Defense and Threat zones and would consequently be more likely to modify habitat favorably for mule deer. However, the prescribed burning under Alternative 6 would also benefit mule deer in a smaller area. On the Los Padres National Forest, implementation of a wildland fire use policy in remote areas under Alternative 6 would provide greater habitat enhancement for mule deer than the other alternatives. Over the longer term, there could be more emphasis under Alternatives 3 and 6 on conducting vegetation treatments to benefit wildlife and species-at-risk than other alternatives.

Mountain lions would be expected to benefit from increased deer populations where fuel treatments increase favorable habitat conditions for mule deer. Thus the consequences of vegetation management activities for mountain lion by alternative would parallel those for mule deer.

To the extent that fuel treatments reduce the incidence of large, high severity fires, habitat for song sparrow, California spotted owl, and arroyo toad would benefit as well. Because fuel treatments will be concentrated in WUI Defense and Threat zones under all alternatives, the effects of fuel treatment on habitat protection will be limited in extent. Prescribed burning of chaparral outside of WUI zones would reduce the threat of wildfires and their associated high erosion and runoff rates, which can affect aquatic habitat and riparian areas. Sediment output from prescribed fires is generally much less than from wildfires (Wohlgemuth and others 1999). More discussion on the effects of vegetation treatment by alternative on aquatic and riparian habitat can be found in the section Effects on Watershed Conditions.

Vegetation management under each alternative would generally maintain the current situation for blue oak, Englemann oak and valley oak, as most fuel treatment would be concentrated in montane conifer forests with high levels of tree mortality and in older stands of chaparral near human communities.

The major threat to bigcone Douglas-fir is stand-replacing fires and too short an interval between fires to permit seedlings and saplings to become fire resistant. In addition, the severe drought and beetle infestation during the past several years have caused substantial mortality of bigcone Douglas-fir, particularly on the San Bernardino National Forest. The anticipated effects of vegetation management by alternative on bigcone Douglas-fir are described extensively in the Effects on Vegetation section. Under Alternatives 1 through 5, the projected 19,000 acres per year of prescribed burning in the WUI environment on the four southern California national forests would be primarily in support of the WUI Defense and Threat zones to protect communities. As a result, protection of bigcone Douglas-fir populations in the WUI environment would be of secondary importance. Accomplishment of this burning will likely not vary substantially among these alternatives. The prescribed fire program under Alternative 6 would treat some of the chaparral around bigcone Douglas-fir stands, particularly when they are in or near WUI Defense or Threat zones, eventually leading to a decreased risk of high-intensity wildfire spreading from chaparral to these stands.

Effects of vegetation management on Coulter pine are discussed in the Effects on Vegetation section as well. Relatively high levels of mortality in Coulter pine are expected to continue in the short term because of drought and insect attack under all alternatives. For the most part, the existing chaparral fire regime is within the range of natural variability and is appropriate for the maintenance of Coulter pine. In some areas where chaparral stands have become very old and Coulter pines are dying, prescribed burning under Alternatives 1 through 5 could benefit the species by stimulating seed release and germination. Under Alternative 6, prescribed fire will mostly be conducted within the WUI Defense and Threat zones, except for around bigcone Douglas-fir, so Coulter pine growing within chaparral would be less likely to be treated unless it occurs in areas that will be burned for community protection. On the Los Padres National Forest, the policy of letting naturally-caused fires burn under specific conditions would help maintain a natural fire regime in chaparral, benefiting Coulter pine that grows within the chaparral.

The greatest threat to the California spotted owl is the loss of habitat and subsequent population loss due to large stand replacement wildland fires. In addition, California spotted owls are subject to loss of habitat from fuels management for community protection on and off the national forests. Under all alternatives, fuels treatment work would be accelerated. Within the planning period (15 years) all alternatives would emphasize treatment of areas (particularly around communities) affected by high levels of vegetation mortality that has resulted from recent drought and insect outbreaks. In WUI Defense zones within mixed conifer forests, canopy thinning could result in habitat becoming unsuitable for California spotted owls. Up to 86 of the historic 345 California spotted owl activity centers (as identified in the state database—see species account in the Reading Room `http://www.fs.fed.us/r5/scfpr/read/` for more information) on the southern California national forests could be affected by WUI Defense zone fuel thinning by the time all areas near communities are treated. Approximately 12 percent of the acres in these 86 activity centers fall within in the maximum WUI Defense zone width (1,500 feet); this figure includes non-conifer forest territories and assumes that the maximum width would be treated everywhere, which is unlikely (Forest Service GIS database calculation). Approximately 4 percent of activity center acres fall within the 300 foot treatment areas immediately adjacent to communities that are most likely to be heavily thinned. Although WUI Defense zone fuel treatments could make habitat unsuitable for California spotted owls, their presence would also help protect untreated spotted owl habitat from fires starting near communities and roads.

Forest thinning would be less extreme in WUI Threat zones and would take California spotted owl habitat needs into consideration; for spotted owls with home ranges near communities, fuel treatments may result in protection of their nests stands and core habitat as well. Little treatment of overly-dense conifer stands outside the WUI Defense and Threat zones would occur in the next 15 years under all alternatives, meaning that the threat of habitat loss to high severity fire would remain. Over the longer term, there could be more emphasis on vegetation treatments designed for resource protection and enhancement of habitat for species-at-risk, including the California spotted owl, under Alternatives 3 and 6.

Maintenance of existing stands of California black oak and creation of regeneration opportunities for this species are likely to occur under all alternatives, because of the emphasis on providing for community protection in the vegetation types that occur around mountain communities. Vegetation management in forested stands as proposed under all alternatives is likely to result in reduced stand densities and the occurrence of forest gaps, conditions that would favor the establishment of new black oaks and the maintenance of many existing large oaks. Most of this work will occur in WUI Threat zones under all alternatives, however, resulting in relatively little change in habitat conditions for California black oak outside these zones over the planning period (15 years).

The discussion of environmental consequences for mixed conifer forest vegetation in the Effects on Vegetation section applies to white fir as well. Under Alternatives 1 through 5, vegetation management in the near term would focus on removal of dead trees and dense understories, especially around communities, which would reduce the risk of wildfire to these forest stands. Some prescribed burning and thinning to improve forest health would occur in overstocked stands that have not experienced mortality, but the extent of this kind of treatment would be extremely limited during the planning period due to the great need for treatment within WUI Defense and Threat zones. Treatment would be designed to thin out smaller white fir trees and reduce the risk of catastrophic fire. Less accessible stands with high tree mortality will remain at risk of catastrophic fire for some time to come. Under Alternative 6, a policy of not suppressing wildland fires in remote areas of the Los Padres National Forest that pose no risk to life and property could result in greater acreage being burned and more reduction in density of small size class white fir in any areas where it occurs. Frequent fire should reduce the risk of crown fire over time, favoring growth of established mature white fir, promote the regeneration of shade-intolerant species, such as pine, and reduce the density of small-diameter white fir in mixed conifer stands.

Effects of Biodiversity Management

Management of biodiversity can be described as a combination of a variety of actions that result in the protection and conservation of species and habitat across the southern California national forests. Many of those actions are actually accomplished through different program areas described in this EIS. Differences in the emphasis for biodiversity management between each alternative can be found in Chapter 2 in the descriptions of alternatives. The following effects section will only discuss the specific types of activities carried out through the biodiversity management program and the effects those activities may have on terrestrial, aquatic, species-at-risk, game species and management indicator species.

A goal of the biodiversity management program is that habitats for federally listed species are conserved and listed species are recovered. Another goal is that habitats for Forest Service sensitive species and other species of concern are managed to prevent downward trends in populations or habitat capability and to prevent federal listing. Although this program primarily focuses on actions to protect and improve conditions for species-at-risk, benefits to biodiversity in general would also be realized.

Five main strategy areas in the management of biological diversity will help focus and emphasize conservation efforts. These strategies are:

- Education, information and interpretation;
- Surveys, inventories, and increasing our knowledge base;
- Habitat restoration and improvement;
- Monitoring and conducting studies; and
- Habitat protection.

Education and interpretation actions include participation in educational events and programs with schools, festivals, local and county fairs, the development of materials such as pamphlets, signs and Web sites, and Forest Service personnel presence at key visitor locations to explain and interpret resources found in that area. The goal of this work is the conservation of those resources.

Under Alternative 1, education and interpretation as tools for the conservation of species-at-risk would continue to be conducted on a sporadic basis. Alternatives 3 and 6 have a more proactive program utilizing this approach for conservation of biodiversity, and Alternatives 4a, 2, 4, and 1 would use education and interpretation as an important tool to principally help manage developed and dispersed recreation use. Alternative 5 would have the least amount of education and interpretation.

Surveys and inventories involve the collection of data to increase our knowledge base about species and habitats on National Forest System lands. These activities are generally passive in nature, involving field visits for data collections, but may also involve collections of samples. The effects would generally be minimal and of short duration.

Inventory efforts for species-at-risk have been a stated goal of existing forest plans. However, under Alternative 1 an integrated and strategic approach to the inventory of habitats for species-at-risk would continue to be an under-emphasized conservation tool, except where it is a priority as a result of the past threatened and endangered species consultations. In Alternatives 2 through 6, inventory efforts would be targeted at habitats and locations most likely to reveal additional populations of species-at-risk. This should result in the discovery of new populations more quickly than would occur under Alternative 1. Alternative 5 would only have inventory and survey work that is necessary to provide for increased access or development.

Resource restoration and habitat improvement is conducted on the national forests to help ensure that functions of plant, fish, and wildlife habitats are maintained or improved, such as rare plant populations, primary feeding areas, winter ranges, breeding areas, spawning areas, birthing areas, rearing areas, migration corridors, and animal concentration areas. A number of on-the-ground projects conducted for fish, wildlife and plants each year would be intended to benefit particular species-at-risk or groups of species. Fencing and barrier rocks or logs are often used to protect habitats for species-at-risk from human and livestock disturbance. There may be impacts from some of these activities, but the effects to biodiversity would likely be short-term in duration and beneficial over the long term.

Vegetation treatments through prescribed burning for bighorn sheep may be undertaken in roadless areas or wilderness areas with bighorn sheep populations, including the San Gabriel, Sheep Mountain, Cucamonga, San Gorgonio, Bighorn Mountain, San Jacinto and Santa Rosa areas. Prescribed burning for species-at-risk and for resource management objectives would be designed to benefit the species or habitat primarily, as opposed to prescribed burning that is designed to reduce fuels primarily for community protection. Opportunities to slightly modify community fuels work to provide habitat enhancement would be integrated with the fuels management objectives. Oak planting and prescribed burning may be done for the benefit of mule deer, California spotted owls, bigcone Douglas-fir and other emphasis species or habitats in various areas. Prescribed burning to protect bigcone Douglas-fir would be an emphasis in Alternatives 3 and 6. Impacts from prescribed burning for species-at-risk and other emphasis species have potential to create some short-term adverse and long-term beneficial effects. For a discussion of the potential impacts of this activity, see the Effects on Vegetation and Effects on Wildland Fire and Community Protection sections in this chapter. Appendix B, Species Viability, General Direct and Indirect Effects to Plants and Animals describes the potential effects of a variety of activities that occur on National Forest System lands.

Water developments for wildlife have potential to affect species-at-risk. These developments are often used to compensate for the loss of natural water due to human settlement, water use and activities. If not properly located and designed, water developments could adversely affect species-at-risk. For example, modification of natural springs as developed water sources for game species has the potential to negatively affect species-at-risk such as riparian plants and animals through competition for the water and potential impacts on areas adjacent to water from concentrated use. However, new developments of this type are very infrequent, and surveys are conducted before projects are implemented to avoid or minimize impacts on species-at-risk.

Closures and revegetation of disturbed areas are often used to protect and improve habitat for fish, wildlife and plants. Riparian area and stream restoration activities can involve placement of structures to discourage human access into sensitive areas while they recover, revegetation of degraded sections of streams, closure and rehabilitation of user-created roads and trails, and other efforts to restore the proper functioning of the stream channel and riparian areas. Impacts from this work can have short-term negative effects, but the projects are generally beneficial in the long term.

Alternatives 2, 3, 4a, and 6 would accomplish the most resource program (biodiversity and watershed condition) restoration work designed to benefit species-at-risk. Habitat restoration primarily relating to stream channel conditions, flow management and riparian vegetation health would receive focused attention in all alternatives. Alternative 1 would accomplish some work that would be beneficial, but emphasis would be primarily on threatened and endangered species. Alternatives 4 and 5 would be more reactive and designed to mitigate impacts from developed recreation use, road access, special-use permits and resource extraction. Alternatives 3 and 6 have the most proactive emphasis on habitat improvement through prescribed burning and planting for species-at-risk and other species as well. Many of these treatments are beneficial for mule deer and bighorn sheep, which will also increase the prey base for mountain lions. Restoration efforts will benefit trout and other harvest fish species through improved habitat conditions.

Alternatives 2, 3, 4, 4a, and 6 are likely to mitigate effects from existing uses at a faster pace than other alternatives, because of the greater emphasis on biodiversity protection. Alternatives 3 and 6 (with an emphasis on conservation and recovery of species-at-risk) would also relocate conflicting uses from riparian areas and possibly restrict the use of some segments of a stream during critical breeding periods. They would make land acquisition for biodiversity a high priority (for example, acquiring lands with streams adjacent to National Forest System lands to restore overall stream channel connectivity).

Monitoring and conducting studies involve collection of key data in an effort to determine trends in conditions as a result of Forest Service authorized activities. These activities are described in detail in Chapter 2, Alternative Comparison (Trends for Key Environmental Indicators) and in Parts 1, 2, and 3 of the revised forest plans.

Monitoring and evaluation would continue at their current pace and would not receive much emphasis in Alternative 1. In Alternatives 2 through 6, adaptive management monitoring and evaluation efforts would target habitats and locations most likely to yield information on trends in the abundance and distribution of species-at-risk as influenced by national forest management. This should help us answer three important questions: Are habitats for threatened and endangered plants and animals recovering? Are populations of sensitive species trending toward or away from federal listing under the Endangered Species Act of 1973, as amended? Are objectives for management indicator species (MIS) being met?

Alternatives 2 through 6 would implement a conservation strategy focused on use of an adaptive management approach to meet conservation objectives and desired conditions in habitat for species-at-risk. A process of incremental mitigation would be used to protect habitat, and it would often begin with the use of the least restrictive mitigation measure. This process would rely on intensive monitoring and could result in occasional delays in providing adequate protection in instances where initial mitigation measures, such as education and signage, proved to be inadequate to achieve conservation objectives. Newly detected impacts resulting from national forest uses and activities would be addressed on a case-by-case basis, guided by standards in the design criteria section, Part 3 of the revised forest plans.

In southern California, the national forests are considered to be the core areas for maintenance of biological diversity (see Cumulative Effects this chapter). Under Alternatives 3, 4a, and 6, the southern California national forests would make the greatest contribution due to the low potential for future development, more restrictive land use zones, and more emphasis on coordination for biological diversity. With emphasis on partnerships, land acquisitions and invasive nonnative species management, Alternatives 3, 4a and 6 provide proactive measures to implement habitat improvement projects with local conservation groups and other agencies and to acquire key parcels of land for the conservation of terrestrial and aquatic organisms, including game, management indicator species and species-at-risk.

All alternatives contain direction to maintain biodiversity, but an element of uncertainty exists based on human population growth; climate; catastrophic events; cooperation with other state, tribal, and county governments, and conservation organizations; and government budgets to support conservation efforts. Under all alternatives, the national forests will face a reality of more people and more demands. Where this increased use or development occurs will vary depending on the alternatives.

Management Indicator Species

Alternatives 3, 4a, and 6 would have the greatest benefits to management indicator species (MIS) and the habitats they represent because of more proactive management of species and habitats. Alternatives 3 and 6 would be best for mountain lion and landscape linkages due to the potential to acquire habitats outside the national forest when needed and the emphasis on providing leadership in bioregional planning and cooperation with other agencies.

Alternatives 1, 2, and 4 would be similar for MIS species and representative habitats should benefit from management actions, but not at the same pace as Alternatives 3, 4a, and 6.

Effects of Invasive Species Management

The establishment and spread of invasive nonnative animal and plant species threatens the health of many forest ecosystems and species-at-risk on the national forests. Restoration of ecosystem conditions to a more natural state and recovery of species-at-risk are often primary reasons for treating invasive nonnative species infestations. Habitat capability for native species is improved as nonnative species decrease in abundance and competition or predation is reduced. Managing for sustainable riparian and terrestrial habitats is an important component of invasive species management.

The reduction of populations of nonnative species is particularly beneficial to aquatic, riparian and invertebrate species-at-risk over the long term. Removal of predators such as bullfrogs, African clawed frogs, gold fish, channel and black bullhead catfish, mosquito fish and other nonnative fish can have short-term negative effects associated with removal work; however, control of these invasive species would generally benefit species-at-risk when efforts are well designed and are sustained over time. Removal of invasive riparian plants such as tamarisk, arundo and tree of heaven may also affect individuals of species-at-risk and may raise water temperatures in the short term. However, habitat improvements such as increased surface and subsurface water flow and changes in composition favoring native plants in riparian systems would be beneficial over the long term. Peninsular bighorn sheep would benefit by control of tamarisk at water sources; removal of tamarisk would also improve habitat for arroyo toad, steelhead trout, and numerous plant species-at-risk across the planning area. Removal of brown-headed cowbirds would reduce nest parasitism rate in riparian bird species-at-risk, including federally-listed and sensitive species.

Within terrestrial habitat, removal of feral dogs would benefit San Bernardino kangaroo rat, Stephens' kangaroo rat, Peninsular bighorn sheep, and Nelson's bighorn sheep, and the removal of brown-headed cowbirds would benefit coastal California gnatcatcher. The removal of invasive nonnative plants would benefit numerous plant species-at-risk such as those found in riparian, gabbro, montane meadow, and pebble plain habitats. Species-at-risk such as coastal California gnatcatcher and Belding's orange-throated whiptail would also benefit by sustaining coastal sage scrub habitat that is affected by altered fire regimes which promote conditions that favor invasive plant species.

Further discussion can be found in the Effects on Invasive Species section and the II. Weed Risk Assessment in Appendix C.

The methods to control invasive species and the priorities for the survey and control of invasive species are common to all alternatives. Under all alternatives the highest priority would be on surveying for early detection in order to contain and control invasive species in riparian areas, as well as in threatened, endangered, proposed, candidate and sensitive species habitat, and in areas where there is a high potential for rapid rate of spread. The differences between alternatives are described below.

Alternative 1 differs from Alternatives 2 through 6 due to the elevated program emphasis on invasive species management given to the latter alternatives. The alternatives also individually differ in the rate at which invasive species management within an integrated species conservation strategy would be accomplished to improve habitat for species-at-risk.

In Alternative 1, the emphasis on invasive species management would continue at the current level in accordance with the current land management plan direction as supplemented by the province U.S. Fish and Wildlife biological opinion. This alternative would continue to provide a high level of emphasis on invasive species management for species-at-risk protection. The large number of standards that apply to pest and nonnative species control and standards to reduce invasive species within other programs would continue to be required as projects are implemented. Conservation measures to implement control programs in areas where undesirable nonnative species are affecting animal species-at-risk would continue to be conducted annually at a target level of 60 acres, which includes not only invasive plant removal but also removal of bullfrogs, African clawed frogs, goldfish and other exotic fish. There would continue to be a high level of emphasis on meeting this target.

In Alternatives 2 through 6, the emphasis on invasive species management would be elevated in response to the national priority and the management challenges identified for the national forests of southern California. The inclusion of Invasive Species Goal 2.1 in Part 1 of the forest plans identifies the problem, sets a goal to reverse the trend of increasing loss of natural resources values due to invasive species, and clearly defines the desired condition. The desired condition for invasive species management is that the structure, function and composition of plant communities and wildlife habitats are not impaired by the presence of invasive nonnative plants and animals. This increased emphasis, combined with a proposed monitoring schedule that would evaluate how well the national forests are moving toward the desired condition, would benefit species-at-risk.

In these alternatives, management of invasive species would be accomplished within an integrated species conservation strategy. Components that deal with invasive nonnative species management include project survey and general inventory, education and interpretation, and monitoring and evaluation. In these alternatives, some of the standards related to invasive species management in Alternative 1 were retained; however, most were affirmed as manual and handbook direction, laws, or strategies. Additional management direction relating to vegetation condition and intensity and duration of ground disturbance would increase protection for species-at-risk above those in Alternative 1. Revised forest plan standards and suitable uses would protect coastal sage scrub and its associated species-at-risk from fuel treatments outside of Wildland/Urban Interface (WUI) Defense zones and on fuelbreaks and prevent rangeland type conversion of any vegetation type for forage production. Standards for livestock grazing capability and suitability and grazing after fire would also be used. Ground disturbance would be reduced by allowing motorized and mechanized vehicles on National Forest System roads and trails only and by designing fuel treatments to minimize use by unauthorized vehicles. Additional direction that is specific to certain Places within individual national forests would increase protection to species-at-risk from ground-disturbing activities.

The highest level of emphasis on the integrated conservation strategy would occur in Alternative 6, followed by Alternatives 3, 4a, 2, 4, 1, and 5, in decreasing order. Alternative 1 would continue to provide a high level of emphasis for invasive species management within federally-listed species habitat; however, this alternative would lack the strategic direction such as the invasive species strategic goal, the national forests' Noxious Weed Strategy, and the standards described above.

To sustain habitat for species-at-risk over the long term, it will be important to not only control invasive species where they occur, but also to manage habitat to remain resilient to invasive species introduction and spread. To analyze this, we compared the amount of area in low impact zoning (no motorized public access) and new recommended special designations across alternatives; these areas are expected to be less susceptible to nonnative species invasion. The acreage of Existing Wilderness zoning and existing special area designations (e.g., research natural areas, special interest areas) is the same in all alternatives and thus not included in this analysis. Back Country Motorized Use Restricted, Back Country Non-Motorized, Critical Biological, Recommended Wilderness, and Experimental Forest zoning, as well as new recommended research natural areas and special interest areas, are expected to contribute to a lower level of ground disturbing impacts than other zones (see table 547: Percent of National Forest System Lands Less Susceptible to Invasive Species by Alternative). Based on this analysis, we found that only 15 percent of the land base in Alternative 1 would be less susceptible to invasive species infestation due to low impact zoning and new special area designation compared to Alternatives 4 (16 percent), 2 (19 percent), 3 (40 percent), 4a (42 percent), and 6 (51 percent). Alternative 5 would have less than 1 percent of the land base, outside of existing wilderness and special designations, in areas with lower potential for invasive species spread. The desired condition would be reached sooner in those alternatives with a higher emphasis on the integrated conservation strategy and those with the highest acreage of low impact land uses.

Table 547. Percent of National Forest System Lands Less Susceptible to Invasive Species by Alternative

Low Impact Land Use Zones and new Recommended Special Area Designations	Alt 1	Alt 2	Alt 3	Alt 4	Alt 4a	Alt 5	Alt 6
Back Country Motorized Use Restricted	0	0	0	0	460,584	0	0
Back Country Non-Motorized	505,948	398,261	823,497	437,169	820,690	0	1,067,583
Critical Biological	3,691	11,502	12,816	11,629	10,094	1,440	14,721
Experimental Forest	15,429	14,145	14,145	15,429	15,498	15,429	15,429
Recommended Wilderness	0	178,605	468,620	80,511	86,857	0	581,656
Recommended candidate Research Natural Areas	9,037	28,798	29,876	11,141	18,731	2,220	32,100
Recommended Special Interest Areas	0	34,809	68,655	24,521	53,289	4,812	77,740
Total acres within low impact zones and recommended Special Area Designations- all Forests	534,105	666,120	1,417,609	580,400	1,465,743	23,901	1,789,229
Total percent of all Forest lands less susceptible over life of Plan due to land use zoning and new Special Area Designations	15%	19%	40%	16%	42%	0.7%	51%

Pest Species

Pest management is used to protect natural resource values at risk due to insect or disease loss at levels outside the historic range of variability or where needed to improve habitat. Activities associated with pest management may include the use of physical, chemical, or mechanical treatments. Examples of such activities include mistletoe removal, application of borate fungicide to prevent establishment of annosus root disease, and the limited application of insecticides or pesticides to prevent mortality due to insect infestations at important sites. Further discussion can be found in the Vegetation Condition and Forest Health and Effects on Vegetation sections and Appendix O. Pesticide Risk Assessment.

Pest management activities would be limited in scope and mitigated to the highest degree possible to avoid potential effects on species-at-risk. As examples, use of insecticides could affect insect-eating birds and bats through the reduction of insect productivity if adequate protection distances or other controls were not implemented. Effects on aquatic and riparian species-at-risk, their habitats, plant pollinators, and animal reproduction are also of concern. Although control efforts could have some short-term adverse effects, some actions could benefit habitat for species-at-risk over the long term. For example, measures to control unusually high levels of pests such as bark beetle and mistletoe within bald eagle habitat could have long-term beneficial effects on maintaining nesting, roosting and perching habitat. Preventing annosus root disease would protect habitat for the many species-at-risk that occur in forested habitats.

In Alternative 1, proposals to treat forest pests within occupied habitat for species-at-risk would likely be mostly mitigated by Forest Plan standards, especially those developed for federally listed species. In Alternatives 2 - 6, proposals to treat forest pests within occupied habitat for species-at-risk would likely be mostly mitigated by Forest Plan standards and additional design criteria. Management of pest species would not vary by alternative; however, the management emphasis for supporting an integrated species conservation strategy would be highest in Alternatives 6, 3, 4a, 2, 4, and 5, in decreasing order.

Management Indicator Species

Management indicator species (MIS) and the habitats they represent would generally benefit from the removal and the prevention of invasive nonnative animals and plants. Nonnative species in riparian areas would have a long-term impact on riparian-dependent species such as arroyo toad and song sparrow, and nonnative annual grasses pose a substantial fire threat to many of the upland habitat types and species such as the oaks and chaparral. In addition, nonnative annual grasses adversely influence native tree and shrub seedling survival in habitats important to all MIS.

Pest management can be beneficial to MIS habitats when it is done with habitat and species health in mind. Controlling annosus root disease is important for the California spotted owl and montane conifer habitat. The emphasis on and effectiveness of strategies to control invasive nonnative species and pests would be the same as described for species-at-risk.

The emphasis on invasive nonnative species prevention and control as well as pest management directed at MIS would be greater in Alternatives 3 and 6 because of the alternative emphasis. These alternatives would have the greatest benefit for MIS.

Effects of Watershed, Soils, Air Quality, and Geological Hazards Management

Soil and watershed restoration is carried out to correct problems caused by past land management or by natural events (e.g., earthquakes, wildfires). Watershed restoration projects are implemented to retain soil on site for improvement of forest health, water quality and quantity and riparian conditions.

Geologic hazards are identified, analyzed and managed to reduce risks and impacts where there is a threat to human life, natural resources or financial investment. This program should be beneficial to species-at--risk, and the results will not vary by alternative.

Watershed restoration activities will emphasize treatment of abandoned mines and landfills to improve water quality, stream condition and hydrology, and aquatic/riparian habitat. These treatments include clean up, stabilization and revegetation of disturbed areas within riparian conservation areas and adjacent uplands. Other projects may include closing, obliterating and revegetating roads; seasonal wet-weather closures to minimize rilling and erosion on roads; redesigning drainage structures on existing roads to reduce soil loss and stream sedimentation; stabilizing damaged streambank segments using vegetation and/or structural support; improving the overall vegetative condition of riparian areas; and removal of invasive nonnative plants. Although there may be some short-term negative impacts from certain projects, the long-term effects to species-at-risk are expected to be positive, especially for aquatic and riparian-dependent species. Gating and closing mines have been done for human health and safety as well as for the protection of wildlife species. Some abandoned mine tunnels have been gated in the recent past using gates designed specifically for the protection of bat species.

Abandoned mine closures using gates and other methods would continue for these reasons under Alternative 1. Gating is expected to continue under Alternative 2 with a slightly greater emphasis on species protection. For the health and safety of national forest visitors, there may be a slight increase in closures in Alternatives 4, 4a, and 5. Alternative 5 could result in more human disturbance of caves and abandoned mine tunnels due to increased vehicle access. These mine tunnel closures for health and safety may be done using bat gates if surveys indicate the presence of or use by bats. More abandoned mines would likely be closed using bat gates for species protection under Alternatives 3 and 6.

Alternatives that emphasize restoration of watershed degradation (such as Alternatives 3 and 6) will provide the most advantages not only to species-at-risk, but to trout, other harvest fish species, and biodiversity in general because of improved watershed conditions.

Alternative 4 will focus restoration efforts on developed recreation sites, which will provide advantages to species-at-risk. Alternative 4a will focus restoration efforts on both developed recreation sites as well as dispersed recreation use locations where the natural setting is being degraded. This added emphasis on prioritizing dispersed recreation locations in Alternative 4a would provide added benefits to species-at-risk and other species compared to Alternative 4. Alternative 5, which has a more reactive approach to protecting species-at-risk and a decreased emphasis on watershed restoration, would have the fewest advantages for species-at-risk.

Management Indicator Species

Watershed restoration would be beneficial to all management indicator species (MIS) and the habitats they represent. Loss of soil and long-term productivity adversely affects all management indicator species and their habitats. MIS species that depend on or prefer aquatic and riparian habitats would benefit the most. Arroyo toad and song sparrow and associated riparian and aquatic species would benefit greatly from watershed restoration projects. Mule deer and mountain lion also make heavy use of riparian areas and would benefit from watershed restoration activities. Upland MIS species such as the oaks and conifers would benefit from projects designed to reduce unauthorized user-created roads and trails and loss of soil. Long-term retention of soil and soil productivity will also benefit upland wildlife species such as mule deer and California spotted owl. There could be some short-term impacts to MIS and their habitats; however, the long-term benefits will out weigh the short-term effects.

Effects of Heritage and Tribal Relations Management

Heritage Resource Management

Heritage Resource program management results in historical, archeological and paleontological sites being protected, promoted, preserved, restored, rehabilitated, monitored or enhanced to the greatest degree possible. Protection of these sites generally benefits species-at-risk where they overlap. Special designations such as special interest areas managed to protect heritage resources generally benefit species-at-risk due to similar desired conditions and limitations on ground disturbance. They can also provide opportunities for cooperative conservation education.

While most actions to conserve heritage resources usually benefit to species-at-risk, the presence of heritage sites can also affect implementation of habitat and watershed restoration projects or mitigation measures proposed to conserve species-at-risk. As a rule, any activity that causes ground disturbance in locations where heritage resources are present has the potential to adversely affect these non-renewable resources. Therefore, habitat restoration projects proposed for species-at-risk that involve prescribed fire, decommissioning, re-contouring and revegetation of roads or trails, installation of terrestrial or aquatic structures or fencing, or emergency actions to protect species-at-risk could negatively affect heritage resources. This can result in the implementation of measures that may reduce the level of protection to species-at-risk. There is also a high probability for heritage resources to be present within a large number of projects proposed to enhance habitat for species-at-risk within developed and dispersed recreation areas. While this may not preclude the restoration activity it may require additional analysis to finalize a proposal that would benefit both resources. Depending on the level of the restoration plan it could take longer to recover habitat for species-at-risk. The presence of heritage resources could also affect mitigation for species-at-risk when project relocation or re-routing is needed but cannot occur due to the presence of heritage resources. Despite these circumstances, actions to mitigate effects to both heritage resources and species-at-risk can usually be achieved using a variety of methods and, in most circumstances, actions that protect heritage resources also aid in the protection of habitat for species-at-risk.

The heritage resource program would have the highest level of beneficial effects to species-at-risk in Alternatives 3 and 6 as these alternatives would focus on restoration and enhancement of heritage sites; they also have the highest acreage recommended for special interest areas for the protection of heritage resources. Alternative 4a would provide a high level of benefits to species-at-risk as the heritage program transitions from maintaining and managing to include restoring, enhancing and interpreting heritage resource sites. Recommendations for designation of special interest areas in Alternative 4a to manage heritage sites are lower than Alternatives 3 and 6 but higher than Alternatives 2 and 4. Alternatives 2 and 4 would provide a moderate level of protection for species-at-risk as the heritage resource program focuses on maintenance and management of sites. Alternative 1 provides the basic level of protection for heritage sites, and there are no recommended special interest areas. Alternative 5 is similar to Alternative 1 in that no special interest areas are recommended.

Tribal and Native American Interests Management

The goal of the tribal relations program is to maintain relationships to assist tribes and other Native American groups and individuals to retain traditional connections to the land and to foster both traditional and contemporary cultural use of the national forests. The national forests have active agreements and protocols to provide for government-to-government relations and consultations. This program results in the opportunity to partner with the tribes for the protection of heritage resources, traditional lifeways, and habitat for species-at-risk. Benefits to tribal members and species-at-risk can occur as more is learned regarding locations where food or material gathering areas and habitat overlap and methods are implemented to sustain the uses within these locations or to protect sites from degradation. As an example, the gathering of willow branches for sweat lodges and willow basketry is a traditional lifeway for Native Americans. At certain times of the year and within certain locations, this could affect nesting of federally listed riparian bird species. When there is active communication with Native Americans, national forests can recommend locations or timing for willow gathering that would not affect the bird's habitat resulting in achievement of desired results for both entities. In the same manner, the production and quality of gathering materials can be improved through communication between Native Americans and the national forests as managers learn to improve management of collection areas and the individual species that are gathered.

The alternative analysis of the Tribal and Native American Interests Program Management on species-at-risk is similar to that analyzed above for Heritage Resource Management. Alternatives 6, 3, 4, and 4a provide the highest level of collaboration with Native Americans and would provide the most benefits to species-at-risk.

Management Indicator Species

Heritage resource management and tribal relationships management are generally beneficial to management indicator species (MIS) and the habitats and processes for which they were chosen. Protecting heritage resources will usually result in protection of MIS. Habitat improvement for MIS such as burning for mule deer, fuels management for California spotted owls, unauthorized road closure for deer and mountain lion, water development for deer, and planting of oaks and riparian species can be more difficult to accomplish when there are heritage resources on site. Additional surveys are required, recording and salvage may be required, and some projects may not be completed. However, in most cases, the projects can proceed with modification to protect the resources. The effects of heritage resource management and tribal relations on MIS should not vary much by alternative. There are many opportunities to work with the tribes on enhancement projects that will benefit the national forests and the tribes.

Effects of Recreation Management

Recreation is the predominant use of the national forests in southern California, as noted in the Affected Environment section on Recreation. That section describes the various types of recreation enjoyed by visitors and the magnitude of those uses. Potential effects of the various recreation uses on biodiversity are summarized in Appendix B under General Direct and Indirect Effects to Plants and Animals. Unmanaged recreation has been identified by the Chief of the Forest Service as one of "Four Threats" facing the national forests and grasslands of the United States, along with fire and fuels, invasive species, and loss of open space (for more information see `http://www.fs.fed.us/projects/four-threats/`). Unmanaged recreation is considered a threat in part due to its impacts on biological diversity (Knight and Gutzwiller 1995).

This section focuses on developed recreation sites, general dispersed recreation activities, and recreation special uses. Access for recreation is provided by roads and trails. The effects of road and trail use on biodiversity will be discussed in the section regarding Effects of Roads, Motorized Trails and Non-Motorized Trails later in this chapter.

The effects of recreation on both wildlife and habitat can be chronic and pervasive (Knight and Gutzwiller 1995). Boyle and Samson (1985) reviewed 166 articles that contained original data on the effects of nonconsumptive outdoor recreation on wildlife. In 81 percent of them, the effects were considered negative. The magnitude of effects on species-at-risk and biodiversity from recreation use would be greatest in areas that are within or adjacent to developed recreation facilities (such as campgrounds or picnic areas) and in areas that are heavily used for dispersed, vehicle-based recreation. Four additional factors influence the potential degree of impact that can occur to species and habitat: the timing of when a use occurs, the magnitude or size of the use or disturbance, the intensity of use, and the duration of use.

Human activities can affect animals through four primary routes: exploitation, disturbance, habitat modification and pollution. The first two are direct effects (Knight and Cole 1995a). Animals and plants may be damaged or killed by parked vehicles; foot, hoof, and tire traffic; picnicking or camping on top of them; fire ring construction; collection; target shooting; poaching; building recreational dams in the streams; and the introduction of nonnative species. Effects on biodiversity from developed day use areas and campgrounds primarily involve impacts from concentrated human use, such as noise, soil compaction, pollution and trash, destruction of vegetation, and alteration of stream habitat, and from vehicle use and parking.

Recreational disturbance can be a dominant structuring force in wildlife communities (Gutzwiller 1995). There are three learned responses that wildlife may show to recreationists: habituation, attraction, and avoidance (Knight and Temple 1995). At least six distinct facets of recreational disturbance shape wildlife responses, each of which is capable of pronounced effects on wildlife: type of activity, predictability, frequency and magnitude, timing, location, and the characteristics of the wildlife affected (Knight and Cole 1995b). Human disturbances can result in animals being displaced out of preferred habitat and altering behavior, with effects on reproduction and other essential functions (Anderson 1995, Gutzwiller 1995). Noise can disturb animals and cause detectable changes in behavior. Aversion, attraction and tolerance are animal reactions to noise (Bowles 1995). Both birds and mammals habituate more rapidly to mechanical noise than they do to human presence (Gabrielson and Smith 1995).

The magnitude of wildlife response to recreationists depends on the distance, the movement pattern of the human, and the animal's access to cover to hide and escape. Animals have a greater defense response to humans moving unpredictably in the terrain than to humans following a distinct path (Gabrielson and Smith 1995). Some potentially nuisance species (jays, crows, raccoons, and others) are attracted to heavily used areas and can have a negative effect on other wildlife species (Knight and Cole 1991). Pets brought to the national forest by their owners may chase and kill wildlife (Knight and Cole 1995a). One of the primary impacts of developed recreation on species-at-risk and biodiversity is the indirect effect of visitors traveling out of developed recreation sites and into less developed areas where they engage in dispersed recreation activities, creating concentrated use impacts (See Appendix B, General Direct and Indirect Effects to Plants and Animals).

Dispersed recreation may cause more disturbance to species-at-risk than developed recreation because there are fewer structural and administrative safeguards at dispersed sites to protect habitat and assure sustainability. Larger mammal and birds are more directly affected by human disturbance. For invertebrates, amphibians, reptiles, small birds, small mammals and many fish, the indirect effects on soils, vegetation, and water quality are likely to be more substantial than direct impacts of recreationists themselves (Cole and Landres 1995).

Numerous studies have documented the effects of recreation on soils and vegetation. Impacts on soil include loss of surface organic horizons, compaction of mineral soil, reduction in porosity, reduction in infiltration rates, and increases in soil erosion. These changes in soil characteristics negatively affect the germination, establishment, growth and reproduction of plants. The most obvious direct effects on vegetation come from the crushing, bruising, shearing, and uprooting of plants that can accompany recreation use. Various changes in individual plant characteristics may occur, including reductions in plant height, stem length, leaf area, flower and seed production, and carbohydrate reserves. Plants may be killed outright in concentrated use areas. Those that survive typically are not as vigorous and reproduce less successfully (Cole and Landres 1995). Ultimately, plant populations affected by chronic impacts may decline in abundance, even to the point that they are replaced by bare ground or other plant species better adapted to frequent defoliation and trampling events, including invasive nonnative species.

Much of the dispersed recreation use across the four southern California national forests occurs adjacent to streams and reservoirs and in meadows and riparian areas that are close to roads. Dispersed recreation can have substantial effects on plants and animals in aquatic and riparian areas where people concentrate (Cole and Landres 1995). Riparian-dependent species can be disturbed when streambanks are denuded, amphibian and fish eggs are disturbed and dislodged, stream habitat is modified by dam building for swimming, and large amounts of trash are left in the stream environment. For aquatic species, changes to stream channels and riparian areas from dispersed recreation, especially water play activities, can cause a decrease or shift in aquatic insect abundance (food for fish and amphibians); a reduction in leaf litter and woody material; reduction in stream shading; and burial of pool and riffle habitat (Cole and Landres 1995). Aquatic species populations may decline in response to these types of impacts.

Other areas that can be substantially affected by dispersed recreation include meadows, caves or abandoned mines, cliffs, peaks, waterfalls, and other special habitats. Many of these special habitats are in remote areas that have lower levels of oversight and management, which can delay the detection and restoration of negative impacts. If roads make it easier to get near these interesting features, human nature will draw people there. Some small percent of national forest users do not pay attention to regulations out of willful disregard. However, most people will be attracted to and make an attempt to get to special features if it is not too difficult, even though they are generally law-abiding.

Recreational target-shooting can occur under special-use permit or may occur at designated areas open for target shooting. This activity can result in negative effects to species-at-risk and biodiversity. Frequently, these target shooting sites can become large open areas where the vegetation is cleared, crushed, or damaged from being shot. The ground can be compacted from motor vehicles driving and parking, and these areas become magnets for an assortment of items brought in as targets (ranging from refrigerators and old cars to other trash) that is abandoned and left after use. Animals can be harassed and chased away from their habitat by human presence, noise, or being shot at. Crushing or removal of vegetation can eliminate plant species-at-risk and reduce available habitat for nesting birds. Poisoning and other physical ailments can occur when animals and birds ingest lead shot or fragments (Lewis and others 2001) and the spent ammunition and trash left on the ground (U.S. Fish and Wildlife Service 2005b). Animals also run the risk of being trampled by shooters or run over by vehicles.

Recreation special-use permitted activities include ski areas, recreation residences, outfitter-guide operations, organization camps, large group gatherings, and special events, to list a few (see the Affected Environment section on Recreation for more description). The variety of recreation special use activities can affect species-at-risk and biodiversity in a number of ways, from human disturbance that disrupts feeding, breeding and resting behaviors, to crushing of animals, plants and burrow systems, creation of dust/mud which coats nearby species and habitats, to pollution of water from introduction of toxic substances that degrades aquatic habitats. Many of the same types of impacts that occur from other recreation activities are possible from the variety of recreation special-uses.

Recreation demand is expected to increase with continued population growth under all alternatives (see Effects on Recreation section). Potential for recreation effects on biodiversity varies by alternative, depending on the alternative emphasis and what activities are suitable and where. Land use zones that limit vehicle access can be assumed to limit the potential for heavy recreation use. To compare alternatives, the Forest Service focused on the theme of each alternative as well as amount of land in zones that restrict vehicle access or limit numbers and kinds of uses. We compared the amount of land in Back Country (BC) zoning to the amount in Back Country Non-Motorized (BCNM), Back Country Motorized Use Restricted (BCMUR), Critical Biological (CB), existing wilderness (EW) and recommended wilderness (RW) zones as a measure of how dispersed vehicle camping and day use—and consequent effects to species-at-risk and biodiversity—would vary by alternative (see table 333: Comparison of Alternative Acres by Land Use Zone, page 26; public recreation use is not allowed in the Experimental Forest zone and acreage does not vary by alternative). Motor vehicle use by the public is prohibited or greatly restricted in BCNM, BCMUR, CB, EW, and RW land use zones, limiting access for vehicle-related recreation.

Alternatives will vary in accommodating developed recreation demand during the life of the plan. Alternative 4 is projected to accommodate the most demand, followed by Alternatives 5, 4a, and 2. Alternatives 1, 3, and 6 would accommodate progressively less demand (see table 197: Variation of recreation program emphasis by alternative (percent change from current situation)).

Table 197. Variation of recreation program emphasis by alternative (percent change from current situation)

Program Management Emphasis*	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 4a
Developed Recreation Accommodation	-1	+5	-10	+20	+10	-20	+5
Dispersed Recreation Accommodation	-1	+5	-10	+20	+10	-20	+5

*The ability to accommodate recreation demand is a projection only for comparison purposes. The ability is dependent upon funding sources, including sources outside traditional ones. See recreation management section.

Despite the overall projected increase in meeting recreation demand under Alternatives 2, 4, 4a, and 5 relative to current conditions (Alternative 1), there would still be some emphasis on decommissioning non-sustainable recreation facilities (for example, those with chronic impacts on threatened and endangered species or with degraded watershed conditions). However, this strategy would be less likely to be utilized under Alternative 5 because of the emphasis on resource development. Decommissioning non-sustainable recreation facilities and replacing them with facilities designed to avoid or minimize direct and indirect effects on federally-listed and sensitive species would be beneficial to other species-at-risk and biodiversity. Under all alternatives, decommissioning sites or establishing site sustainability would most often take place in and near riparian habitats, where the greatest beneficiaries will be fish, riparian-dependent wildlife, and riparian plants. Alternative 4a places the most emphasis on this kind of mitigation, followed by Alternative 4. Alternatives 3 and 6 are likely to result in the eventual decommission of unsustainable recreation facilities, without replacement, to protect species-at-risk. Alternative 4a (with an emphasis on sustainable settings) would not only emphasize decommissioning and replacing unsustainable recreation facilities, but would also focus on improving management and restoring dispersed recreation sites that are not sustainable.

Forest plan standards and design criteria (such as the provisions of Appendix D [Adaptive Mitigation for Recreation Uses]—see Part 3 of the revised forest plans) will be used at the site-specific level to mitigate impacts from recreation activities. Existing and newly acquired information would help identify opportunities for modification or relocation of recreation activities in a strategic fashion that would result in less intensive use of sensitive habitats. Redirecting use to less sensitive habitats and building new facilities that avoid or minimize impacts on federally-listed and sensitive species would provide long-term benefits to many species. The use of these forms of mitigation is likely to occur with the greatest frequency under Alternatives 2, 3, 4, 4a and 6 and with the least frequency under Alternative 5.

Because Alternatives 4 and 4a, with their focus on resolving conflicts between recreation at developed sites or dispersed areas and the habitat needs of species-at-risk, would likely result in measurable progress toward meeting desired conditions for species-at-risk and biodiversity. Under Alternative 1, plant and animal species-at-risk that are vulnerable to impacts from concentrated dispersed recreation would continue to be subjected to these activities; land use zoning (and likely recreation impacts) is similar under Alternative 2. Alternative 5 would have the greatest potential for motorized recreation access and, thus, the greatest area in which species sensitive to human presence and recreation impacts could be negatively affected. Protection for species-at-risk could be delayed or ineffective due to greater numbers of visitors and activities.

Although Alternative 6 would restrict public vehicle access the most, this could produce more concentrated use at areas that are already accessible. Concentrated recreation use in a smaller area could cause greater negative effects to species-at-risk in remaining accessible acres under Alternative 6 and, to a lesser extent, Alternative 3. Species currently affected by recreation use at developed facilities are likely to be vulnerable to even more intensive impacts. On the other hand, having public road access limited to a smaller area of the national forests could increase the ability of the Forest Service to manage recreation for sustainability and enforce regulations. Alternatives 3 and 6 also emphasize restoration of habitat in areas affected by recreation use.

The use of education and interpretation to mitigate impacts associated with recreation use can be effective. However, it may be difficult, under all alternatives, to provide the quantity and quality of educational and interpretive materials that would be needed to make a difference in how people treat the outdoor environment due to the rapid turnover of users and other problems discussed in the Effects on Recreation section. Under all alternatives, some national forest visitors would probably continue to engage in unauthorized activities such as off-route travel, flower collection, butterfly, insect and animal collection, littering, and rock collection in times and places that would have negative consequences for species-at-risk. Education and interpretive efforts would have only a small influence in reducing these impacts.

The use of education and interpretation as a conservation tool is likely to occur most extensively in Alternatives 3, 4, 4a, and 6, although in all alternatives education and interpretive programs will be designed, in part, to influence how visitors to the national forests use developed and dispersed recreation areas. Education and information efforts will focus on establishing awareness, creating advocacy, and developing leadership. Each alternative would seek to do this with a distinct focus. Alternatives 3 and 6 would emphasize habitat and biodiversity; Alternatives 4 and 4a would place emphasis on recreation issues and concerns. Alternatives 1 and 2 would emphasize a broad range of efforts, while Alternative 5 would focus on a broad range of activities and uses for the national forests.

Management Indicator Species

The strong emphasis on public education in association with recreation use sites and responsible outdoor use under Alternatives 3, 4, 4a, and 6 would help maintain or improve habitat conditions for all management indicator species.

Mule deer can be negatively affected by human disturbance near fawning areas and on the winter range. Disturbance effects from recreation in mule deer habitat would be similar under Alternatives 1, 2, and 4, because land use zoning is similar. Alternative 4a would place emphasis on sustainable recreation to maintain the natural setting and resolution of existing conflicts with biodiversity. Alternatives 4a, 3 and 6 would be expected to have less dispersed recreation impact on mule deer, relative to Alternative 1, due to the greater amount of habitat in public non-motorized zoning. Alternative 5 has the potential to greatly increase recreation disturbance in mule deer habitat, because more area would eventually be accessible by road.

Mountain lions would benefit from increased mule deer abundance that could result from Alternatives 3, 4a, and 6 relative to other alternatives.

Perennial streams, with year-round flows, would continue to receive heavy pressure from recreational use under all alternatives, because these are very desirable locations for day-use activities. Habitat restoration under Alternatives 4 and 4a would be primarily accomplished at prioritized recreational use areas in association with environmental education and interpretation, hardening of the recreation sites, increased Forest Service presence, and restriction of unauthorized uses. These efforts would benefit the arroyo toad and song sparrow, as well as other riparian-dependent species. National forest visitors should develop an increased understanding and appreciation of the local environment and an increased willingness to help maintain it under Alternatives 4 and 4a. These alternatives would assist in the protection, conservation, and recovery of riparian habitats to a greater extent than other alternatives.

Effects of Law Enforcement

The ability to provide law enforcement services on public lands is important for protecting the health of species-at-risk, the management of indicator species, and for the retention of biodiversity. Many of the activities that negatively affect plant and animal species are not authorized and are prohibited by law (see Appendix B, General Direct and Indirect Effects to Plants and Animals). For example, unauthorized off-route use of motor vehicles and mountain bikes can have negative effects on many plants and animals, as described in the section on Effects of Roads, Motorized Trails, and Non-Motorized Trails. Dumped garbage and other discarded items on the National Forest System lands can pose problems for at-risk plants and animals by burying plants at the dumpsite, attracting pest species, entangling animals, and by being ingested with fatal consequences by species such as California condors (U.S. Fish and Wildlife Service 2005b). Recreational target shooting in unauthorized areas can result in the degradation of habitat and direct mortality of plants and animals. Poaching can have serious effects on species by reducing populations or by harvesting animals at times that affect survival of dependent young.

The presence of Forest Service personnel with law enforcement authorities can be an effective tool in helping to protect areas where sensitive biological resources are present by preventing, or at least reducing, incidents such as those noted above. Although there is currently limited law enforcement coverage in some areas of the national forests that are important to species-at-risk and biodiversity, increased Forest Service presence and the use of volunteer patrols have helped reduce illegal activities in many areas. Additional use of volunteer resources may expand these benefits to other areas in the future, primarily through conservation education efforts with the public.

Law enforcement services are also important for the protection of biodiversity in locations where criminal activities occur. Drug labs and marijuana cultivation sites degrade habitat and harm species with the use of large amounts of fertilizers or other chemicals that support the operation. Waste materials, drug production byproducts, and other toxic substances used during production or during the cultivation effort are abandoned on site and would remain a source of ongoing resource degradation unless they are detected and removed by law enforcement staff (see section on Law Enforcement in the Affected Environment). In addition, water is usually diverted from streams or springs for growing marijuana, which can create shortages for native plants and animals during dry periods. Ongoing detection and eradication efforts by law enforcement personnel are essential for the long term protection of biological resources from these criminal activities.

Law enforcement activities themselves may have a negative effect on biodiversity in some circumstances, although these impacts are generally of short term duration and associated with specific locations that are already highly disturbed. Raids on illegal activities can result in habitat modification and disturbance from helicopters and/or the numbers of law enforcement personnel involved on the ground. Damage can occur where riparian areas are used by large numbers of enforcement personnel to gain access to ongoing criminal activity sites during raids in rough, densely-vegetated locations. Helicopters flying low during enforcement actions and marijuana eradication projects can disturb nesting birds and displace resting or foraging animals. This can be a problem where sensitive areas are not known by the law enforcement personnel or other involved agencies. In general, however, law enforcement activities are integral to the maintenance and restoration of biological diversity in the southern California national forests. Early prevention and correction of unauthorized uses is expected to change visitor behaviors over time, reducing the likelihood that national forest users will engage in unlawful activities.

Alternatives 3 and 6 are expected to provide the greatest degree of protection for biodiversity and are anticipated to have a reduced need for law enforcement services, as much of the national forests become less accessible in general. The concentration of uses in areas that remain accessible by motor vehicle are expected to have an increased effect on localized species-at-risk and require additional law enforcement presence in these locations until desired changes in use patterns are achieved.

Alternatives 4 and 4a are expected to provide a high degree of species protection primarily as a result of focused management efforts (Alternative 4) or due to land use zone modifications that manage 72 percent of the national forests for non-motorized use (Alternative 4a). Both alternatives would continue to utilize law enforcement services as a management tool for the protection of resources. Law enforcement resources are expected to be more dispersed under Alternative 4 than in 4a, due to the amount of the national forests accessible by vehicles.

Alternative 2 is expected to provide a modest level of species protection, as current management conditions would remain prevalent. Limited law enforcement personnel would be dispersed over a landscape similar in configuration to the existing condition (Alternative 1).

Alternative 5 is expected to have the greatest degree of effect on species and biodiversity. The ability to address resource violations would be reduced as limited law enforcement resources are spread out over the largest motor vehicle-accessible landscape.

Management Indicator Species

Unauthorized activities (such as cross-country vehicle or mountain bike use and shooting outside of designated areas) can negatively affect management indicator species (MIS) and the habitats they represent. Illegal activities such as cultivation and production of drugs, dumping, and arson can have damaging impacts on habitat. Law enforcement is an essential management tool for protection and meeting the desired conditions for MIS. If enforcement capability continues to be strained with budget and personnel shortages in the future, the alternatives that limit motorized access to smaller areas (such as Alternatives 3, 4a, and 6) would allow law enforcement personnel to focus on protection of habitat conditions and MIS.

Effects of Administrative Facility Management

Administrative sites include Forest Service facilities such as ranger stations, fire stations, work centers, horse pastures, barns, lookouts, communication sites and other types of buildings. Effects to species-at-risk can include direct mortality from crushing of individuals through daily use of the site, or from the use of heavy equipment to repair or maintain facilities. Chemical spillage, noise, and vegetation treatments within the Wildland/Urban Interface Defense zone within or adjacent to facilities also has the potential to affect habitat.

Species-at-risk are affected to different degrees by facility operations that relate to the intensity and the seasonality of activities. In addition, the duration of effects at these locations often occurs over a long period of time. After the initial effects to the habitat occurs from constructing a station (as an example), several species-at-risk benefit from being located next to or within fire station compounds as this provides the opportunity for increased protection through education and monitoring. Smith's blue butterfly, Nevin's barberry, slender-horned spineflower and Jacumba milkvetch are examples of species-at-risk that receive habitat protection and monitoring at or adjacent to fire stations.

Administrative facility management varies little by alternative except that in Alternatives 2 through 6, species-at-risk would receive additional protection from the revised Forest-wide standard that directs national forests to design new facilities or expand existing facilities to direct public use away from occupied habitat for threatened, endangered, proposed or candidate species. Several Forest specific Place standards that limit expansion of facilities within listed species habitat would also be utilized. This would benefit federally listed species-at-risk and other species that occur at the site. Alternative 1 does not have specific standards regarding this use. The level of attention that species-at-risk would receive at administrative sites would also depend on the management emphasis for supporting an integrated species conservation strategy. This emphasis would be highest in Alternatives 6, 3, 4a, 2, 4, 1, and 5, respectively.

Management Indicator Species

The effect of administrative facility management is negligible to management indicator species under any alternative since there are so few new facilities planned and the amount of landscape affected by this activity is so small. Arroyo toad and California spotted owl would be protected by strong standards and the need to analyze potential adverse effects at the site-specific project level for threatened, endangered, proposed, candidate and sensitive species. These and other MIS are landscape level indicators that would not be affected by such small-scale developments or maintenance actions.

Effects of Roads

Direct and indirect effects on species-at-risk and biological diversity are directly proportional to the size of the road system and the habitat area it accesses. The alternatives vary in regard to the mileage of the roads in the transportation system, the amount of this mileage that will be retained for public access, and the amount of land base that is available for motorized uses. Details on the mileage of roads and land use zoning that is available for motorized access can be found in the Affected Environment section on Roads and the Environmental Consequences section Effects on Roads. State and county highways and freeways have major impacts on plants and animals, but this planning effort does not make decisions on these types of roads. The following discussion of effects will focus on National Forest System and non-system roads only.

The ecological effects of roads have been summarized in various literature reviews (Brooks and Lair 2005, Forman and Alexander 1998, Spellerberg 1998, Stephenson and Calcarone 1999, USDA Forest Service 2001, Watson 2005). These reviews all conclude that construction of roads, the presence of roads in the landscape, and the vehicles that travel upon roads have a wide range of ecological effects. These effects range from changes in the physical and chemical properties of ecosystems to alterations in the population and community structure of living organisms. Roads and their associated use can have substantial effects on species-at-risk and biological diversity, depending on the overlap of the facilities with sensitive habitats or species (see Appendix B, General Direct and Indirect Effects to Plants and Animals). Roads provide access for many forms of recreation; the effects of this recreation on plants and animals can be substantial, as was discussed in the Effects of Recreation section.

National Forest System roads themselves can have both positive and negative effects on biodiversity. For example, designating a system road or constructing a system road that consolidates use that was formerly on multiple unauthorized, user-created roads can reduce the impacts on habitat and species-at-risk. Generally, however, roads have negative effects. Plants adjacent to roads often get covered with dust, which can affect their vigor and reproductive capabilities. Water runoff and infiltration rates are modified from naturally occurring conditions and can affect adjacent vegetation. Vehicle travel on roads is a major mechanism for the transport and spread of invasive species, which can lead to declines in native species abundance. Roads are an ongoing source of harassment (noise, visual disturbance) for many animals. Roads can often be barriers to movement for terrestrial and aquatic species. Road crossings of riparian areas and streams are especially critical areas because of the higher levels of animal use. The movement of aquatic species can be constrained by the type of stream crossing that is constructed. Improperly designed crossings sometimes results in an inability for species to move up and down stream to optimize habitat effectiveness, reach spawning areas, and adjust to seasonal flows and temperatures.

Effective engineering and design can minimize or prevent many of these impacts by routing new roads away from sensitive areas. Relocating existing roads that are in conflict with species-at-risk or sensitive habitats is another positive way to protect biological diversity. Proper design of stream crossings can reduce the effect on riparian-dependent species by elevating the road prism out of the riparian area or by providing adequate passageways that minimize animal mortality from vehicles (roadkill).

Construction of new roads can destroy habitat where the ground is disturbed. It can also result in increased erosion and sedimentation, which affects aquatic species by reducing oxygen, covering eggs, and silting in resting pools. Best Management Practices and good design greatly reduce these potential impacts. New road construction under any alternative is expected to be minimal. Maintenance of existing roads crushes some animals and plants on the road edges, creates loose soil which is subject to erosion, and can expose species to effects similar to road construction. Maintenance activities create noise and human disturbance, to which some animals are very sensitive depending on timing of the activity. Failure to adequately maintain existing roads can also result in erosion and sedimentation that can negatively affect aquatic ecosystems. Correcting problem areas and poor conditions on existing roads, as well as doing proper maintenance, is beneficial to species-at-risk and habitats. Alternatives 2, 3, 4, 4a, and 6 all emphasize biological sustainability (moderate or high emphasis—see Chapter 2) and the relocation or decommissioning of National Forest System roads that are in conflict with the habitat needs of threatened and endangered species.

The ongoing establishment and use of unclassified roads has chronic impacts on biodiversity. Unclassified roads are the product of off-route vehicle travel, generally developing over time as people access favorite dispersed recreation sites, participate in off-highway vehicle activities off of designated routes, or pioneer “roads” into wood cutting, hunting, and camping areas. In other instances they are remnants of previous logging, mining, or development activities. Unclassified roads are not engineered to any standard and can pose a direct threat to species-at-risk through the destruction of habitat and the potential for soil erosion. The incorporation of unclassified roads into the national forest road system is expected to be low under all alternatives, because most of these features could not feasibly be brought up to the design and maintenance standards for National Forest System roads. In addition, candidates for inclusion to the national forest road system would have to be carefully analyzed for the effects on species-at-risk and other wildlife before they could be added.

Converting unclassified roads to National Forest System roads would have short-term impacts in the form of erosion and sediment due to the reconstruction needed to bring them up to standard. However, once an unclassified road is brought up to standard, erosion and sediment effects associated with the road are expected to decrease. Unclassified roads located in areas not zoned for public motorized use would become candidates for conversion to non-motorized trails if they help in the attainment of the desired condition for the activity, or they could be retained for administrative purposes if a need is identified. Conversion to non-motorized trails would have fewer impacts on species-at-risk, compared to designation as a motorized route, because non-motorized activities are generally less disruptive (see Effects of Non-Motorized Trails section below for more discussion).

Listed from least to most, Alternatives 6, 4a, 3, and 2 would have fewer miles of unclassified roads that could be considered for addition to the national forest roads system for public use than currently exist (Alternative 1) (see table 298: Unclassified road miles by land use zone by alternative). Unclassified roads in Developed Area Interface (DAI in table 298) and Back Country (BC in table 298) zones would be evaluated for inclusion as part of the national forest road and motorized trail systems. Alternatives 5 and 4 would have the most miles of unclassified roads in zones open for public motorized access (table 298) and thus could add the greatest mileage to the national forest road system after appropriate analysis.

Table 298. Unclassified road miles by land use zone by alternative

Land Use Zone	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
BC	656	689	513	708	816	317	422
CB	**0**	**4**	**5**	**4**	**0**	**8**	**5**
EF	**2**	**1**	**1**	**2**	**0**	**2**	**2**
DAI	192	148	151	149	145	157	144
BCNM	**113**	**111**	**187**	**96**	**0**	**405**	**170**
EW	**49**	**49**	**49**	**49**	**49**	**49**	**49**
RW	**0**	**11**	**107**	**6**	**0**	**76**	**12**
BCMUR	**0**	**0**	**0**	**0**	**0**	**0**	**209**
Conflicts	**164**	**175**	**348**	**156**	**51**	**539**	**447**

Notes: conflicts in bold; discrepancies in totals due to rounding

Over time, unclassified roads in non-motorized land use zones that are not needed as non-motorized trails or for administrative purposes would be decommissioned. Decommissioning unclassified roads could cause some short-term impacts, such as erosion and sedimentation, when the roads are put to bed (restored), but decommissioning would be beneficial in the long term as habitat recovers. The greatest short-term impact from decommissioning would occur under Alternatives 6, 4a, and 3, as well as the greatest long-term benefit to species-at-risk and habitats.

Incorporation of more of the unclassified road network into the national forest road system and the preponderance of motorized zoning under Alternative 5 are expected to result in increased potential for additional unclassified route development (see discussion in the Effects on Motorized Trails section). This could produce a commensurate level of negative effects on species-at-risk and habitats. Because there would be less motorized access, the number and miles of new user-created roads generated on the national forests in the future would probably be least in Alternatives 6, 3, and 4a, with fewer resultant impacts on species-at-risk.

Table 253. Alternative Comparison of Road Mileage Not Available for Public Motorized Access

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 4a	Alt 5	Alt 6
Angeles	10.7%	9.8%	9.8%	9.4%	31.4%	7.6%	27.9%
Cleveland	6.1%	9.8%	6.4%	5.0%	23.5%	2.9%	40.4%
Los Padres	3.8%	5.9%	6.3%	5.4%	22.8%	3.8%	54.7%
San Bernardino	7.7%	7.6%	10.0%	6.5%	12.3%	5.9%	31.9%
Combined	7.2%	8.0%	8.5%	7.1%	21.8%	5.4%	38.2%

Note: Includes Maintenance Level (ML) 1 miles on each Forest closed to all motorized use in all land use zones
And all other ML 2-5 as they vary by BCNM, EW, RW and BCMUR
All Experimental Forest miles are restricted

Assessment of species-at-risk identified 45 plant and 14 animal species that face substantial threats from roads, road-stream crossings, or off-highway vehicle use (table 367: Plant Species-At-Risk, page 160, and table 370: Animal Species-At-Risk, page 173). Many other species can be negatively affected by the presence of roads and road use, as described above. Alternative 5 would have the highest percentage of current road mileage available for public access. Alternatives 4, 2, 1 and 3 (in decreasing order) would have the next greatest road miles available, with Alternatives 4a and 6 having the least (see table 253: Alternative Comparison of Road Mileage Not Available for Public Motorized Access). Land use zoning that would not allow public motorized access would be greatest in Alternatives 3, 4a, and 6 with 70, 72, and 80 percent, respectively, of the land base in non-motorized land use zones. Alternatives 1, 2, 4, and 5 have less non-motorized zoning, with 47, 49, 47, and 33 percent, respectively (see table 334: Percent of Each Land Use Zone by Alternative, page 26). As a result, Alternatives 3, 4a, and 6 would better protect species that are at risk from or sensitive to the effects of roads.

Alternative 5 (with its emphasis on resource development and motorized access) would result in the greatest amount of area being susceptible to disturbance from vehicles and roads, and the frequency and intensity of disturbance would often be moderate to high. The spider web pattern of disturbance that could result from high levels of road-related access and recreation use would be more difficult to manage (see discussion in the Effects on Non-Motorized Trails section), and this would have more widespread impact on habitat for species-at-risk compared to the other alternatives. However, by concentrating motorized use into smaller areas, Alternatives 3, 4a, and 6 could produce localized increased impacts on species sensitive to road presence and resulting dispersed recreation activities, as described earlier under Effects of Recreation.

Management Indicator Species

Mule deer are especially sensitive to roads and accompanying human use (Herman and others 2001, Kilgo and others 1998, Rost and Bailey 1979, Thomas 1979, Utah Division of Wildlife Resources 2003) and seem to be more sensitive during hunting season (Kilgo and others 1998). This is largely due to the fact that they are hunted on the national forests and they develop a fear of being shot at. Experiences and administrative evaluations on the southern California national forests have demonstrated that as road densities increase, mule deer numbers decrease (Loe personal observation). This is especially true where road densities exceed two to three miles of road per square mile (Thomas 1979). Areas with the highest mule deer numbers on the San Bernardino National Forest, where this issue has been studied, are generally unroaded or have very low road mileage. Some unroaded areas on the San Bernardino National Forest have greater than 20 mule deer per square mile in the winter, while moderately roaded areas with comparable habitat have less than five. Some relatively gentle, open areas on the desert side of the San Bernardino Mountains have up to 10 miles of authorized and unauthorized roads per square mile, and there is virtually no mule deer use of that area. Some mule deer are killed each year by vehicle collisions on roads running through the national forests, but this is generally on the paved, higher-speed roads, not typical National Forest System roads.

Because mountain lions prey primarily on mule deer, areas with low mule deer populations would support fewer mountain lions. Mountain lions are also susceptible to being shot illegally from vehicles traveling on the roadways (Bancroft 1990, Tsukamoto 2001).

Roads in or near riparian areas can negatively affect song sparrows, arroyo toads, and other riparian-dependent species. The noise from road use and maintenance can cause birds to abandon nests or to not attempt nesting at all. In addition, roads provide access for recreation use in streams and riparian habitats; the impacts of recreation on aquatic and riparian species and habitats were discussed in the Effects of Recreation section earlier. Under all alternatives, new proposals for roads or incorporation of unclassified roads in riparian areas would be subject to standards and guidance for riparian conservation areas (see Part 3 of the revised forest plans), which should minimize future new impacts on aquatic and riparian habitats.

California spotted owls are relatively tolerant of roads except during the nesting season, where disturbance at nest sites from vehicles or humans can result in nest abandonment. The biggest impact is from noise and human activity that are associated with road access within nest stands. Under all alternatives, new proposals for roads or incorporation of unclassified roads would be subject to standards in Part 3 of the revised forest plans designed to protect California spotted owl habitat.

Effects of Motorized Trails

The ecological effects of motorized trails have been described in various literature reviews (Brooks and Lair 2005, Knight and Gutzwiller 1995, Stokowski and others 2000, Taylor 2002, Texas Chapter of American Fisheries Society 2002; USDA Forest Service 2001e, 2003f, 2004b). Motorized trails can have effects on species and habitat that are similar to those of roads (described above), although the scale is different because of the lower mileage of the motorized trail system compared to the national forest road system and because the trail tread is narrower than typical National Forest System roads. Approximately 25 percent of the national forests' off-highway vehicle (OHV) route system is located on National Forest System trails that are designated for this activity, with the remaining 75 percent located on National Forest System roads (generally Maintenance Level 2 roads; see table 455: OHV Mileage by Forest, page 284). The current OHV trail system and use patterns are described in the Affected Environment section on Motorized Trails. The general direct and indirect effects of motorized trails on plants and animals are summarized in Appendix B (General Direct and Indirect Effects to Plants and Animals).

Potential impacts on species-at-risk are essentially proportional to the size of the motorized trail system and the habitat area it accesses. The alternatives vary in the amount of OHV opportunity that could potentially be developed, primarily as a result of land use zoning and the emphasis of the alternatives (see Chapter 2). Designation of additional OHV opportunities requires site-specific NEPA analysis and would fully consider the effects any new proposal would have on species and habitats. OHV use is expected to remain a popular activity on all the national forests, and demand is expected to increase over the planning period. Based on the increases in OHV sales and the projected increase in visitation to the national forests, management efforts to prevent impacts from motorized trail use and unauthorized off-route travel will be challenged during the next 10 to 15 years. The consequences of the alternatives for potential expansion of the motorized trail system are described in the section Effects on Motorized Trails.

In an area with high demand for OHV use, managed OHV systems can provide many benefits for the sustainability of biodiversity. Failure to have a designated system in this situation will result in an unauthorized system of user-created trails developing, with no environmental planning or design. Even with a well-designed and engineered system, the designated motorized trail system can have direct effects on species-at-risk and their habitats (Stephenson and Calcarone 1999; USDA Forest Service 2001, 2003f, 2004b). Sound and human disturbance associated with the activity can disrupt behavioral patterns of animals, causing them to abandon preferred habitat or use more energy, and negatively affect reproduction and survival (Bowles 1995, Gabrielsen and Smith 1995).

Some National Forest System trails were poorly located or poorly designed originally and are now resulting in chronic soil movement. Other trails are poorly located in relationship to riparian areas or occupied habitat for species-at-risk, contributing high levels of sediment into streams or directly affecting species. In some localized areas, the incorporation of user-created routes, skid trails, abandoned roadbeds, or dozer lines as part of the designated motorized route system has contributed to the general deterioration of habitat. In other cases, trails were constructed before concerns for individual species became apparent or before species were listed as threatened and endangered. Relocation of trail segments that are directly affecting species or habitat could mitigate some of these effects. Proper design and location of proposed additions to the designated trail system will remain an important component in the protection of biological diversity.

Unauthorized off-route vehicle travel is the greatest management concern associated with motorized trails. Indeed, the Chief of the Forest Service has identified unmanaged OHV use as the major component of one of the four threats facing the national forests (for more information see http://www.fs.fed.us/projects/four-threats/). The proliferation of unclassified routes originating from National Forest System roads and motorized trails, and their associated effects on resources such as species-at-risk, can be one of the major consequences of OHV use (USDA Forest Service 2003). Newly pioneered trails can quickly become established routes because of high levels of use and the substantial effects that motorized vehicles can have on undisturbed ground. For the OHV enthusiast, unclassified routes have all the appearances of an authorized National Forest System road or trail.

Many animals adapt somewhat to predictable travel on well used, properly designed and designated trails and learn to avoid them. On unauthorized trails, the effects of disturbance to species-at-risk are greater because they often go through sensitive areas, and animals are not as likely to adapt to the presence of irregular trail use. In addition, erosion and sedimentation often result from these routes, which were not located, designed or engineered properly. This can negatively affect aquatic species and habitats, sensitive soils and dependent plants, and wetland habitats. Open terrain without vegetation barriers that supports habitat for plant species-at-risk can also be affected by unauthorized off-road vehicle use, especially when soils are saturated. Ground disturbance caused by unauthorized off-route use also increases the network of denuded areas throughout the national forests and can contribute to the spread of invasive nonnative plants.

Unrestricted off-road vehicle use is prohibited on the national forests in all alternatives, except in a few small identified open areas on the Angeles and Cleveland National Forests. Outside of these few open areas, OHV use is restricted to designated National Forest System roads and trails. This helps managers, law enforcement officers, and visitors clearly understand that off-route travel by motorized vehicles is not an authorized use on the southern California national forests. Motorized trail design and compliance strategies would be developed in an effort to achieve greater user compliance and for the sustainability of resources and the activity. Properly designed and maintained, designated motorized trail systems are expected to reduce the effects on species-at-risk and their habitats; they are also expected to reduce the extent of area affected by motorized vehicles when compared to the random development of a user-created unauthorized trail network.

Alternative 1 would continue current management, with some minor work done to make improvements to connecting route opportunities as well as correct trail deficiencies for species protection. Unauthorized use would continue to be a concern for the 45 plant and 14 animal species-at-risk identified as being subject to threats from road and OHV use, because OHV systems are not expected to meet future demands and unauthorized uses will continue to take place (see Effects on Motorized Trails section for further explanation).

Under Alternative 2, motorized trail construction would be minimal, but opportunities for use would increase slightly as some maintenance level (ML) 2 roads would be designated for OHV use to connect existing trails for loop routes. The anticipated increase in motorized trail use would result in greater threats to species-at-risk, but this alternative also includes an emphasis to restore land affected by off-route use.

Alternative 3 would reduce OHV route mileage somewhat due to recommended wilderness zoning in areas where trails currently exist (see table 333: Comparison of Alternative Acres by Land Use Zone, page 26, and the discussion under Effects on Motorized Trails). This reduction in OHV routes would benefit species-at-risk by reducing the threat that off-route travel would occur in non-motorized land use zones. It would also reduce human disturbance of animals. An emphasis on decommissioning and rehabilitating classified and unclassified roads and motorized trails would benefit species-at-risk by reducing the likelihood that invasive nonnative plants would become established and spread. However, restricting the amount of trail mileage could result in more off-route travel occurring in locations where OHV use is allowed, increasing impacts there.

Because of the large amount of Back Country land use zoning (see table 333: Comparison of Alternative Acres by Land Use Zone, page 26), Alternative 4 would allow construction of more new motorized trails or incorporation of appropriate unclassified trails into the OHV route system. This could have greater impacts on species-at-risk than alternatives discussed above, although this alternative also emphasizes mitigating conflicts between recreation uses, including OHV routes, and threatened and endangered species and habitats.

Under Alternative 4a, there would be less opportunity to expand the OHV route system than under Alternatives 1, 2, 4, and 5, because more of the land base would be in Back Country Non-Motorized and Back Country Motorized Use Restricted zoning. This would provide a high level of protection for species-at-risk, yet Alternative 4a would still allow for development of some loop trails and trail segment connections between current use areas, helping to meet the demand for this kind of recreation opportunity. A somewhat higher level of user satisfaction could result from Alternative 4a, leading to less creation of unauthorized routes.

Alternative 5 would have the greatest land area in motorized land use zones and thus the greatest potential for motorized trail system expansion. Much of the projected increase in the OHV system would be due to the incorporation of existing unclassified roads or trails, although any unclassified route that could be accepted into the system must be reconstructed and maintained to Forest Service standards. Under Alternative 5, it is expected that there would be the largest number of motorized trails over the largest area, making it difficult to effectively and efficiently manage the trail network (see Effects on Motorized Trails section). Consequently, impacts from expanded OHV trail use and an anticipated increase in the proliferation of user-created roads and trails are expected.

The effects of Alternative 6 would be similar to Alternative 3, except that no currently designated motorized trails would fall in non-motorized zoning. The opportunity for new OHV routes, using either low-standard National Forest System roads or appropriate unclassified trails, would be least under Alternative 6 (see Effects on Motorized Trails section), with a correspondingly greater benefit to species-at-risk. As under Alternative 3, there would continue to be impacts from a limited and poorly connected trail system in the remaining accessible areas, including continued expansion of the user-created trail network. Thus localized impacts to biodiversity could be exacerbated while other areas are protected.

Management Indicator Species

The effects of motorized trail use on management indicator species and the habitats they represent would be essentially the same as for roads. Animals can adapt somewhat to properly designed and located authorized routes if they are in low density and riders stay on the trails (Loe personal observation). Because motorcycles and all-terrain vehicles (ATVs) can cross terrain too rugged or gaps too narrow for street vehicles, user-created trail networks can affect somewhat more habitat. The effects of the alternatives in managing the route system and network of unauthorized routes, however, would produce similar consequences for habitat.

Effects of Non-Motorized Trails

The ecological effects of non-motorized trails have been summarized in various literature reviews and publications (Boyle and Samson 1985, Cassels-Brown 2002, Cessford 1995, Chavez 1996, Gaines and others 2003, Knight and Cole 1991, Knight and Gutzwiller 1995, Lathrop 2002, Miller and others 1997, Sprung 2003, Vandeman 2004, Yu-Fai Leung 2000). The degree of impact is generally less than from motorized trails and roads due to the narrower width of non-motorized trails, the fact that native surface trails have less adverse influence on hydrologic processes, and the generally less frequent use of non-motorized trails compared to roads and motorized trails. Exceptions occur in some popular backcountry areas, such as the San Gorgonio Wilderness, and in areas with concentrated commercial horseback riding or mountain bike operations, such as the Big Bear Basin.

Trails or trail segments that are located in or near habitat for species-at-risk and special habitats, such as riparian areas and meadows, have the greatest potential for negative effects. Under wet conditions, trail users tend to avoid muddy sections of trail and travel around them, causing trail widening and trampling of trailside vegetation, including any species-at-risk present. However, properly designed and maintained non-motorized trails can generally be located with little impact to species-at-risk and special habitats by avoiding the most sensitive areas. The development of a well-designed system of trails can help maintain habitat in good condition by reducing the need for visitors to travel cross-country or by directing trail users away from sensitive areas. The general direct and indirect effects of non-motorized trails themselves and trail use by horseback riders, hikers, and mountain bicyclists on plants and animals are summarized in Appendix B (General Direct and Indirect Effects to Plants and Animals).

Trail construction and maintenance can cause direct destruction of habitat, although the construction of new National Forest System trails would likely avoid sensitive habitats. Relocation of trails that are in conflict with sensitive habitats is expected to reduce impacts to species-at-risk over the planning period. The effects of trail construction and maintenance are similar those of roads, though on a smaller scale (see discussion under Effects of Roads, above). Use of trails can affect some species negatively. Recreational trails and associated human use can result in changes in bird species composition (favoring generalists over specialists), increased nest predation, and less nesting in areas near trails (Miller and others 1997). Both birds and mammals habituate more rapidly to mechanical noise than they do to human presence, although they have a greater defense response to humans moving unpredictably in the terrain than to humans following a distinct path, like a trail (Gabrielson and Smith 1995). Non-motorized trail users can transport seeds of invasive nonnative species on their clothing, fur (horses or dogs with hikers), or bicycle tires, spreading them into wilderness areas.

User-created trails can proliferate in areas where recreationists leave roads or designated routes in large numbers to get to unique or attractive features such as streams, meadows, rock outcrops, waterfalls, or cliffs. Access trails may be developed over time with little to no formal management by the Forest Service. As an example, concentrated use has created unofficial trails along popular stream courses such as the San Gabriel River on the Angeles National Forest and portions of Deep Creek on the San Bernardino National Forest. These locations also happen to be important habitat for many species-at-risk. Similar examples can be found on all the national forests. User-created trails are frequently found adjacent to developed areas, such as campgrounds and picnic areas. A spider web pattern of disturbance results from this type of random but intensive recreational use; these impacts can have a pervasive effect on habitat and species-at-risk. User-created trails may also become an attraction for other forms of use. For example, trails pioneered by mountain bikers may attract motorcyclists.

Cross-country travel by all forms of non-motorized recreation can have impacts on species-at-risk and their habitats. Of particular concern is cross-country travel by mountain bikes, because of the rapidly increasing number of riders and the amount of habitat they can cross easily with modern equipment. Mountain bikes can have effects on soils and vegetation that are similar to those of motor vehicles, although less severe, when used off of designated routes (see Effects of Motorized Trails discussion). Mountain bikes ridden directly downhill can create ruts, just as motorcycle tracks do, which have a tendency to become gullies over time because the linear nature of the tracks tends to concentrate water. Mountain bike routes (like motorized trails) directly up or down slope tend to get wider as the riding surface becomes more rutted and users move to the side for safety and comfort. Similar to motorized use, topography influences where bicyclists are more likely to leave roads or trails. In some locations, such as pebble plains or meadows, this can put bicyclists in direct conflict with threatened and endangered species.

User-created mountain bike trails have developed adjacent to communities at the national forest boundaries. On the Trabuco District of the Cleveland National Forest (M. Thomas pers. comm.), mountain bicyclists ride Forest Service roads up into the mountains and then create return trails to the community directly downhill, often through sensitive habitats such as oak woodlands and riparian areas.

A similar situation occurs between the Santa Barbara community and Camino Cielo Ridge. Unauthorized trails have even been constructed through chaparral, a vegetation type normally impervious to dispersed recreation use. Users have created unofficial trails in the Big Bear Basin (R. Eliason pers. comm.) and on Laguna Mountain (N. Ferrell pers. comm.). Both areas are extremely popular among mountain bicyclists, and there is intensive trail use, particularly on summer weekends. The presence of commercial bike rentals in the Big Bear Basin contributes to high use levels.

Advances in mountain bike technology present similar management concerns as the advances in motorized technology. In the Big Bear Basin, for example, "extreme sport" mountain bike riders have been taken to the top of the mountain by ski lift or vehicle and subsequently “race” downhill to the community. The user-created trails cross through riparian areas, meadows, and populations of species-at-risk. Because of the damage (rutting, erosion, and sedimentation) that is occurring on the slopes on and around the Big Bear ski areas, and the fact that more and more technically sophisticated extreme bikes are being developed, the ski area operator has stopped extreme sport mountain bikes from being taken up on the ski lifts (P. Bennett pers. comm.).

All of the alternatives have strategies for achieving sustainability of resource values. Alternatives 3, 4, 4a, and 6 would emphasize sustainability by mitigating, removing, or rehabilitating trails that are negatively affecting species-at-risk, particularly federally listed species. However, it is expected that closure would rarely be needed except where watershed hydrologic function was being substantially altered or populations of species-at-risk were threatened. Alternative 4 would focus on developed site facilities, whereas 4a would focus on the recreation setting including dispersed areas where the setting is being harmed as well as species-at-risk. Under Alternative 5 there would be an emphasis on maintaining trails and on mitigating as needed on a case-by-case basis. Public access and development would be the emphasis in this alternative. Species-at-risk would continue to be affected by trail erosion and route proliferation, although case-by-case mitigation would reduce impacts to some degree. Alternatives 1 and 2 would also close, remove or mitigate impacts from high-risk trails. This would benefit species-at-risk, although not to the extent of Alternatives 3, 4, 4a, and 6 because of less emphasis on rehabilitation.

Alternatives 3 and 6 recommend the largest amount of wilderness designation and would limit the development of new mechanized trails to the greatest degree, followed by Alternatives 4a, 2, and 4, respectively. Some trails currently open to mountain bike use would be closed in recommended wilderness zones. This could concentrate mountain bike use and the possibility of off-route travel into a smaller area than at present, with some negative impacts on species-at-risk that are sensitive to that kind of ground disturbance. Species-at-risk in recommended wilderness zones, like existing wilderness, would be protected from the effects of off-route mountain bike riding, but they would still be subject to occasional cross-country travel (and trampling) by hikers and equestrians. Under Alternative 6 (but not 3), all Maintenance Level 2 National Forest System roads would be closed to public motorized use, but they would still be open for hiking, horseback and mountain bike riding. This would effectively expand non-motorized opportunities into areas hikers, equestrians, and bicyclists may have avoided because of vehicle use; the potential impacts on species-at-risk adjacent to the closed roads would be lessened from those of off-route motor vehicle travel to those of off-route hikers, horses or bicycles.

No recommended wilderness zoning is included in Alternatives 1 and 5, so the opportunity to develop mechanized trail opportunities would be the highest in these two alternatives. Because more areas could be developed for motorized use, however, hikers and equestrians may avoid some locations and concentrate their activities in wilderness areas or remaining non-motorized zones (Alternative 1), increasing foot-travel disturbance to some species.

Management Indicator Species

Environmental consequences of the alternatives for management indicator species (MIS) would be similar to those described for motorized trails, though with lower levels of disturbance to habitat. Newly constructed trails could be located outside of important habitats for management indicator species where possible, and conflicting trails could be relocated depending on the alternative emphasis. Fawning areas, California spotted owl nest groves, and riparian habitat could be avoided. This would help protect habitat conditions for arroyo toad, song sparrow, mule deer, California spotted owl, and mountain lion. As with species-at-risk, the greatest management concern with non-motorized trails is off-trail use in habitat that is important to the species and the proliferation of user-created routes

Non-motorized trails would not have a substantial effect on overall forest health and the distribution or abundance of dense, mature conifer forest stands used by California spotted owls. Use and maintenance of trails immediately around the nest stand may disturb California spotted owls during the nesting season. Although no studies have been reported for the California subspecies, Mexican spotted owls flushed from their daytime roosts when approached by hikers within 29 feet (12 m) for juveniles or 79 feet (24 m) for adults (Swarthout and Steidl 2001). Female Mexican spotted owls were observed to change their behavior in response to frequent presence of hikers near their nests in another study (Swarthout and Steidl 2003). California spotted owls may respond similarly to disturbance, suggesting that the presence of large numbers of hikers or other recreationists could reduce nesting success of owl pairs located in easily accessible areas. Some existing trails that were in conflict with California spotted owl nest stands have already been moved.

The effects of non-motorized trails on habitat for plant MIS are not expected to be substantially different by alternative.

Effects of Special Forest Products Management

Special Forest Products (SFPs) are renewable products derived from biological resources for personal, educational, commercial and scientific use. Further description of the types and amounts of Special Forest Products collected on the southern California national forests can be found in the Special Forest Products section in the Affected Environment of Chapter 3. The section General Direct and Indirect Effects to Plants and Animals in Appendix B describes the potential effects of a variety of activities that occur on National Forest System lands.

Several species-at-risk require retention of an abundance of snags and down logs as part of their habitat requirements. The recent level of tree mortality has provided for increased amounts of snags and down logs that would be removed from the Wildland/Urban Interface (WUI) Defense zone to a distance that provides for firefighter safety under all alternatives. Outside of Defense zones, snags and down logs would be retained as needed for wildlife habitat and soil productivity, within the constraints of protection for life and property. Snags and down logs are subject to collection as fuelwood with, or sometimes without, Forest Service permit. Easily accessed sites have the potential to be over collected, and this is especially true for unauthorized collections. In these situations a deficiency in snags and down logs could occur in areas without high levels of tree mortality. Ground disturbance caused by motorized vehicles during the personal collection of fuelwood may also affect species-at-risk. On the other hand, removal of accumulated biomass from fuel treatments through the use of SFP sales in some locations could benefit other species-at-risk by reducing high levels of fuel loading within habitat.

Adverse effects from this activity include trampling of vegetation, disturbance to bird nesting sites and cover during harvesting of SFP (branches, stems, grass, seeds), and effects to insects due to loss of host plants or larvae which are disturbed during harvesting. Effects to wildlife food sources and loss of individuals collected by visitors could also occur. Human disturbance associated with gathering SFP can adversely affect wildlife and plants. Little is known regarding the ecological effects at the landscape level. More knowledge is needed regarding how harvesting and collecting Special Forest Products affect species and ecosystems (USDA Forest Service 2001).

Management direction that is designed to meet objectives for species-at-risk is present in all alternatives. In Alternative 1, the forest plan standard that restricts collection where it would negatively affect recovery or occupied habitat of federally-listed threatened, endangered, proposed, or candidate species, except where appropriate in response to requests from Native Americans would be retained in all alternatives. In addition, in Alternatives 2 through 6, the standard for snag and down log requirements outside of WUI Defense zones or where they pose a safety hazard, and use of motorized vehicles on National Forest System roads only would also assist in meeting species-at risk objectives during collection of special forest products.

Ground disturbance by motor vehicles and the ability to meet the snag and down log requirement related to the amount of motorized access to SFP collection sites was used for alternative analysis. Alternatives are analyzed by comparing land use zones that restrict public motorized access (Back Country Non-Motorized, Back Country Motorized Use Restricted, Critical Biological, Experimental Forest, existing wilderness, and recommended wilderness) and acres of recommended research natural areas, as permits would not be given within this special area designation. Alternatives with the highest acreage of limited motorized use and biodiversity protection from SFP removal are 6, 4a, 3, 2, 4, 1, and 5, respectively. Alternatives with the highest acreage of recommended research natural areas are 6, 3, 2, 4a, 4, 1, and 5, respectively.

Management Indicator Species

Special forest product harvesting should have relatively minor impacts to management indicator species (MIS) and the habitats and biological processes they represent. This activity cumulatively adds to the impacts of human disturbance which can be a problem for mule deer, mountain lion, arroyo toad, California spotted owl and song sparrow. However, this activity on its own has little affect when done according to policy and regulated. Permits are required generally for this activity and sensitive areas such as California spotted owl nest stands and riparian areas can be excluded from permitted areas. Unauthorized collection of forest products can be a problem and there have been some examples of nest disturbance to spotted owls in illegal fuelwood removal operations. The ranking of alternatives above related to motorized access would generally be the same for MIS as for species-at-risk, since it is generally not a problem in inaccessible areas.

Effects of Livestock Grazing

There are 602,222 acres of capable livestock grazing land within the four southern California national forests (table 182: Acres Capable of Supporting Livestock); this is 17 percent of the total National Forest System land base of 3,530,993 acres. Of these capable grazing lands, a maximum of 585,549 acres are actually suitable for grazing, depending on the alternative (table 108: Grazing Suitability by Forest by Alternative). Livestock grazing can affect biodiversity on designated livestock grazing areas in a variety of ways (see Appendix B, General Direct and Indirect Effects to Plants and Animals).

Table 182. Acres Capable of Supporting Livestock

National Forest	Total Acres	NFS Acres	Capable NFS Acres
Angeles	52,298	50,862	23,291
Cleveland	161,746	126,696	47,401
Los Padres	873,162	756,669	407,736
San Bernardino	206,192	184,925	123,794
Totals	1,293,398	1,119,152	602,222

Table 108. Grazing Suitability by Forest by Alternative

		Angeles	Cleveland	Los Padres	San Bernardino	Totals
# Grazing Areas		7	33	141	26	207
NFS Capable Area		23,291	47,401	407,736	123,794	602,222
Alt 1	#	7	33	135	26	201
	Acres	23,273	44,259	398,652	119,365	585,549
Alt 2	#	5	26	116	18	165
	Acres	16,791	41,065	346,554	45,672	450,082
Alt 3	#	5	25	108	18	156
	Acres	16,791	36,120	313,694	45,672	412,277
Alt 4	#	5	26	113	18	162
	Acres	16,791	41,065	345,361	45,672	448,889
Alt 4a	#	5	26	113	18	162
	Acres	16,791	41,132	345,361	45,672	448,956
Alt 5	#	5	33	125	26	189
	Acres	16,791	42,646	364,959	118,481	542,877
Alt 6	#	5	22	94	18	139
	Acres	2,030	15,061	54,462	15,766	87,319

The impacts of livestock grazing on plants vary, depending on grazing animal species, numbers, and management. Individual plants can be affected directly, by defoliation, pull-up, breakage and trampling, or indirectly, by animal-induced changes in habitat that make conditions less favorable for plant growth and survival. Livestock herbivory does not have equally negative effects on all native plant species. Some plants apparently can tolerate a certain amount of herbivory; others have avoidance mechanisms. Plants often have similar responses to damage from several different sources (e.g., fire, wind, and freezing) (Painter 1995).

There are two major opposing views of the effects of herbivores on plant growth and reproduction (McNaughton 1983). The most common view is that herbivory is detrimental to plants and represents a selective pressure for the evolution of plant defenses. In contrast is the view that plants can benefit from being eaten because they respond by overcompensating, ultimately achieving greater fitness. Belsky (1986) concluded that there was as yet no convincing evidence that herbivory increases plant fitness under natural conditions. Paige and Whitham (1987) documented a reproductive advantage to being eaten in *Ipomopsis aggregata* (scarlet gilia); however, results from that study have been challenged by other investigators (e.g., Bergelson and Crawley 1992). Caution is recommended when extrapolating the results of compensatory-growth studies from one species to others. Phylogeny and similar morphology are not necessarily good predictors of response to grazing or defoliation (Painter and Belsky 1993).

Grazing, whether by livestock or wildlife, can affect the competitive relationships between species, favoring unpalatable species at the expense of those favored by grazers (Hobbs and Huenneke 1992). This does not mean that grazing benefits individual plants that have been partially eaten, however (Belsky 1986). An intermediate level of grazing may result in the maximum level of species richness or diversity, although some of that diversity may be the result of invasion by nonnative species. Grazers can bring seeds of nonnative species into an area, as well as create soil disturbance that provides establishment opportunities for invasive species (Hobbs and Huenneke 1992). In particular, livestock concentrated use areas, such as trails, bedding locations and water sources, may create favorable sites for the spread and establishment of nonnative plants. On the other hand, proper grazing management can help to minimize spread and effectively manage noxious weeds in many rangeland systems (DiTomaso and others 2000).

Livestock grazing can affect ecosystems by changing species composition, disrupting ecosystem functions, and altering ecosystem structure. This has best been documented on arid and semiarid lands (Fleischner 1994). Current levels of grazing on public lands may not have a substantial impact on species composition, however. Comparison of grazing exclosures in place for 65 years on Nevada rangelands showed little difference in species composition or cover (Courtois and other 2004). Changes in species composition from pre-settlement times probably occurred earlier, during periods of excessively heavy grazing; the trajectory of recovery was not different under moderate grazing and grazing exclusion.

Replacement of native perennial grass species by nonnative annuals has been partially attributed to grazing in California as well as elsewhere. Although soil disturbance by grazers does create establishment opportunities for nonnative annuals, as noted above, native perennial grasses have persisted despite being grazed by cattle in some California rangelands (Stromberg and Griffin 1996). Past soil cultivation was found to be the strongest factor associated with nonnative annual grass dominance in that study. A native grazer (the pocket gopher) produced bare soil piles that favored the establishment of exotic annual grasses relative to native perennial grasses as well (Stromberg and Griffin 1996). Bartolome and Gemmill (1981) found that seedlings of *Nasella pulcra (*a native perennial bunchgrass) did not survive where annual grasses were dense. Where the annual cover was reduced by fire, grazing, or disturbance, *N. pulcra* seedlings were able to establish. Once established, *N. pulcra* plants persisted under moderately heavy grazing (Bartolome and Gemmill 1981). These studies suggest that current moderate levels of grazing on National Forest System lands probably do not further degrade the already-altered condition of the rangelands.

Livestock may increase the invasibility of grass, shrub, and woodland ecosystems by redistributing soil nitrogen, creating locally enriched areas via deposition of urine and manure. High soil nitrogen content may favor the establishment of weeds that prefer high nitrogen concentration (Belsky and Gelbard 2000). However, Jones and Woodmansee (1979) noted that the availability of nitrogen in manure was low, and the amount mineralized and utilized by plants during one year is very small. Because manure was more resistant to decomposition than was plant material in the annual grasslands studied, a smaller proportion of nitrogen was mineralized from the manure than from plant material. In addition, they found that 70 percent of the nitrogen ingested by animals was excreted in urine, and 50 to 80 percent of urea nitrogen could be volatilized as NH_3 (ammonia) under dry, warm conditions (Jones and Woodmansee 1979). Spatial and temporal patterns of cattle manure deposition across oak savannah watersheds is dependent upon a complex and interacting group of management and environmental factors. These include location of livestock attractants, slope, aspect, topographic position, and season (Tate and others 2003).

Livestock can modify the physical structure of soil and soil crusts through compaction, dusting, hoof action, bedding areas, trails, and removal of ground cover. Jones (2000) suggested that ecosystem integrity be evaluated by the following connected variables: cryptogamic crust cover, soil infiltration rates, and litter cover. Soil-related variables were most negatively affected by grazing, followed by litter cover and biomass, respectively (Jones 2000). The effects of livestock grazing on cryptogamic soil crusts are discussed in the section Effects on Soil.

Aquatic species and riparian-dependent species can be affected by livestock grazing (see table 218: Potential Effects to Riparian Vegetation from Management Activities, page 209, and table 219: Potential effects to streambanks from management activities, page 202). Livestock grazing was found to negatively affect water quality and seasonal quantity, stream channel morphology, hydrology, riparian zone soils, instream and streambank vegetation, and aquatic and riparian wildlife (Belsky and others 1999). Kauffman and Krueger (1984) reported that inappropriate livestock management resulted in overuse and subsequent degradation of riparian and stream ecosystems. Trails created by livestock, especially in concentrated use areas, can be sources of sediment delivery to streams, especially under heavy stocking rates. However, this effect is less likely to occur under proper stocking rates and grazing practices (George and others 2004). Some degree of bare soil and trampling effects will be inevitable in livestock concentration areas, such as around water sources, especially during the extended dry season in southern California.

Allen-Diaz and others (2004) found that light cattle grazing could be compatible with maintaining ecosystem function at springs in a long-term study in the Sierra Nevada foothills. Moderately grazed plots near streams maintained greater relative total species evenness and diversity than lightly grazed and ungrazed plots, which were not significantly different from each other. Sustained moderate grazing eventually reduced total plant cover near springs, suggesting that decreasing the grazing pressure periodically was an advisable management action (Allen-Diaz and others 2004). Properly managed grazing appears to be beneficial to vernal pool habitats on California's annual rangelands (Barry 1995). By eating aggressive nonnative annual grasses and reducing the thatch they create, livestock help keep the habitat more open for native vernal pool plant species. Reduced vegetation cover under grazing management also results in greater rainfall runoff flowing into vernal pools, allowing water to persist longer and favoring native vernal pool plant and animal species (Barry 1995).

Biodiversity can be affected by the changes in plant and animal habitat that occur during the construction, maintenance, and use of rangeland improvements such as fences, cattle guards, water troughs, and corrals. For threatened, endangered, proposed, candidate, and sensitive species, direct negative effects resulting from the construction, use, and maintenance of new rangeland improvements would be avoided or mitigated because these species would be considered during the project planning process due to forest plan standards (S11, S12, and others). There are often indirect benefits when rangeland improvement structures prevent or limit livestock access to habitat for species-at-risk. Livestock water impoundments provide breeding habitat for some native amphibians (Quinn and others 2001). They also provide a water source for native wildlife and are especially important where natural sources have been affected by human use and development.

Beschta and others (2004) considered livestock grazing following fire to be generally inconsistent with efforts to restore ecosystem functions. Practices that negatively affect soil integrity, persistence or recovery of native species, riparian functions, or water quality generally impede ecological recovery after fire. Robichaud and others (2000) found that many Burned Area Emergency Rehabilitation team members considered eliminating grazing from burned areas for the first few years after fire as one of the best ways to quickly establish vegetation cover and prevent soil erosion. Both native and nonnative grazers could reduce plant cover establishment after a fire. Under the revised forest plans, a site-specific interdisciplinary effects analysis would be conducted following a fire to determine the timing, duration, frequency, and intensity of grazing, if any, that would be allowed (Part 3 of revised forest plans, standard S54).

Under all alternatives, when permits for allotments and grazing areas are issued, site-specific analysis of the degree of impact(s) would be conducted and appropriate management actions required and implemented. In addition to measures required when site-specific analysis of allotments is done, forest plan design criteria and guidance would provide protection of resources and should help rangelands meet or move towards desired conditions.

Within the planning area, the Los Padres National Forest has the majority of impacts associated with livestock grazing, with 23 percent of its acreage capable of supporting livestock. The San Bernardino National Forest has 19 percent, the Cleveland National Forest has 11 percent, and the Angeles National Forest has 4 percent of the total acreage of each national forest capable of supporting livestock grazing.

Effects of Livestock Grazing Between Alternatives

The magnitude of impacts resulting from livestock use is directly related to type of vegetation being grazed and the extent to which grazing occurs across the landscape. The number of acres of land suitable for grazing (table 108: Grazing Suitability by Forest by Alternative) and the number of vacant grazing areas expected to be available for grazing (table 183: Number of Vacant Grazing Areas Expected to be

Available for Grazing by Alternative, page 64) vary by alternative. Differences among alternatives are a result of the number of acres in Critical Biological zones and the results of capability and suitability analysis (Appendix P. Livestock Grazing Suitability Analysis). Alternative 6 restricts livestock grazing to slopes of less than 20 percent, compared to 60 percent for all other alternatives. Certain habitat types contain greater numbers of species-at-risk that are potentially sensitive to the impacts of livestock grazing (see table 374: Summary of Plant Threats by Vegetation Group; table 367: Plant Species-At-Risk, and table 370: Animal Species at Risk List). As a result, the acres of coastal sage scrub (habitat group number 3.1), meadow (habitat groups 13 and 13.1), oak woodland and savanna (habitat group 2), and mapped riparian habitat (habitat groups 1.1 through 1.3) expected to be grazed also vary among the alternatives (table 550: Acres Expected to be Grazed by Key Vegetation Types).

Table 374. Summary of Plant Threats by Vegetation Group

Please see Table 467, Key to Codes Frequently Used in Biodiversity Tables, page **131**

Habitat Group No.	1	1.1	2	3	3.1	3.2	4	5	6	7	8	9	10	11	12	13	13.1	13.2	16	17.1	17.3	18
No. of Species	5	9	10	25	7	43	1	33	5	17	27	15	10	9	11	9	13	2	11	2	3	3
Threats Not Described	1	2	4	3	3	8		8	1	3	11	4			4	1	1		5	1	1	
Narrow Endemism		3	2	5		6	1	3		4	3	4	4	1	4	4	1			1		1
Private Land Development and Use	2	6	6	18	6	12		1	3		3	10	1	5	2	5	4	1	3	2	3	2
Grazing	1	3	4	4	2	7		2	2	1	5	4	3	5	3	7	10	1	1	1		1
Invasive Species		3	4	2		5		1	2	1	1	6	1	4	3	2	1	1	1		1	1
Mining		2				3		3		1	7	2	10	4	2		4	1			3	
Recreation Use	3	3		3	3	11	1	19	2	11	8	3	5	8	3	8	10	2	2			
OHV Use	1	1	1	1		3		5			7	3	10	7	4	6	4	2		1	1	2
Illegal Dumping												2		1							1	1
Fire Suppression		1	1	3	1	9		1				2			1	1			1	1		
Disking												1								1		
Road Maintenance and Construction	1	1	1	4	4	8		5	2	1	5	2	1	2	6	5	2		1			3
Frequent Fire				2		7		2			1	3	1			1						
Trail Construction						4		2			3		1	1			1					2
Altered Hydrology and Erosion	3	3	1			1								2	1	2	6			1	3	3
Utility Corridors						2		2			2		2						1			2
Facility Construction				1		2		2			3		2	1	1		1	2				
Fuel Management				2	1	6									1			1				
Timber Harvest								3			1					1	1					
Collecting	1	1		1						1	1	3					1					
Fuelwood								3														
Ski Area								5		2			1									

Habitat Group No.	1	1.1	2	3	3.1	3.2	4	5	6	7	8	9	10	11	12	13	13.1	13.2	16	17.1	17.3	18
Development																						
Hybridization			1	1		1		1									1					
Trampling Cryptobiotic Crusts															1							
Insects						1																
Herbicides															1							
None											1											
Tree Planting						1		1														
Landslides						1																
Drought						1																
Military Maneuvers						1																

Table 376. Potential Threats to 93 Plant Species-At-Risk and Standards That Address Those Threats

Potential Threat Factors for Plant Species-At-Risk	Standards That Address Threats*
Access (roads, trails, OHV routes)	11, 12, 13, 24, 25, 32, 33, 34, 35, 37, 47 , CNF 3, CNF 16, SBNF 2
Altered hydrology	11, 12, 24, 41, 45, 46, 47, 48
Recreation	11, 12, 13, 24, 31, 32, 33, 34, 35, 36, 40, 41, 47, 50, CNF 9, CNF 16, SBNF 2
Grazing	11, 12, 13, 24, 51, 52, 53, 54, 56, CNF 11
Incomplete knowledge	6, 12, 29, 31, 32, 52, 54, 56
Invasive nonnative plants	6, 11, 12, 24, 33, 34, SBNF 11
Mining	11, 12, 24, 34, 43, 44, SBNF 3
Small population size	11, 12, 24, 29, 34, CNF 10, CNF 13, CNF 14
Vegetation management	6, 11, 12, 13, 32, 33, 37

* Standards are located in the land management plans in Part 3: Design Criteria for the Southern California National Forests

Table 377. Animal Species-At-Risk, Threats That Affect Them, And Standards That Address the Threats

Table 377. Animal Species-At-Risk, Threats That Affect Them, And Standards That Address the Threats		
Common Name	**Threats on National Forest System lands**	**Standards that address threats to animal species-at-risk***
All species-at-risk	Ground disturbing activities	6, 33, 40, 41, 47, 54
Arroyo toad	Diversion or groundwater extraction, road crossings, roads, campgrounds, nonnative plants, unauthorized OHV use, livestock grazing, and suction dredging and prospecting	6, 11, 12, 13, 22, 24 ,25, 31, 33, 34, 35, 36, 37, 40, 41, 43, 44, 45, 46, 47, 48, 50, 51, 53, 54
California red-legged frog	Grazing, water diversion/extraction, campgrounds and roads, water play, disease spread from surveys	11, 12, 13, 22, 24, 25, 31, 33, 34 ,35, 36, 37, 40, 41, 43, 44, 45, 46, 47, 48, 50
Coast range newt	Groundwater extraction, water diversion or pollution, recreation and roads in riparian, water releases	22, 35, 36, 37, 40, 41, 45, 46, 47, 48, 50
Mountain yellow-legged frog	Recreation use in streams, water play, roads and trails, water diversion or extraction, recreation facilities, small-scale mining and prospecting	11, 12, 13, 22, 24, 25, 31, 33, 34 ,35, 36, 37, 40, 41, 43, 44, 45, 46, 47, 48, 50
Western spadefoot	Roads and lack of connectivity to valley open space, hydrologic changes	22, 37, 45, 46, 47, 48, 50
American dipper	High levels of summer recreation use on major rivers	35, 40, 41, 47, 50
Bald eagle (breeding)	Recreational use, OHV use, wildfire	6, 11, 12, 14, 15, 18, 24, 25, 27, 31, 34, 35, 36, 37, 38, 42, 47, 50
Black swift	Waterfall related recreation	35, 47, 50
California condor	Communication and utility facilities, harassment at cliffs, lead, shooting	11, 12, 18, 24, 25, 28, 33, 34, 36, 42
California spotted owl	Wildfire and fuels treatment, ski area expansion	11, 14, 15, 17, 18, 19, 20, 21, 34, 37
Calliope hummingbird	Recreation and other meadow disturbance	35, 40, 41, 47, 50, 51, 52, 53, 54, 56
Coastal California gnatcatcher	Fire suppression, fragmentation, grazing	6, 11, 12, 24, 25, 31, 32, 34, 37, 38, 39, 51, 54
Common yellowthroat	Dewatering, recreation use, grazing	35, 41, 45, 46, 47, 48, 50, 51, 53, 54, 56
Flammulated owl	Lack of natural fire return intervals in conifer stands	14, 15, 17
Golden eagle	Development of valleys and human use of cliffs for climbing, shooting and lead	18, 36

Table 377. Animal Species-At-Risk, Threats That Affect Them, And Standards That Address the Threats

Common Name	Threats on National Forest System lands	Standards that address threats to animal species-at-risk*
Least Bell's vireo	Grazing, special uses, recreation	11, 12, 13, 24, 25, 29, 31, 32, 33, 34, 35, 40, 41, 43, 44, 45, 46, 47, 50, 51, 53, 54, 55, 56
Lincoln's sparrow	Wet meadow activities	35, 41, 46, 47, 50, 51, 53
Long-eared owl	Riparian and oak woodland degradation from activities and recreation use	47, 50, 51, 52, 53, 54, 56
MacGillivray's warbler	Wet meadow and riparian activities	35, 41, 46, 47, 50, 51, 53
Prairie falcon	Cliff climbing recreation	18
Purple martin	Loss of bigcone Douglas-fir and large snags to wildfire, fuel wood harvest and fuels management	14, 15, 17
Southwestern willow flycatcher	Intensive recreation use, wildfire, grazing, special uses, OHV use, roads, water diversion	11, 12, 13, 24, 25, 29, 31, 32, 33, 34, 35, 40, 41, 43, 44, 45, 46, 47, 50, 51, 53, 54, 55, 56
Swainson's thrush	Intensive recreation use, wildfire, grazing, OHV use, roads and water diversion	35, 37, 46, 47, 48, 50, 51, 53, 54
Turkey vulture (breeding)	Harassment at nesting locations - climbing at cliffs, shooting and lead	18, 36
Western snowy plover	Dispersed recreation (beaches)	11, 12, 24, 34
Wilson's warbler	Intensive recreation use, wildfire, grazing, OHV use, roads and water diversion	5, 37, 46, 47, 48, 50, 51, 53, 54
Yellow-breasted chat	Dewatering, recreation use, grazing	35, 41, 45, 46, 47, 48, 50, 51, 53, 54, 56
Arroyo chub	Isolation, no connectivity with off-forest downstream habitat, channelization, diversions, dewatering, intensive recreation, water play in streams during critical life stages, recreational dam building, hybridization w/Mojave tui chub, competition and predation by nonnative fish	11, 13, 22, 34, 35, 41, 45, 46, 47, 48, 49, 50

Table 377. Animal Species-At-Risk, Threats That Affect Them, And Standards That Address the Threats

Common Name	Threats on National Forest System lands	Standards that address threats to animal species-at-risk*
Pacific lamprey	Water play, roads, road crossings and trails, water diversion and/or excessive flow releases, campgrounds, suction dredging, small scale mining and prospecting, oil and gas exploration and development, nonnative plant invasions, nonnative/stocked fish, livestock overgrazing, upstream/downstream mobility restrictions-road fish passage barriers, habitat fragmentation, reduced connectivity with upstream habitat	6, 22, 35, 45, 46, 47, 48, 49, 50, 51, 53
Partially armored three-spine stickleback	Isolation, no connectivity with downstream off-forest habitat, channelization, diversions, dewatering, OHV use, roads and trail crossings (SBNF)	11, 13, 22, 34, 35, 41, 45, 46, 47, 48, 49, 50
Santa Ana speckled dace	Isolation, no connectivity with downstream off-forest habitat, channelization, diversions, dewatering, intensive recreation, water play in streams during critical life stages, recreational dam building, suction dredging, trash in streams	11, 13, 22, 34, 35, 41, 45, 46, 47, 48, 49, 50
Santa Ana sucker	Intensive recreation, water play in streams during critical life stages (spawning and egg development), recreational dam building, suction dredging, trash in streams, competition & predation by introduced game fish (brown trout) & nonnative fish (red shiner & green sunfish), hybridization risks, stream flow management downstream of reservoirs (ANF)	11, 12, 13, 22, 24, 34, 35, 41, 45, 46, 47, 48, 49, 50
Southern and south-central steelhead trout	Water play during critical life stages, roads, road crossings and trails, water diversion and/or excessive flow releases, campgrounds, suction dredging, small scale mining and prospecting, oil and gas exploration and development, nonnative plant invasions, nonnative/stocked fish, hybridization, livestock overgrazing, upstream/downstream mobility restrictions-road fish passage barriers, habitat fragmentation, loss of connectivity with upstream habitat	11, 12, 13, 22, 24, 25, 34, 35, 41, 45, 46, 47, 48, 49, 50, 51, 53, 54, 56
Unarmored three-spine stickleback	Isolation, no connectivity with downstream habitat, channelization, diversions, dewatering, recreation	11, 12, 13, 22, 24, 34, 35, 41, 45, 46, 47, 48, 49, 50
Baldwin Lake blue butterfly (near dammersi ssp.)	General threats to pebble plains (illegal OHV use, recreation)	6, 35, 37, SBNF 2; also protected by pebble plains mgmt guide
California diplectronan caddisfly	Water play activities	47, 50

Table 377. Animal Species-At-Risk, Threats That Affect Them, And Standards That Address the Threats

Common Name	Threats on National Forest System lands	Standards that address threats to animal species-at-risk*
Desert monkey grasshopper	Too-frequent fire could affect habitat due to cheat grass invasion; unauthorized off-road vehicle activity	6, 35, 37; also protected by designation of suitable uses (no off route vehicle travel)
Erlich's checkerspot butterfly	Recreation activity in pebble plains	35, 37, SBNF 2; also protected by pebble plains mgmt guide
Harbison's dun skipper	Associated with low-elevation springs and seeps, so could be threatened by water withdrawal; grazing could affect larval host plant	35, 46, 47, 50, 51, 53, 56
Hermes copper butterfly	Could be affected by prescribed fire or fuel reduction projects in habitat that affect host plant, Rhamnus crocea; wildfire risk	37
Laguna Mountains skipper	Grazing, recreation activity, small numbers	11, 12, 24, 25, 29, 30, 31, 32, 33, 34, 35, 37, 38, 40, 41, 50, 51, 52, 53, 54, 56, CNF 9, CNF 16
Quino checkerspot butterfly	Habitat disturbance that increases nonnative grass at expense of larval food plants	6, 11, 12, 13, 24, 25, 30, 34, 37, 38, 43, 44, 51, 52, 53, 54, 56
San Gabriel Mountains elfin	Main threat appears to be from butterfly collectors	
Vernal blue butterfly	Plant collection; unauthorized insect collection; unauthorized OHV activity; unauthorized grazing	35, 37, SBNF 2; also protected by pebble plains mgmt guide
American badger	Urbanization and disruption of linkages to suitable valley habitat	22
Mountain lion	Loss of connectivity, loss of mule deer and sheep productivity	22, 26, SBNF 5
Nelson's bighorn sheep	Cobblestone Mountain: lack of fire; San Gabriel Mountains: lack of fire, recreation and ski area expansion, highway reconstruction; Cushenbury: mining	11, 22, 26, 34, 35, 36, 37, 43, 44, SBNF 5
Peninsular bighorn sheep	Grazing by cattle, lack of fire, feral dogs, hiking in lambing areas	11, 22, 24, 25, 26, 34, 35, 36, 37, 38, 51, 53, 54, 56, SBNF 5
San Bernardino flying squirrel	Wildfire, fuels management, fuel wood removal	11, 14, 15, 17, 37
San Bernardino kangaroo rat	Special use permits, railroad expansion, road and railroad expansion, flood control work	6, 11, 12, 24, 31, 47
Townsend's big-eared bat	Disturbance of caves/mines	11, 23, 34
Belding's orange-throated whiptail	Fuels management in coastal sage scrub and conversion to annual grassland from fire	39 (where overlaps with coastal California gnatcatcher)

Table 377. Animal Species-At-Risk, Threats That Affect Them, And Standards That Address the Threats

Common Name	Threats on National Forest System lands	Standards that address threats to animal species-at-risk*
Mountain garter snake	Dewatering, human disturbance in meadows	35, 38, 46, 47, 50
Southern Pacific pond turtle	Diversion or groundwater extraction, recreational collecting	11, 22, 34, 45, 46, 47, 48, 50
Southern rubber boa	Fuels mgmt. and other ground disturbance, development, roads and motorized trails	11, 14, 15, 17, 34, 37, SBNF 4

*Standards are located in the land management plans in Part 3: Design Criteria for the Southern California National Forests

These tables indicate that the extent of livestock grazing in habitat with the most biodiversity concerns would be greatest under Alternatives 1 and 5; intermediate under Alternatives 2, 4, 4a, and 3; and least under Alternative 6. Overall, there would be slightly fewer acres of land suitable for livestock grazing under Alternative 3 relative to Alternatives 4 and 4a, and correspondingly less acreage of coastal sage scrub, meadow, and riparian vegetation would be expected to be grazed under Alternative 3 than Alternatives 4 and 4a.

As a consequence, for the 15 plant and 13 animal species-at-risk potentially threatened by the effects of livestock grazing, Alternatives 1, 5, and 2 would contribute more to this risk factor than would Alternatives 6, 3, 4a, and 4, respectively. For those species-at-risk found in coastal sage scrub, meadows, and oak woodlands, the potential impacts from grazing would be less in Alternative 3 relative to Alternatives 4 and 4a due to the smaller amount of land available for this use. Under all alternatives, the effects of livestock grazing on threatened, endangered, proposed, candidate, and sensitive species would be mitigated by Forest Plan standards (see tables 376: Potential Threats to 93 Plant Species-At-Risk and Standards That Address Those Threats and 377: Animal Species-At-Risk, Threats That Affect Them, And Standards That Address the Threats for identification of standards specific to grazing).

Alternative 6 is expected to decrease the number of grazing areas by 68 and reduce capable acres by 514,882 by restricting grazing to slopes of less than 20 percent. Most of the land that would be excluded from grazing is covered with chaparral. The suitable acres remaining under this alternative are the most productive areas on the national forests. Because cattle in grazing areas tend to spend most of their time in the flatter and more productive areas anyway, the actual change in grazing pressure may not be substantial in some allotments. This could still result in beneficial effects on some plant species growing on steeper slopes, while a negative effect could be realized on plant species that benefit from the reduced competition caused by grazing of their neighbors.

Management Indicator Species

Mule deer and mountain lion have benefited from water development for livestock primarily because of the lack of water in some areas (as have other species with similar water requirements). Closing grazing areas could negatively affect wildlife dependent on that source of water if the available water developments are abandoned by the grazing permittee and maintenance is not performed by the Forest Service or volunteer groups. Because Alternative 6 would have the fewest grazing areas that remained suitable, it could reduce the availability of water from livestock developments the most (table 108: Grazing Suitability by Forest by Alternative, page 64). This could reduce habitat quality for these two species and others with similar requirements. Alternatives 2, 3, 4, and 4a reduce the number of suitable grazing areas, relative to Alternative 1, more than does Alternative 5 but less than Alternative 6. They would consequently have an intermediate level of potential effect on water availability for wide-ranging species.

As described above, cattle tend to congregate in riparian areas, near water, especially during hot dry seasons. Grazing animals in streams could trample arroyo toad egg masses or tadpoles; nesting habitat for song sparrows could be damaged or eaten as well. Alternatives 2, 3, 4, 4a, and 6 would reduce the number of acres of mapped riparian habitat expected to be grazed by roughly 42 to 45 percent compared to Alternative 1 (table 550: Acres Expected to be Grazed by Key Vegetation Types, page 322), due to suitability criteria and locations of Critical Biological zoning. This could result in improved habitat conditions for the two aquatic/riparian management indicator species, as well as for other species dependent on healthy, functional riparian areas. The standards and guidelines that were developed for riparian conservation areas should also help protect habitat for arroyo toad, song sparrow, and other riparian-dependent species within grazing areas.

The discussion of effects of livestock grazing on oak woodlands and savannas in the section Effects on Vegetation applies to the management indicators for this habitat type: blue oak, Engelmann oak, and valley oak. To the extent that livestock grazing limits the ability of oak seedlings to reach the sapling stage, Alternatives 2, 3, 4, 4a, and 6 could increase opportunities for seedling and sapling recruitment in oak woodlands and savannas by removing grazing from 10 to 20 percent of currently suitable acres (table 550: Acres Expected to be Grazed by Key Vegetation Types, page 322). However, the removal of grazing without control of nonnative annual grasses may not result in increased oak seedling survival if grass competition is a significant factor affecting seedling success (Danielson and Halvorsen 1991). Likewise, herbivore pressure on acorns and oak seedlings from native rodents and ungulates would remain under these alternatives. Alternatives 1 and 5 would generally maintain the current situation for blue oak, Engelmann oak and valley oak.

Variations in livestock grazing by alternative would have little to no effect on Coulter pine, bigcone Douglas-fir, and conifer forest management indicator species, as little of these habitat types is within grazing areas.

Effects of Mineral and Energy

Mineral and energy management consists of Forest Service administration of discovery, exploration, and development of locatable minerals (*e.g.* precious metals, rare earth minerals, and high quality carbonate rock), non-renewable energy resources (*e.g.* oil and gas), and mineral materials (common variety minerals such as rock, sand and gravel, *etc*.). Also included is the development of renewable energy resources such as solar, wind, geothermal and hydroelectric power. See the Affected Environment and Environmental Consequences sections for Minerals and Energy Management, Watershed, and Soils for more details about this type of management.

Table 545. Approximate acres of major ground disturbance currently present.

Disturbance Indicators (in acres)	ANF	CNF	LPNF	SBNF	Total	Percent of land base disturbed
Veg/Fuel treatments (approximate)	3,375	3,375	4,000	7,000	17,750	0.5%
Grazed acres suitable	23,273	44,259	398,652	119,365	585,549	17%
Roads maintained	883	408	1,129	1,198	3,618	0.1%
Active mining operations	1,098	122	159	623	2,002	0.06%
Wildfire-approximate over last 3 years	112,900	80,000	40,000	92,000	324,900	9%
Special use permits	20,946	4,592	6,169	5,314	37,021	1%
Total disturbed acres	162,475	132,756	450,109	225,500	970,840	28%
Total Forest acreage FY05	662,983	420,877	1,781,380	665,753	3,530,993	
Total percent disturbed By Forest	25%	32%	25%	34%		

There are currently approximately 2,002 acres of active mines, or 0.06 percent of the National Forest System lands base in southern California (see table 545: Approximate Acres of major ground disturbance currently present), and this total does not change by alternative. This acreage does not include the tens of thousands of mineralized acres (many of which are under mining claim) that are open for mining-related activities, although in most areas there has been very little demand for new mining developments or energy operations over the past decade. Mining and energy management activities have a high potential for effects to species-at-risk and biodiversity (see Appendix B, Species Viability, General Direct and Indirect Effects to Plants and Animals).

Sixteen plant and some animal species-at-risk occur in habitat threatened by existing mining claims and operations. Mining operations can affect species-at-risk by removing, degrading, and fragmenting habitat. In addition, there are potential impacts such as animal harassment and dust associated with the operations. Plans of Operation and reclamation plans are designed and administered to partially mitigate adverse impacts. Closing adits or mining shafts with gates to protect national forest visitors is a proactive method of securing an unsafe area while at the same time providing access to cave habitat for bats. The severity of these impacts range widely, from the large-scale habitat removal associated with open-pit mining to the relatively minor but chronic habitat degradation associated with prospecting and small-scale gold mining. Areas that are withdrawn from mineral entry can have a positive affect to species-at-risk because they will not be exposed to these types of activities. Of the plant and animal species potentially affected by mining operations or prospecting, some are also listed as threatened or endangered under the federal Endangered Species Act of 1973, as amended.

Oil and gas exploration and development can result in ground disturbance, erosion, sedimentation, noise, traffic, concentrated human presence, potential for contamination of soils near the drill sites, and removal of habitat. As explained in the Minerals and Energy section of the Affected Environment, exploration (on the Los Padres National Forest only) will be limited geographically and be subject to the stipulations from the Oil and Gas EIS. In addition, oil and gas operations are prohibited by stipulation in areas subject to slope instability, riparian areas, and wetlands, which reduces the risk to riparian areas and watercourses. The entire set of stipulations is expected to avoid or minimize potential effects to species-at-risk and biodiversity.

Renewable energy resource development can have a variety of effects on species-at-risk and biodiversity depending on the type developed. Towers and turbines associated with wind energy development can result in collision death and injury hazards to birds; solar development would require clearing and removal of habitat and can cause impediments to migration and animal movement. Hydroelectric power developments with instream structures that modify and alter the natural hydrologic flow regime have potential for substantial effects on riparian-dependent species-at-risk and biodiversity. Reduction in stream flows can result in loss of habitat from a change in water quantity, lowered water quality, a decrease or loss of riparian vegetation, and fragmentation of habitat or losses of movement corridors, which can result in species genetic isolation. Inadequate streamflow, poor water quality and degraded riparian conditions are issues for trout, other harvest fish species, and a number of species-at-risk. On the other hand, aquatic species can also be affected when too much water is released, for too long a period of time, or flows that fluctuate dramatically over a short period of time. This can result in fish being flushed out of a stream segment, riparian vegetation being swept away, and generally causing a wet-dry scenario that can strand fish when the flows drop low again. Water storage behind impoundments can result in changing a flowing stream environment to a flat-water reservoir environment. This dramatic change in habitat type can have detrimental effects to native species and can create a more suitable environment for invasive nonnative aquatic species to take over. Beneficial effects may also result from managed flow releases from dams when they augment late summer and fall streamflows and actually serve to provide cool water habitat later into the year than would naturally occur.

Current mining operations have not been identified as an activity of concern on the Los Padres National Forest. A review of the limited number of mining Plans of Operation on the Angeles, Cleveland and Los Padres National Forests has yet to detect conflicts with species-at-risk that could not be mitigated, even though there may be overlaps between species habitats and the land use zones that allow mining. On the San Bernardino National Forest, conflicts between small-scale gold mining and several species-at-risk (including eight federally-listed threatened or endangered plant species) have been identified. Large-scale carbonate rock mining on the San Bernardino National Forest impacts several additional plant and wildlife species-at-risk, including four federally-listed threatened or endangered plant species.

Protections that govern mining operations on federal lands are found in 36 CFR 228 and are applied at the site-specific level. Effects of mining would be avoided or mitigated by Forest Plan standards where needed and feasible as conditions of approval of Plans of Operation. Some activities conducted during mining may also have beneficial effects by restoring features that were damaged in the past, such as; improving drainage patterns, stabilizing erosive slopes, obliterating unnecessary access routes, re-establishing wetlands, gating adits and tunnels, and eradicating invasive nonnative weeds at the site.

Alternatives 2 through 6 contain standards that require additional restrictions and coordination, which are expected to minimize, but not fully avoid, effects to species-at-risk across the southern California national forests. As a result, sand and gravel and other mineral material operations are not expected to pose a viability concern.

On the San Bernardino National Forest, the Carbonate Habitat Management Strategy (CHMS) is expected to maintain the viability of the listed carbonate plants within the associated Habitat Reserve, while also allowing the continued large-scale mining of carbonate rock. The CHMS outlines measures for the conservation of *Astragalus albens*, *Erigeron parishii*, *Eriogonum ovalifolium* var. *vineum*, and *Acanthoscyphus parishii* var. *goodmaniana,* while also allowing continued mining of economically significant carbonate rock deposits. Under the CHMS the San Bernardino National Forest will establish a carbonate habitat reserve, seek to acquire lands to add essential habitat areas to the reserve, and manage the reserve consistent with the conservation of these species. The San Bernardino National Forest will also process and approve future mine plans consistent with the provisions of the CHMS, and will track conserved, lost and restored carbonate habitat and the conservation values associated with these lands.

Table 244. Acres of Potential Increase to Mineral Withdrawal Status, by Alternative

Forest	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Angeles	17,910	98,583	127,024	31,543	16,869	165,019	28,729
Cleveland	1,210	22,416	86,763	6,487	0	74,673	11,377
Los Padres	0	62,363	144,607	46,192	0	311,806	35,821
San Bernardino	0	20,890	137,187	23,348	0	60,308	26,439
Total	19,120	204,252	495,581	107,570	16,869	611,806	102,366

Acres above include land zoned as Recommended Wilderness, Critical Biological, or Experimental Forest.

Alternatives 3 and 6 have substantially more acres of potential mineral withdrawal than the other alternatives (see table 244: Acres of Potential Increase to Mineral Withdrawal Status, by Alternative. This has potential to greatly benefit species and their habitats in the long-term.

Management Indicator Species

All of the management indicator species (MIS) can be affected by mining and energy development. Habitat can be lost directly as energy or mineral resources are developed. Mule deer, California spotted owl, song sparrow, and arroyo toad can be adversely affected by the human disturbance that accompanies mining and energy development operations and exploration. All alternatives are similar for these areas.

Effects of Non-Recreation Special Uses Management

Special use authorizations are issued for a wide variety of non-recreation activities from power lines within utility corridors and communication facilities at mountain ridgetop communication sites, to flood control and water retention impoundments, and ground water extraction and conveyance structures for water delivery in and near stream corridors. Potential impacts associated with a wide variety of authorized special-use permits are described in Appendix B, Species Viability, General Direct and Indirect Effects to Plants and Animals.

Installation and maintenance of power lines, utility corridors, highways and roads, railroads, and communications facilities can result in loss of upland species habitat, interference with or loss of connectivity between habitats, death or injury to wildlife from collisions and electrocutions. Instream structures such as dams, diversions, and flood control facilities that modify or alter the natural hydrologic flow regime have potential for substantial effects on riparian-dependent species-at-risk and biodiversity. Surface and groundwater extraction can result in loss of habitat from a change in water quantity, lowered water quality, a decrease or loss of riparian vegetation, and fragmentation of habitat or loss of movement corridors, that can result in the inability of wildlife to move for food, to get to breeding areas, or result in genetic isolation. See Effects of Mineral and Energy Management on biodiversity in the previous section for more information.

In all the alternatives existing special use authorizations are continued with emphasis toward consolidation and co-location of new uses at existing sites and corridors. This would benefit species-at-risk by keeping the facilities and the number and location of support roads needed to service such facilities to a minimum.

The acreage available for consideration of special uses varies by alternative. Alternatives with more acreage zoned as suitable for non-recreation special uses would have a higher potential to consider special uses. Alternative 5 would have the greatest land area for consideration of non-recreation special uses, offering 27 percent more suitable acreage than the current land use zoning in Alternative 1. See table 308, Acreage Suitable for Consideration of Non-Recreation Special-Uses, page 65 for a summary of suitable acreage by alternative. The Non-Recreation Special-Uses Affected Environment section has more discussion on considering special use proposals.

Under Alternatives 3 and 6, the land area suitable for consideration of special use proposals would be much less than the current land management plans, with a reduction of 43 percent and 62 percent, respectively. Consequently, the potential for activity impacts to result in effects on species-at-risk from special use authorizations is lowest under Alternatives 3 and 6 and greatest under Alternative 5. Alternative 5 has an emphasis on resource development and community support, which could adversely affect species-at-risk and biodiversity.

Water extraction from National Forest System lands will continue under all alternatives. Alternatives 3 and 6 have a decreased emphasis on resource uses and support of community infrastructure, and species-at-risk that are threatened by water extractions or diversions would benefit the most from these alternatives. Alternative 5, with its emphasis on resource development, such as water diversion and uses, would provide the least protection for species-at-risk and biodiversity, followed by Alternative 1.

Alternatives 2, 3, 4, 4a, 5, and 6 would use forest plan standard 47 and Appendix E, Five-Step Project Screening Process, to mitigate the effects of water extraction to some extent. A more complete discussion of water extractions, diversions and uses can be found in the Watershed section of the Affected Environment in Chapter 3.

Management Indicator Species

The primary threats to riparian-dependent species like the arroyo toad and song sparrow are changes to the hydrologic regime in drainages where they occur, loss and/or degradation of aquatic, riparian and upland habitat, predatory invasive nonnative species, human harassment during the reproductive period, and blockages to individual dispersal. Mule deer, mountain lion, and California spotted owl can also be negatively affected by riparian habitat degradation. Alternative 5 emphasizes increased resource development and community infrastructure development. This will result in a more reactive approach to protecting species-at-risk; the possibility of higher risks to the management indicator species (MIS) and their habitat because of the effects of more overall development, motorized uses and extraction activities occurring concurrently; and a decreased emphasis on habitat improvement.

Alternatives 3 and 6 would provide the most protection for MIS from non-recreation special uses because of the more favorable land use zoning, special designations, and emphasis on habitat protection and improvement. Alternatives 1, 2, and 4 are intermediate in effects between Alternatives 3 and 6 and Alternative 5. Alternative 4a is closer to Alternatives 3 and 6.

Effects of Lands (Real Estate) Management

The mixed ownership pattern of land within national forest boundaries presents many opportunities for land ownership adjustment to improve administrative efficiency and the function of national forest programs. Land adjustment administration contributes to the reduction of the complexity of land ownership and consolidates the National Forest System lands; reduces administrative problems and costs; enhances public access and use; and supports resource management objectives, including the protection and improvement of habitat conditions and landscape linkages. Strategic easements for access and species conservation can be acquired and are generally beneficial for maintaining biological diversity on the national forests. A goal of the program is that occupancy trespass is eliminated and national forest boundaries are clearly posted. For a detailed description, see the Lands (Real Estate) section of the Affected Environment.

Land exchanges can affect species-at-risk. Habitat may be lost if exchanged out of National Forest System ownership, or quality habitat may be acquired to improve conditions for various species. Land acquisition is intended primarily to consolidate the national forests and places some priority on alleviating habitat fragmentation within Forest Service boundaries under Alternatives 1, 2, 4, and 4a. This will benefit those species that need large tracts of land for habitat, such as large herbivores and predators. However, connectivity with state and county parks and habitat reserves would remain problematic because of development on private lands adjacent to the national forests. Linkages to the highest quality suitable habitat on private land would continue to be lost because of a lack of emphasis on acquisition of habitat for linkages to and on lands outside national forest boundaries. Alternatives 3 and 6 would focus land acquisition for species conservation and habitat linkages. This would likely include accepting acres that are outside national forest boundaries in some instances. Alternative 5 is the only alternative that does not place an emphasis on land acquisition for biological diversity. The emphasis in this alternative is public and agency motorized access. This could result in adverse impacts to species-at-risk. Under all alternatives, the overall National Forest System lands base would increase and consolidate.

Acquisition of important habitat linkages would greatly benefit those species that disperse or migrate to or from off-forest land or between national forest parcels, particularly species-at-risk, and large mammals. The national forests have made efforts to work with other groups through the South Coast Missing Linkages Project and multi-species planning efforts (see section on cumulative effects on biological diversity and Appendix B (Landscape Linkage Identification Process) to define and map linkages, and that work is expected to receive focused attention under Alternatives 2, 3,4a, and 6; where the national forests would actively participate and provide leadership among the agencies.

Management Indicator Species

Alternatives 2, 3, 4a, and 6 would emphasize acquisition of habitat for linkages and taking a leadership role in working with agencies to provide for mountain lion movement, biological diversity and protection of oak woodlands. Alternatives 3 and 6 could include acquisition of lands outside national forest boundaries. Under Alternative 5, acquisition would focus on lands suitable for motorized recreation, so management indicator species (MIS) and their representative habitats would not benefit from acquisition compared to other alternatives. To the contrary, if acquisition results in more motorized access, MIS such as song sparrow, California spotted owl, mule deer and mountain lion could be adversely affected due to harassment and increased development.

Encouraging private landholders to protect Engelmann oak on their properties is the key to long-term conservation of this species (Stephenson and Calcarone 1999). In recent years, progress has been made in conserving Engelmann oak through the purchase of key areas by Riverside County (on the Santa Rosa Plateau), San Diego County (on Vulcan Mountain), Caltrans and the Cleveland National Forest (Roberts and Rutherford Ranches) (Stephenson and Calcarone 1999). Use of land acquisition as a tool to acquire and maintain habitat for Engelmann oak would most likely occur under Alternatives 3 and 6 and least likely to occur under Alternative 5.

Effects of Wildland Fire and Community Protection

Fire is a natural process in most ecosystems in southern California. However, biotic communities are adapted to a particular fire regime, with its own range of fire severity, fire size, frequency (return interval), and season of burn. Different vegetation types can have vastly different natural fire regimes. If fires burn within the parameters of the natural fire regime, given time and protection from further disturbance plant and animal communities recover within a few years or decades after fires. Human development and activities have altered fire regimes in many ecosystems since pre-settlement times, as described in the Affected Environment section on Vegetation Condition and Forest Health. Thus fire itself and fire management can have substantial impacts, both positive and negative, on biological diversity and particularly on species-at-risk. The primary effects of wildland fire are described in Appendix B in the section General Direct and Indirect Effects to Plants and Animals.

Fire affects animals mainly through changes in habitat. Fires may result in short-term increases in wildlife foods that contribute to increases in populations of some early seral stage-dependent animals. If other components of their life history needs, such as cover or shelter, are missing, then population increases are moderated in the altered, often simplified post fire environment. The extent of fire effects on animals depends on the extent of change in habitat structure and species composition caused by fire. When fire frequency increases or decreases substantially or fire severity changes from pre-suppression patterns, habitat changes may result in animal species suffering population declines.

Vegetation treatments are discussed not only in this section but also in the Effects of Vegetation Management section above. Here we discuss how fire suppression strategies and fuel treatments within the Wildland/Urban Interface (WUI) Defense and Threat zones and fuelbreaks may modify fire extent or behavior, resulting in effects to biodiversity.

All alternatives retain an emphasis on fire suppression, relying on mechanical thinning and prescribed fire to attain fuels management objectives in vegetation types adapted to fire. As noted in the Vegetation Management section, the acreage that will be treated during the planning period by prescribed fire will be low relative to total National Forest System land area under these alternatives, although it will vary by vegetation type. Only Alternative 6 contains provision for wildland fire use in remote areas of the Los Padres National Forest. The general consequences of this are discussed in the section Effects on Vegetation; implications for biodiversity are discussed further below.

Alternative 6 differs from Alternatives 1 through 5 in that it would allow natural fire starts to burn unsuppressed if human life and property are not at risk through implementation of a "wildland fire use" policy in remote parts of the Los Padres National Forest. All fire starts would be actively suppressed under Alternatives 1 through 5, although those in remote areas, such as wilderness, could be managed with a confine-and-contain strategy (see Chapter 2; also see Effects on Wildland Fire and Community Protection section later in this chapter). An expected consequence of the fire management philosophy under Alternative 6 would be a more rapid creation of a fine-grained age class mosaic in chaparral, the predominant vegetation type on the Los Padres National Forest, than could be achieved using prescribed fire alone. The small amount of pine and mixed conifer forest vegetation in those parts of the Los Padres where wildland fire use would be allowed would benefit from a return to a more frequent, low-intensity fire regime that could occur under Alternative 6. However, as pointed out in the Vegetation Management section, the first fires to occur under this policy could be quite hot in conifer stands due to fuel build-up since the implementation of fire suppression. More frequent fires in these two habitat types could be detrimental to species-at-risk that rely on older age classes of vegetation, but would benefit species that use young age classes. This alternative may affect chaparral plant community composition and structure; by allowing more fires to burn, a fine-grained age class mosaic may eventually result, with a much greater proportion of the vegetation in young age classes than under other alternatives or than exists at present. Plant and animal species that rely on younger age classes of chaparral may become more abundant under this alternative in the limited geographic area where this policy would apply. However, if fires are too frequent chaparral may be degraded to nonnative annual grassland, with a corresponding loss of habitat value for chaparral-dependent species.

In all alternatives, vegetation alteration for fuels reduction would be concentrated around human communities during the planning period, particularly in areas where high levels of tree or shrub mortality pose a great risk of catastrophic fire to homes, businesses and other developments. The distribution of treatments varies slightly between Alternatives 1 through 5 and Alternative 6, as discussed in the section Effects of Vegetation Management above. In response to the National Fire Plan and other changes in federal policy, all alternatives would likely result in the use of management prescriptions such as prescribed burning, mechanical thinning, grubbing, brush piling and perhaps use of herbicides to attain desired vegetation structure in WUI Defense and Threat zones and fuelbreaks. Repeated disturbance and changes in vegetation structure would threaten species-at-risk directly and indirectly by altering habitat and by providing many opportunities for the introduction and spread of invasive nonnative plants.

For plant species-at-risk, threats are primarily derived from short-term impacts on individual plants and from long-term changes in vegetation resulting from chronic manipulation of vegetation. These impacts would be reduced through project design standards. In addition, disturbed areas would be restored with native vegetation of the appropriate sizes and structures, which would allow attainment of fuel management objectives while minimizing opportunities for invasive nonnative plants to become established. For other species-at-risk, all alternatives are intended to minimize the risks of large wildland fires by creating a mosaic of vegetative age classes supported by selective fuelbreaks and buffers. These are planned to reduce the risks to watersheds from excessive surface and mass erosion and from large continuous blocks of similarly aged vegetation. Vegetation management projects, by necessity and design, alter the structure and often the composition of vegetation. For more information on these activities, refer to Wildland Fire and Community Protection section of the Affected Environment.

In the WUI Defense zone and fuelbreaks, changes in vegetation structure alter the treated plant communities from late to early seral stages. In some instances treatment results in a de-facto type conversion from shrubs to grassland. Where habitat for animal species-at-risk cannot be avoided during project planning and implementation, animals would have to leave the area or perish from direct and indirect effects of vegetation modification. However, the amount of area to be treated to this extent is small, and the adverse impacts must be measured against the potential benefits to untreated vegetation and habitat that would result from experiencing fewer fires with large patch sizes. Species that prefer early seral vegetation stages would find some increase in habitat available in treated areas.

All dead trees and down logs will be removed from the WUI Defense zone to a distance that provides for firefighter safety under all alternatives. This will greatly reduce habitat for those species that use these features. Outside of WUI Defense zones, snags and down logs will be retained as needed for wildlife habitat and soil productivity, within the constraints of protection for life and property. Because WUI Defense zones are expected to be treated most quickly under Alternative 6, this alternative would reduce the abundance of down logs faster than other alternatives in the immediate vicinity of communities.

Fire suppression may be beneficial or detrimental to species-at-risk, depending on their life history characteristics. The effectiveness of fire suppression would be somewhat lower under Alternative 6 than under Alternatives 1 through 5 because less strategic prescribed burning, mainly in chaparral, would occur outside the WUI Defense and Threat zones in Alternative 6 (see discussion in Effects on Wildland Fire and Community Protection section for more detail). Construction of new fuelbreaks outside of WUI zones would also receive less emphasis under Alternative 6. Species-at-risk that occur in habitats at risk of too-frequent fire (coastal sage scrub) or catastrophic fire (montane conifer forests) could be at greater risk under this alternative.

If WUI Defense and Threat zone fuel modification and fuelbreaks are effective in limiting fire patch size in chaparral and coastal sage scrub habitats, there is a lower potential for species-at-risk to be affected by fire suppression activities such as fireline construction and staging areas. This would especially benefit those species for which we have limited information and are therefore less successful in identifying their habitat needs prior to occurrence of wildfire events.

All alternatives intend to minimize the negative impacts (large blocks of similar age class vegetation, erosion, sedimentation) from large wildfires with the use of prescribed fire and Burned Area Emergency Rehabilitation projects.

Management Indicator Species

For mule deer, Alternative 6 is expected to affect chaparral plant community composition and structure in remote areas of the Los Padres National Forest; by allowing some natural fires to burn, a fine-grained age class mosaic will eventually result, with a much greater proportion of the vegetation in young age classes than under other alternatives or than exists at present. Young chaparral vegetation is good for deer forage, but only if older stands or forest vegetation are nearby for cover. If fires are too frequent, chaparral may be degraded to nonnative annual grassland, with a corresponding loss of habitat value for chaparral-dependent species, including mule deer.

Mountain lions depend upon the availability of prey, as well as habitat conditions. The effects of alternatives on this species would be similar to those for mule deer.

Under Alternative 6, a policy of not suppressing wildland fires that pose no risk to human life and property on the Los Padres National Forest could result in greater acreage being burned, with perhaps more benefit to California black oak if the resultant fires are not stand-replacing.

In general, the consequences for management indicator species and their habitats from wildland fire management would be similar to what is described under Effects of Vegetation Management. Conifer forest habitat will remain at risk from stand-replacing fires due to high stand densities and large numbers of dead trees in certain locales for some time to come, because thinning projects will be focused on WUI Defense and Threat zones, with little work conducted outside these zones. Over time, under all alternatives, fuel treatment in and outside of WUI Defense and Threat zones would decrease the risk of large stand-replacing fires, because fire fighters would eventually have better access for suppression tactics and fuelbreaks would help limit fire spread.

Combined Effects of Forest Plan Decisions on Biological Diversity

Our analysis began by considering over 3,300 species of plants, invertebrate animals and vertebrate animals that were known or suspected to occur on National Forest System lands. Species of potential conservation concern were then identified through our viability analysis process, which is outlined in Appendix B (Species Viability Evaluation Process). After additional review and consideration, a small percentage of the total species found in the planning area were carried forward for further analysis. Of those carried forward for further analysis, a small percentage was found to be at-risk from activities and uses on National Forest System lands (table 217: Summary of the number and percent of species at-risk from activities and uses on NFS lands).

Table 217.Summary of the number and percent of species considered to be at risk from activities and uses on National Forest System lands

	Number of species known or suspected to occur on NFS lands	Number of known species which are of potential conservation concern	Percent of known species which are of potential conservation concern	Number of known species at risk from activities and uses on NFS lands	Percent of known species at risk from activities and uses on NFS lands
Plants	2,900	286	10	93	3
Invertebrate and Vertebrate Animals	464	196	42	56	12
Total	3,364	482	14	149	4

The majority of native plant and animal species on National Forest System lands are considered to have low vulnerability, in terms of population persistence and stability, to the types of uses and activities allowed by the revised forest plans on National Forest System lands under any alternative (see Appendix B Species Viability Evaluation Process for explanation). Their survival depends on the distribution and ecosystem health of the various habitat types found on the national forests, which is discussed in the section Effects on Vegetation. These species would persist in more or less their current abundance and distributions under all alternatives. However, Alternatives 6 and 3, which emphasize biodiversity conservation and more wilderness recommendations, and Alternative 4a, which has more acreage in Back Country Motorized Use Restricted zoning, would be more likely to result in improved habitat conditions for these species, particularly when compared to Alternative 5.

Species identified as being at risk from one or more type of activity (including some federally-listed and Forest Service Pacific Southwest Region sensitive species) have been the focus of discussion, along with management indicator species and the habitats and ecological processes they represent. A number of forest plan standards address management of threatened, endangered, proposed, candidate, and sensitive species (many of which are identified as species-at-risk) as well as riparian habitat conditions. These standards are the same in Alternatives 2 through 6 (Alternative 1 would continue current forest plan standards and guidelines) and provide sideboards to site-specific management actions, intended to mitigate potential negative effects. Revised forest plan standards that address general threat categories for plants are given in table 376: (Potential Threats to 93 Plant Species-At-Risk and Standards That Address Those Threats, page 366), and standards applicable to specific animal species-at-risk are identified in table 377: Animal Species-At-Risk, Threats That Affect Them, And Standards That Address the Threats, page 367. Because these standards are the same across almost all of the alternatives, they do not provide a means for contrasting the impacts on species-at-risk or biodiversity in general from the forest plan alternatives (we assume they will be applied consistently when the revised forest plans are implemented).

As one way to assess the overall consequences for biodiversity of the different alternatives, we determined a likelihood of persistence for each species-at-risk under each alternative. This was done by evaluating each alternative's mix of land use zones, suitable uses, special designations, themes, and program emphases; by reviewing the conclusions presented in the preceding sections; and by evaluating the information presented in the species accounts (see Reading Room `www.fs.fed.us/r5/scfpr/read/)` concerning the habitat requirements and life history traits of the species-at-risk. This likelihood of persistence was expressed using viability outcome statements, as described in Appendix B (Species Viability Evaluation Process). The viability outcomes are just predictions of the possibility that a plant or animal species will persist over time and are based on a number of assumptions explained earlier in this section (and described in Appendix B).

Each species-at-risk was given an outcome for each alternative (assigned as letters A-E, with A being most favorable and E generally worst), as described above and in Appendix B (Species Viability Evaluation Process). A slightly different set of outcome statements was used for plants and invertebrates than for vertebrates. The outcomes for individual species-at-risk by alternative on National Forest System lands are given in table 368: Viability Outcomes By Alternative For Plant Species-At-Risk page 387, table 372: Viability Outcomes by Alternative for Invertebrate Animal Species-At-Risk, page 392, and table 371: Viability Outcomes by Alternative for Vertebrate Animal Species-At-Risk, page 390. For explanations of the meaning of letter outcomes, please see Appendix B (Species Viability Evaluation Process).

The distribution of outcomes was used as an indicator to assess the degree to which each alternative would meet the requirements of federal law, regulation, and policy and to compare the responsiveness of the alternatives to the following forest plan issue: "The trend of increased listing of threatened, endangered and sensitive species and the consequences of management actions on these species must be addressed." The distribution of outcomes by alternative is summarized in table 198: Plant Viability Outcomes on National Forest System Lands Summed by Alternative; table 199: Invertebrate Animal

Viability Outcomes on National Forest System lands Summed by Alternative; and table 200: Vertebrate Animal Viability Outcomes on National Forest System Lands Summed by Alternative.

Key to Viability Outcome Codes Frequently Used in Biodiversity Tables

The following codes apply to tables 368, 371, 372, 204, 205, 206, 207, 208, 209, 210, 211 and 212 in this section. Note that the code to use depends upon table content. The codes of A through E apply to the tables that reference National Forest System lands—use the definitions for plants and invertebrates (with host plant) or animals, as appropriate. The codes of A through D apply to the tables that reference **all** land within the range of species.

	For Plants and Invertebrates (with host plants) on National Forest System lands:
A.	Habitat is sufficient quality, distribution, and abundance to allow the species population to remain stable or stabilize, well distributed across historic range on NFS land.
B.	Habitat is of sufficient quality, distribution, and abundance to allow the species population to remain stable or stabilize, but with significant gaps in the historic species distribution on NFS land. These gaps cause some limitations in interactions among populations.
C.	Habitat only allows continued species existence in isolated patches relative to the historic distribution, with strong limitations on interactions among or within local populations on NFS land.
D.	Habitat conditions likely result in the loss of populations (occurrences) such that the potential for extirpation from NFS lands is high.
E.	Small population size in plants that are inherently rare and not naturally well distributed may result in the loss of populations (occurrences) from stochastic events such that the potential for extirpation from NFS lands is high. Potential for extirpation is unrelated to uses and activities on NFS land.
	For Animals on National Forest System lands:
A.	Suitable habitat is well distributed and abundant across NFS lands.
B.	Suitable habitat is either well distributed or abundant across NFS lands; however, there are temporary gaps where suitable habitat is absent or only present in low abundance. Disjunct areas of suitable habitat are typically large enough and close enough to permit dispersal and interaction among subpopulations.
C.	Suitable habitat is often distributed as patches or exists at low abundance, or both across NFS lands. Gaps, where suitable habitat is either absent or present in low abundance, are large enough to isolate some subpopulations, limiting opportunity for species interactions. In most of the species range there are opportunities for dispersal and interaction among subpopulations; however, some subpopulations are so disjunct or of such low density that they are essentially isolated.
D.	Suitable habitat is highly isolated or exists at very low abundance, or both across NFS lands. While some subpopulations associated with these habitats may be self-sustaining, there is limited or no opportunity for population interaction, resulting in potential for local or regional extirpation, and low likelihood of recolonization. There has likely been a reduction in overall species range from historical conditions, except for some rare, local endemics that may have persisted in this condition since the historical period.
E.	Suitable habitat is highly isolated and exists at very low abundance across NFS lands. Populations have declined irrespective of habitat conditions or have little or no interaction. This results in strong potential for local or regional extirpation, and no likelihood of recolonization.

For all land within range of species (based in part on the geographic distribution within which the species is projected to persist):	
A.	The combination of environmental (habitat) and population conditions allows the species population to remain stable or stabilize, well distributed across historic range.
B.	The combination of environmental (habitat) and population conditions allows the species population to remain stable or stabilize, but with significant gaps in the historic species distribution. These gaps cause some limitations in interactions among populations.
C.	The combination of environmental (habitat) and population conditions only allows continued species existence in isolated patches relative to the historic distribution, with strong limitations on interactions among or within local populations.
D.	The combination of environmental (habitat) and population conditions likely result in the loss of populations (occurrences).

Table 198. Plant Viability Outcomes on National Forest System Lands Summed by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
A	0	9	42	3	14	0	47
B	52	63	35	49	61	11	31
C	32	12	8	32	9	63	7
D	2	2	1	2	2	12	1
E	6	6	6	6	6	6	6

Table 199. Invertebrate Animal Viability Outcomes on National Forest System lands Summed by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
A	0	1	3	0	1	0	6
B	7	7	5	8	7	1	3
C	2	1	1	1	1	7	0
D	0	0	0	0	0	1	0
E	1	1	1	1	1	1	1

Table 200. Vertebrate Animal Viability Outcomes on National Forest System Lands Summed by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
A	0	0	0	0	0	0	0
B*	5	5	14	5	13	0	14
C*	13	32	23	17	23	8	24
D*	26	7	7	22	8	33	6
E	2	2	2	2	2	5	2

*Outcome is different for the southern margin of species' range for California red-legged frog, southern rubber boa, and San Bernardino flying squirrel. See species accounts for geographical differences in viability outcomes.

Alternative 6 and, to a lesser extent, Alternative 3 yielded more A (plants and invertebrates) and B (vertebrates) outcomes (more favorable outlook for persistence) than other alternatives, due mainly to the decrease in roaded access and greater acreage in protective land use zones and special designations under these alternatives (table 198: Plant Viability Outcomes on National Forest System Lands Summed by Alternative, table 199: Invertebrate Animal Viability Outcomes on National Forest System lands Summed by Alternative, table 200: Vertebrate Animal Viability Outcomes on National Forest System Lands Summed by Alternative). Alternative 5 had the most unfavorable viability outcomes for species-at-risk (D outcomes for plants and invertebrates, D and E for vertebrate animals), due mainly to the proposed expansion of the motorized road and trail system, increases in dispersed and developed recreation, lack of special designations and Critical Biological zones designed to protect critical components of biodiversity, and an emphasis on supporting development and resource extraction. The other alternatives were intermediate in their distribution of outcomes. Alternative 4a was similar to Alternative 2 for plants and invertebrates but closer to Alternatives 3 and 6 for vertebrates.

Many of the plant and invertebrate species-at-risk are currently negatively affected by unauthorized off-route vehicle use, and this impact would be expected to increase the most under Alternative 5. Many vertebrate species-at-risk are threatened by habitat loss due to human activity or the risk of catastrophic fire. The increase in motorized access under Alternative 5 would be expected to increase disturbance and the chance for accidental fire starts.

For those plant and animal species identified as being at risk due to small population sizes and imprecise knowledge about their locations and habitat requirements (see table 367: Plant Species-At-Risk, page 160, and table 370: Animal Species-At-Risk, page 173), impacts from dispersed recreation use and, more importantly, from unauthorized off-route vehicle travel would present a substantial risk to their continued existence. This risk is due to three factors: (1) small populations are vulnerable to random catastrophic disturbances because their small size makes it more likely that all of the individuals constituting the population would be destroyed; (2) incomplete information regarding the location and habitat requirements of these species makes it difficult to intervene with preventative measures that would protect the species; and (3) it is difficult to predict where dispersed recreation and unauthorized vehicle use will occur so that intervention measures can be undertaken to mitigate impacts. These species would be less likely to face random extirpation of populations from these causes under Alternatives 6, 3, and 4a than Alternatives 5 and 1 (2 and 4 would be intermediate).

Watersheds with fewer disturbances would be expected to improve faster than areas with ongoing disturbance such as roads, concentrated recreation, or other activities that increase the risk of sediment introduction into streams. Habitat for aquatic and riparian species-at-risk would be expected to move more toward reference (or expected) conditions under alternatives that have the most acreage in land use zones with fewer suitable uses and less motorized access (Back Country Non-Motorized, Back Country Motorized Use Restricted, Critical Biological, existing wilderness, recommended wilderness), such as Alternatives 6, 3, and 4a.

Table 368. Viability Outcomes By Alternative For Plant Species-At-Risk

Species	National Forest System Lands								All Lands						
	1	2	3	4	4a	5	6		1	2	3	4	4a	5	6
Acanthomintha ilicifolia	B	B	A	C	B	C	A		C	C	C	C	C	C	C
Acanthoscyphus parishii var. *abramsii*	B	B	B	B	B	C	B		B	B	B	B	B	C	B
Acanthoscyphusparishii var. *goodmaniana*	C	B	B	C	B	C	B		C	B	B	C	B	C	B
Allium hickmanii	C	C	C	C	C	C	C		D	D	D	D	D	D	D
Allium munzii	B	B	B	C	B	C	B		C	C	C	C	C	C	C
Androsace elongata ssp. *acuta*	B	B	B	B	B	C	B		C	C	C	C	C	C	C
Arabis dispar	B	B	A	B	A	B	A		B	B	B	B	B	B	B
Arabis johnstonii	B	B	A	B	B	C	A		C	C	C	C	C	C	C
Arabis parishii	C	A	A	B	A	C	A		C	B	B	B	B	C	B
Arctostaphylos cruzensis	E	E	E	E	E	E	E		B	B	B	B	B	B	B
Arenaria lanuginosa ssp. *saxosa*	B	B	B	B	B	C	B		B	B	B	B	B	B	B
Arenaria macradenia var. *kuschei*	C	B	B	C	B	D	B		C	B	B	C	B	D	B
Arenaria ursina	C	A	A	C	B	C	A		D	D	D	D	D	D	D
Astragalus albens	C	B	B	C	B	C	B		C	B	B	C	B	C	B
Astragalus lentiginosus var. *sierrae*	B	B	A	A	A	C	A		C	C	C	C	C	C	C
Astragalus oocarpus	B	B	A	C	B	C	A		C	C	C	C	C	C	C
Astragalus pachypus var. *jaegeri*	C	C	A	C	B	D	A		C	C	B	C	C	D	B
Berberis nevinii	B	B	A	B	B	C	A		C	C	C	C	C	C	C
Botrychium crenulatum	B	B	B	B	B	C	B		B	B	B	B	B	B	B
Calochortus clavatus var. *gracilis*	C	C	B	C	B	C	B		D	D	D	D	D	D	D
Calochortus dunnii	B	B	A	B	B	C	A		B	B	B	B	B	C	B
Calochortus obispoensis	B	B	B	B	B	C	B		C	C	C	C	C	C	C
Calochortus palmeri var. *munzii*	B	B	A	B	B	B	A		C	C	C	C	C	C	C
Calochortus palmeri var. *palmeri*	B	B	A	C	B	C	B		C	C	C	C	C	C	C
Calochortus simulans	C	C	C	C	C	C	C		B	B	B	B	B	B	B
Camissonia hardhamiae	E	E	E	E	E	E	E		C	C	C	C	C	C	C

Species	National Forest System Lands								All Lands						
	1	2	3	4	4a	5	6		1	2	3	4	4a	5	6
Canbya candida	C	B	B	B	B	C	B		D	D	D	D	D	D	D
Carex obispoensis	B	B	B	C	B	C	B		C	C	C	C	C	C	C
Castilleja cinerea	C	A	A	C	A	C	A		D	D	D	D	D	D	D
Castilleja gleasonii	B	B	A	B	A	B	A		B	B	A	B	A	B	A
Castilleja lasiorhyncha	B	B	A	B	B	C	A		C	C	C	C	C	C	C
Castilleja plagiotoma	B	B	A	B	A	C	A		D	D	D	D	D	D	D
Caulanthus amplexicaulis var. *barbarae*	B	B	B	B	B	C	B		B	B	B	B	B	C	B
Caulanthus lemmonii	B	B	B	B	B	C	B		C	C	C	C	C	C	C
Chlorogalum purpureum var. *reductum*	B	B	B	B	B	C	A		C	C	C	C	C	C	B
Chorizanthe blakleyi	B	B	B	B	B	C	B		C	C	C	C	C	C	C
Clarkia jolonensis	B	B	B	B	B	B	A		C	C	C	C	C	C	B
Claytonia lanceolata var. *peirsonii*	B	B	B	B	B	C	B		B	B	B	B	B	C	B
Cupressus stephensonii	E	E	E	E	E	E	E		D	D	D	D	D	D	D
Delphinium hesperium ssp. *cuyamaceae*	C	B	B	C	C	C	B		C	C	C	C	C	C	C
Delphinium hutchinsoniae	B	B	B	B	B	B	B		D	D	D	D	D	D	D
Dieteria asteroides var. *lagunensis*	B	B	B	B	B	C	B		C	C	C	C	C	D	C
Dieteria canescens var. *ziegleri*	B	B	A	B	B	B	A		C	C	B	C	C	C	B
Dodecahema leptoceras	B	B	A	B	A	C	A		C	C	B	C	B	C	B
Dudleya abramsii ssp. *affinis*	C	A	A	B	A	C	A		C	C	C	C	C	C	C
Dudleya densiflora	C	C	C	C	C	C	C		D	D	D	D	D	D	D
Erigeron parishii	C	B	B	C	B	C	B		C	B	B	C	B	C	B
Eriogonum evanidum	E	E	E	E	E	E	E		D	D	D	D	D	D	D
Eriogonum kennedyi var. *austromontanum*	C	A	A	C	B	C	A		D	D	D	D	D	D	D
Eriogonum ovalifolium var. *vineum*	C	B	B	C	B	C	B		C	B	B	C	B	C	B
Galium angustifolium ssp. *jacinticum*	C	B	B	B	B	C	A		C	B	B	B	B	C	A
Galium californicum ssp. primum	C	C	C	C	C	D	C		C	C	C	C	C	D	C
Galium grande	C	C	C	C	C	D	C		C	C	C	C	C	D	C

Species	National Forest System Lands								All Lands						
	1	2	3	4	4a	5	6		1	2	3	4	4a	5	6
Gentiana fremontii	C	C	C	C	C	D	C		C	C	C	C	C	C	C
Horkelia yadonii	B	B	B	B	B	C	B		C	C	C	C	C	C	C
Ivesia argyrocoma	C	A	A	B	A	C	A		C	B	B	B	B	C	B
Juncus duranii	B	B	A	B	A	C	A		C	B	B	B	B	C	B
Lepichinia fragrans	C	C	B	C	B	C	B		B	B	B	B	B	B	B
Leptosiphon floribundus ssp. *hallii*	B	B	A	B	A	B	A		B	B	A	B	A	B	A
Lilium humboldtii ssp. *ocellatum*	B	B	B	B	B	C	B		D	D	D	D	D	D	D
Limnanthes gracilis ssp. *parishii*	B	B	B	B	B	C	A		B	B	B	B	B	B	B
Linanthus concinnus	B	B	A	B	B	C	A		B	B	A	B	B	C	A
Linanthus killipii	C	A	A	B	A	C	A		D	D	D	D	D	D	D
Lupinus ludovicianus	E	E	E	E	E	E	E		D	D	D	D	D	D	D
Malacothamnus palmeri var. *lucianus*	D	D	C	D	D	D	C		D	D	C	D	D	D	C
Malaxis monophyllos var. brachypoda	E	E	E	E	E	E	E		C	C	C	C	C	C	C
Marina orcuttii var. *orcuttii*	B	B	A	B	B	B	A		C	C	B	B	C	C	B
Matlea parvifolia	B	B	A	B	B	B	A		B	B	A	B	B	B	A
Mimulus exiguus	C	B	A	C	B	D	A		C	B	B	C	C	D	B
Mimulus purpureus	C	B	A	C	B	D	A		D	D	D	D	D	D	D
Packera bernardina	B	B	A	C	B	C	A		C	C	B	C	C	D	B
Packera ganderi	B	B	B	B	B	C	A		B	B	B	B	B	C	B
Parnassia cirrata var. *cirrata*	B	A	A	A	A	B	A		B	A	A	A	A	B	A
Penstemon californicus	B	B	A	B	A	C	A		D	D	D	D	D	D	D
Pentachaeta exilis ssp. *aeolica*	C	C	B	B	B	C	B		D	D	D	D	D	D	D
Phacelia exilis	B	B	A	B	B	C	A		D	D	D	D	D	D	D
Phacelia mohavensis	B	B	A	B	B	C	A		D	D	D	D	D	D	D
Phlox dolichantha	B	A	A	B	B	C	A		C	B	B	C	C	D	B
Physaria kingii ssp. *bernardina*	C	B	B	B	B	C	B		C	B	B	B	B	C	B
Piperia leptopetala	C	C	C	C	C	D	C		C	C	C	C	C	D	C

Species	National Forest System Lands								All Lands						
	1	2	3	4	4a	5	6		1	2	3	4	4a	5	6
Poa atropurpurea	C	B	B	C	B	C	A		C	C	C	C	C	C	B
Podistera nevadensis	B	B	A	A	B	C	A		B	B	A	A	B	C	A
Pyrrocoma uniflora var. *gossypina*	B	B	A	C	B	C	A		C	C	B	C	C	C	B
Sanicula maritima	D	D	D	D	D	D	D		C	C	C	C	C	C	C
Sedum niveum	B	B	A	B	B	C	A		B	B	B	B	B	B	B
Sibaropsis hammittii	B	B	A	C	B	C	A		B	B	A	C	B	C	A
Sidalcea hickmanii ssp. *hickmanii*	C	C	C	C	C	D	B		C	C	C	C	C	D	B
Sidalcea hickmanii ssp. *parishii*	C	C	B	C	C	D	B		C	C	C	C	C	D	C
Sidalcea pedata	B	B	A	B	B	C	A		D	D	D	D	D	D	D
Sidotheca emarginata	B	B	A	B	B	B	A		B	B	A	B	B	B	A
Taraxacum californicum	C	B	B	C	B	C	B		C	C	C	C	C	C	C
Thelypodium stenopetalum	B	B	A	B	B	C	A		D	D	D	D	D	D	D
Thermopsis macrophylla	B	B	B	B	B	C	B		B	B	B	B	B	C	B

Table 371. Viability Outcomes by Alternative for Vertebrate Animal Species-At-Risk

Table 371. Viability Outcomes by Alternative for Vertebrate Animal Species-At-Risk															
Species	National Forest System Land								All Land						
	1	2	3	4	4a	5	6		1	2	3	4	4a	5	6
Arroyo toad	D	C	C	D	C	E	C		D	C	C	D	C	D	C
California red-legged frog*	D	D	D	D	D	D	D		D	D	D	D	D	D	D
Coast range newt	D	C	C	C	C	D	C		D	C	C	C	C	D	C
Mountain yellow-legged frog	E	E	E	E	E	E	E		D	D	D	D	D	D	D
Western spadefoot toad	D	C	C	D	C	D	C		D	D	C	D	D	D	C
American dipper	D	C	C	D	C	D	C		D	C	C	D	C	D	C
Bald eagle (breeding)	B	B	B	B	B	C	B		C	C	C	C	C	D	C
Black swift	D	C	C	C	C	D	C		D	C	C	C	C	D	C
California condor	B	B	B	B	B	C	B		C	C	C	C	C	D	C

Table 371. Viability Outcomes by Alternative for Vertebrate Animal Species-At-Risk

Species	National Forest System Land								All Land						
	1	2	3	4	4a	5	6		1	2	3	4	4a	5	6
California spotted owl	C	C	C	C	C	D	C		C	C	C	C	C	D	C
Calliope hummingbird	D	C	C	D	C	D	C		D	C	C	D	C	D	C
Coastal California gnatcatcher	D	C	C	C	C	D	C		D	D	D	D	D	D	D
Common yellow-throat	D	C	C	D	C	D	C		C	C	C	C	C	C	C
Flammulated owl	B	B	B	B	B	C	B		B	B	B	B	B	C	B
Golden eagle	C	C	B	C	B	D	B		D	D	C	D	C	D	C
Least Bell's vireo	D	C	C	D	C	D	C		D	D	D	D	D	D	D
Lincoln's sparrow	D	C	C	D	C	D	C		D	C	C	D	C	D	C
Long-eared owl	C	C	B	C	B	D	B		D	D	C	D	D	D	C
MacGillivray's warbler	D	C	C	D	C	D	C		D	C	C	D	C	D	C
Prairie falcon	C	C	B	C	B	D	B		D	D	C	D	C	D	C
Purple martin	C	C	C	C	C	D	B		C	C	C	C	C	D	C
Southwestern willow flycatcher	D	C	C	D	C	D	C		D	D	D	D	D	D	D
Swainson's thrush	D	C	C	D	C	D	C		C	C	C	C	C	C	C
Turkey vulture (breeding)	C	C	B	C	B	D	B		D	D	C	D	D	D	C
Western snowy plover	C	C	C	C	C	C	C		D	D	D	D	D	D	D
Wilson's warbler	D	C	C	D	C	D	C		D	C	C	D	C	D	C
Yellow-breasted chat	D	C	C	D	C	D	C		C	C	C	C	C	C	C
Arroyo chub	D	C	C	D	C	D	C		D	C	B	C	C	D	B
Pacific lamprey	D	D	D	D	D	D	D		D	D	D	D	D	D	D
Partially armored three-spine stickleback	D	C	C	D	D	D	C		D	C	C	D	D	D	D
Santa Ana speckled dace	D	D	D	D	D	D	C		D	D	D	D	D	D	D
Santa Ana sucker	D	D	D	D	D	E	D		D	D	D	D	D	D	D
Southern steelhead, southern California ESU	E	E	E	E	E	E	E		D	D	D	D	D	D	D
Southern steelhead, south-central ESU	D	D	D	D	D	D	D		D	D	D	D	D	D	D
Unarmored three-spine stickleback	D	D	D	D	D	E	D		D	D	D	D	D	D	D
American badger	C	C	B	C	B	D	B		D	D	C	D	C	D	C
Mountain lion	C	C	B	C	B	D	B		D	D	C	D	C	D	C

Table 371. Viability Outcomes by Alternative for Vertebrate Animal Species-At-Risk															
Species	National Forest System Land								All Land						
	1	2	3	4	4a	5	6		1	2	3	4	4a	5	6
Nelson's bighorn sheep	C	C	B	C	B	C	B		C	C	B	C	B	C	B
Peninsular bighorn sheep	C	C	C	C	C	C	C		C	C	C	C	C	C	C
San Bernardino flying squirrel*	C	C	C	C	C	D	C		C	C	C	C	C	D	C
San Bernardino kangaroo rat	D	D	D	D	D	D	D		D	D	D	D	D	D	D
Townsend's big-eared bat	B	B	B	B	B	C	B		C	C	C	C	C	D	C
Belding's orange-throated whiptail	D	C	B	C	C	D	B		D	D	D	D	D	D	D
Mountain garter snake	C	C	B	C	B	D	C		D	C	C	D	C	D	C
Southern rubber boa*	B	B	B	B	B	C	B		C	C	C	C	C	D	C
Southern Pacific pond turtle	D	C	C	D	C	D	C		D	D	C	D	D	D	C

*Outcome is different for the southern margin of species' range for California red-legged frog, southern rubber boa, and San Bernardino flying squirrel. See species accounts for geographical differences in viability outcomes.

Table 372. Viability Outcomes by Alternative for Invertebrate Animal Species-At-Risk

Species	National Forest System Lands								All Lands						
	1	2	3	4	4a	5	6		1	2	3	4	4a	5	6
Baldwin Lake blue butterfly, *Euphilotes enoptes ssp.* near *dammersi*	B	A	A	B	A	C	A		B	A	A	B	A	C	A
California deplectronan caddisfly, *Diplectrona californica*	E	E	E	E	E	E	E		D	D	D	D	D	D	D
Desert monkey grasshopper, *Psychomastix deserticola*	B	B	B	B	B	C	B		B	B	B	B	B	C	B
Ehrlich's checkerspot, *Euphydryas editha ehrlichi*	B	B	B	B	B	C	A		B	B	B	B	B	C	A
Harbison's dun skipper, *Euphyes vestris harbisoni*	B	B	A	B	B	C	A		C	C	B	C	C	D	B
Hermes copper butterfly, *Lycaena hermes*	C	B	B	B	B	C	B		C	C	C	C	C	C	C
Laguna Mountains skipper, *Pyrgus ruralis lagunae*	C	C	C	C	C	D	B		C	C	C	C	C	D	B
Quino checkerspot, *Euphydryas editha quino*	B	B	B	B	B	C	A		C	C	C	C	C	C	C
San Gabriel Mountains elfin, *Incisalia mossii hidakupa*	B	B	A	B	B	B	A		B	B	A	B	B	B	A
Vernal or Coxey blue butterfly, *Euphilotes baueri [battoides] vernalis*	B	B	B	B	B	C	A		B	B	B	B	B	C	A

Management Indicator Species

Mule Deer

The mule deer was selected as a management indicator species for ecosystem health related to vegetation management, roads, and associated recreation management. Alternatives 3 and 6 would likely improve this habitat the most over the planning period because of their emphasis on non-motorized recreation, resolving recreation-wildlife conflicts, and prescribed burning for wildlife benefit. Alternatives 4 and 4a, which emphasize mitigation of recreation impacts due to developed and dispersed recreation, respectively, would also benefit mule deer and similar species that can be negatively affected by disturbance from recreation activities. Alternative 5, with the most roaded access, would be expected to contribute to habitat disturbance more than other alternatives; however, it could also provide the most access for prescribed burn projects in the future which are beneficial to deer and other species that require patches of early-seral chaparral.

Mountain Lion

The mountain lion was selected as an indicator for species needing large blocks of naturally functioning habitat and habitat connectivity to other large wildland areas. Alternatives 6 and 3, with more acreage recommended for wilderness and other blocks of relatively undisturbed habitat, would be most beneficial for species like this. Alternatives 3, 4a, and 6 would place the most emphasis on acquiring lands for habitat linkages, with consideration under Alternatives 3 and 6 of habitat outside the current national forest boundaries. The potential increase in the road and motorized trail systems allowed under Alternative 5 and, to a lesser degree, Alternative 4 would have the greatest likelihood of fragmenting habitat blocks, to the detriment of mountain lions and other species that require large, undisturbed areas.

Arroyo Toad and Song Sparrow

Arroyo toad and song sparrow were selected as indicators of aquatic and riparian habitat conditions. Riparian habitat would be expected to improve most under Alternatives 6 and 3 due to reduced motorized access, emphasis on habitat protection and improvement, and reduced grazing in riparian areas. Alternative 4a and, to a lesser extent, 4 would improve or at least maintain riparian habitat quality due to their emphasis on mitigating recreation impacts on at-risk species. Alternative 5 would probably result in some deterioration of aquatic and riparian habitat because of the increased access, resource development, and added challenge of managerial control of these activities.

Blue Oak, Engelmann Oak, and Valley Oak

The overall outlook for the oak woodland and savanna habitat these species were chosen to represent is discussed in the Effects on Vegetation section. There is relatively little difference in the likely outcome for these habitat types between alternatives because management direction would not vary substantially. Monitoring of sapling recruitment in these oaks will serve as an indicator of future success in maintaining oak populations and habitat quality.

Bigcone Douglas-Fir

Altered fire regimes have affected the abundance and distribution of bigcone Douglas-fir. However, due to the heavy focus on vegetative treatments in the WUI Defense and Threat zones, relatively little direct treatment of chaparral adjacent to bigcone Douglas-fir stands is expected to take place under Alternatives 1, 2, 4, 4a, and 5. The risk of high intensity wildfire burning into bigcone Douglas-fir stands would remain high for some time to come. Alternatives 6 and 3 (to a lesser extent) would likely result in more fuel reduction treatment of chaparral in the vicinity of this vegetation type over the longer term (see also the discussion in the Effects on Vegetation section). Maintenance of bigcone Douglas-fir stands would be good for wildlife that depend on these forest islands amid the chaparral, including the California spotted owl, mule deer, and mountain lion.

Coulter Pine

The alternatives do not vary to any extent in their projected outcomes for Coulter pine and the habitat it represents (see the Effects on Vegetation section). Treatment of stands in the WUI Defense and Threat zones and re-introduction of fire where it has been excluded for many years should benefit this species. Under all alternatives some planting will be done in priority areas where drought has resulted in severe mortality.

California Spotted Owl

The California spotted owl was chosen as a management indicator species for mature, large diameter, high canopy closure stand conditions in montane conifer forest. The forest plan alternatives would not differ substantially in their outcome for this vegetation type, as most of the fuel treatment work is expected to occur in WUI Defense and Threat zones, with little thinning to reduce the risk of stand-replacement fire occurring outside of these zones. Increased motorized access under Alternative 5 could potentially increase the risk of fire starts leading to catastrophic wildfire in this habitat. However, roads also allow access for fire suppression forces if fires start.

Black Oak and White Fir

Black oak and white fir were chosen as indicators for other facets of montane conifer habitat (forest gaps and stand stem density, respectively). As described for California spotted owl, most fuel reduction in montane conifer forest will take place in the WUI Threat and Defense zones during the planning period, and this does not vary substantially by alternative.

Cumulative Effects

The cumulative effects analysis for biological diversity was projected for the planning period (15 years) and the next 50 years, which is longer than the lifespan of most animal species found in the planning area, although not so for perennial plants. The analysis considers the land base that contains all of the National Forest System lands administered by the southern California national forests and private and other land ownership within and adjacent to National Forest System lands. Many of the watersheds originating on National Forest System lands are held in mixed ownership at their lower elevations, commonly with urban developments that are near and adjacent to the national forests, which contributes to cumulative impacts.

Projected human population growth throughout all of southern California is expected to bring major increases in pressure upon national forest resources, including requests to develop and use resources to support community growth (such as water, energy, and transportation). Demand for new or improvements to existing interstate highways, state highways, and large utility and water projects crossing the national forests are expected to continue. Increased adjacent urban development also has the potential to affect national forest water, riparian areas, and various biological resources through increased introductions of invasive nonnative species; lighting-up of dark skies; runoff and pollutants from roads, roofs, driveways, fertilized yards, and agricultural areas; and increased or additional harassment of some species from humans, pets not on leashes, and feral cats and dogs.

Increased urbanization has a high potential to result in increased unauthorized uses and criminal activities on the national forests. Arson, cultivation and manufacture of drugs, and trash dumping will continue to have substantial impacts on species and habitats. Unauthorized uses, such as off-route motorized and non-motorized vehicle travel and shooting outside of authorized areas, will continue to be a problem.

Accidental or unintentional human-caused wildfires are expected to increase because of increased use of the national forests and of the roads in or adjacent to National Forest System lands.

Many activities with the potential to negatively affect plants and animals are outside of Forest Service control and beyond the scope of the revised forest plans. Through diligent coordination and collaboration with local community groups, governments, and other agencies, the Forest Service can reduce the potential for future adverse cumulative effects through land use planning efforts, habitat restoration projects, and land acquisitions. Of greatest concern are those actions that have effects on: (a) water and riparian connectivity with off-forest stream systems, (b) habitat linkages between and within National Forest System lands for wide-ranging species, and (c) protection of remaining open spaces adjacent to National Forest System lands that currently provide terrestrial and aquatic species habitat. Opportunities to halt the loss of these habitats decreases as communities grow and the cost to purchase or trade for land increases.

The greatest threat to maintaining connectivity between large blocks of natural habitat is urbanization (California Wilderness Coalition 2001, Stephenson and Calcarone 1999). Development on private lands is steadily consuming wildland habitats and reducing connectivity between the natural areas that remain. This trend poses significant challenges for the conservation of habitat and species on public lands, including National Forest System lands (Stephenson and Calcarone 1999, Western States Tourism Policy Council Web site 2005). Continued urbanization has the power to erase any remaining habitat links (corridors) between the mountain ranges and between mountains and open space (either public or private) in the foothills and coastal areas.

Because of their natural and relatively unfragmented conditions, the national forests are considered to be the backbone or core of regionally-coordinated approaches to the maintenance of biodiversity across the landscape in southern California. Regional wildland planning efforts, such as the state of California's Natural Community Conservation Planning (NCCP) program, occur with Forest Service involvement. Multiple species habitat conservation plans being developed at the city or county level (table 559: County Multi-species Planning Efforts Affecting the Southern California National Forests) are designed to sustain biological diversity in the their planning areas and maintain viable populations of endangered, threatened, and other at-risk species and their habitats (California Department of Fish and Game 2002a).

Table 559. County Multi-species Planning Efforts Affecting the Southern California National Forests

Planning Name	County	Forests	Web site(s) – http://
County of San Diego Multiple Habitat Conservation and Open Space Program (MHCOSP)	Eastern San Diego	Cleveland	www.sdcounty.ca.gov/dplu
Multiple Species Conservation Program (MSCP) – the South County Subarea	Southwestern San Diego	Cleveland	www.sdcounty.ca.gov/dplu
Multiple Species Conservation Program (MSCP) North County Subarea	Northwestern San Diego	Cleveland	www.sdcounty.ca.gov/dplu
Southern Orange County Coordinated Planning Process (SOCCPP)	Southern Orange	Cleveland	pdsd.oc.ca.gov/planning/soccpp/index.asp
Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP)	Western Riverside	Cleveland and San Bernardino	rcip.org/conservation.htm
Coachella Valley MSHCP	Coachella Valley portion of Eastern Riverside	San Bernardino	www.cvmshcp.org/
West Mojave Plan	Western Mojave Desert of San Bernardino	San Bernardino	www.mojavedata.gov/westmojave/info.html

The Missing Linkages Steering Committee, made up of representatives from several agencies and non-governmental organizations (California Wilderness Coalition 2001), oversees another type of regional effort. The goal is to identify landscape linkages or important habitat among the remaining natural areas and to minimize further fragmentation, in order to maintain viability of California's natural heritage by retaining these lands in as natural a condition as possible. The South Coast Missing Linkages Project (`http://scwildlands.org/index.htm`) is holding a series of workshops regarding protection of specific linkages, with limited financial and personnel assistance from the Forest Service. Coordination with other agencies mostly focuses on threatened and endangered species management and not on habitat linkages in Alternatives 1, 2, 4, and 5. Alternatives 3, 4a, and 6 would have a stronger emphasis on coordination with other agencies and focus on maintaining and improving landscape linkages.

Under all alternatives, implementing the actions described in the alternatives—especially land use zones, standards, other design criteria, Best Management Practices, and monitoring—would limit the extent, intensity and timing of negative environmental effects and could result in a high likelihood of maintaining the presence and viability of the biological resources on the southern California national forests. Nevertheless, some adverse effects are unavoidable.

Interstate highways, two-lane county roads, and many existing National Forest System roads were built along streams through the national forests. Increased pressure to improve some of the two-lane county roads into larger, higher volume, and higher speed roads is expected during the next 15 years. Major highways traversing the national forests not only create movement barriers to some wildlife species (such as deer, bear, fish and amphibians), but they also tend to funnel or attract species to roads, where the animals can be killed by vehicles.

As communities adjacent to the national forests continue to expand, many of the important habitat connections or linkages among patches of public land will be modified, altered, degraded or lost. Species such as deer, bear, mountain lion, badger and California spotted owl depend on diverse and seasonal habitats and on prey species that are themselves subject to cumulative changes. Most developments and activities outside the national forests are not necessarily subject to the same restrictions as those on the national forests to minimize or eliminate adverse effects on species and habitats. Human activities will continue to influence species and habitat in various and unpredictable ways. Development of wide-reaching and effective public education tools and programs would be needed to explain the problems and solicit help with solutions.

The management of biological resources across mixed ownerships is becoming increasingly complex, and many of the solutions must be dealt with cooperatively. Focused cooperation and collaboration are urgently needed between the state and federal fish and wildlife management agencies to develop an emergency response process for collecting, holding in an off-site location, and reintroducing threatened, endangered, proposed, candidate and sensitive species with limited distributions when their existence is threatened. To illustrate this point using a recent event, the southern California wildfires of 2003 and the subsequent floods in 2004 and 2005 affected a number of rare aquatic species, whose habitat was not only destroyed, but the animals were also likely washed away.

Wildland fires shape the existing vegetative distribution and structure, often creating large expanses of early seral vegetation. On the other hand, fire prevention and suppression actions have resulted in large acreages of old, dense forests with high fuel loading. Prescribed fire and other vegetation treatments conducted both by the national forests and by adjacent local communities would benefit overall forest health and habitat conditions for most species.

Terrestrial Species - Plants and Animals

Projected human population growth and land development off of the national forests is expected to further fragment and isolate the natural habitats remaining on National Forest System lands. The national forests will continue to be relied upon to provide the bulk of habitat for higher elevation, at-risk and other species during county land management planning efforts, such as the various multi-species habitat conservation plans under development adjacent to the national forests (table 559: County Multi-species Planning Efforts Affecting the Southern California National Forests). Build-out of these county plans will result in National Forest System lands being among the last remaining habitat blocks for many species, particularly those that occur at low elevations. For species that occur at higher elevations, the national forests already provide the bulk of their habitat, and continued development of mountain communities would mean that eventually only habitat on National Forest System lands would remain in a relatively natural state.

At the same time that the national forests are being relied upon to serve as habitat refugia, increasing human populations in the planning area will also look to National Forest System lands for recreation opportunities, especially as undeveloped lands near communities become covered with homes and businesses. Those areas and habitats that are accessible by road and trail are predicted to see increased demand during the planning period, on National Forest System lands as well as in state and county parks and habitat preserves. Some vegetation types, such as chaparral, would see relatively little increased use because of steep terrain and inaccessibility (except after wildland fires), while others, such as montane conifer forests and meadows, would likely receive a large increase in recreation use demand. Low-elevation riparian habitats and coastal sage scrub would likely see both decreased acreage available off-forest and increased demand for use on-forest.

Population growth and increasing development on private lands would also increase requests to locate special uses, such as utility corridors, on National Forest System lands. Habitat modification or loss can result from these uses. Development of private lands within national forest administrative boundaries would increase the amount of land that must be treated for community fire protection. Vegetation modification for fuels reduction would result in further habitat modification.

Alternatives 3 and 6 would allocate the greatest amount of National Forest System land into non-motorized land use zones, reducing the area that will be subject to high levels of motorized recreation use and potential special use development. They would also target for acquisition those private lands that provide connectivity to state and county protected habitat areas. These alternatives would allow the highest level of natural habitat protection, moderating the cumulative loss of habitat that will occur in the planning area due to population growth. Alternatives 1 and 2 allocate fewer acres to low-impact land use zones and thus would contribute more to cumulative adverse effects, especially in accessible habitats such as montane conifer forest, desert montane woodland, and pebble plains. Alternative 4 would emphasize sustainable recreation use at developed sites through education, protective measures, and Forest Service presence in high use areas. This alternative would be intermediate between Alternatives 3 and 6 and Alternatives 1 and 2 in potential for cumulative effects to terrestrial habitats.

Alternative 4a would use the same adaptive mitigation approach to recreation use as Alternative 4, but Alternative 4a focuses not only on developed sites, but on dispersed recreation uses as well. This additional emphasis would be beneficial to protection of biodiversity as demand for use of National Forest System lands increases, especially around the boundaries adjacent to urban development. This alternative falls between Alternatives 3 and 6 and Alternative 4 in relation to cumulative effects to natural habitats.

Alternative 5 would allow the greatest motorized access to National Forest System lands. More land would be available for authorizing a projected increase in commodity production and special-use permitting associated with development. These uses would result in the greatest potential of all the alternatives for alteration and degradation of natural habitats, contributing the most to cumulative adverse impacts on terrestrial species habitat. For the entire planning area, forest plan contributions to negative cumulative impacts would be greatest in those habitats found primarily on National Forest System lands and most accessible to vehicles, including conifer forest, oak and conifer woodlands, pebble plains, and montane meadows.

Aquatic Species

Nearly all of the management activities conducted on the national forests and off-National Forest System lands have the potential to affect water, riparian, and aquatic resources (see the Affected Environment sections on Biological Diversity and Watershed Conditions). Potential cumulative effects on water, riparian, and aquatic resources resulting from past, current, and future management are based on the total amount of disturbance and a watershed's inherent ability to absorb additional disturbance to its biological and physical elements and processes. Past management activities have been concentrated within certain watersheds, and these are the same watersheds where most activities would continue under any of the alternatives.

Activities that have a high risk of adverse effects on watersheds and aquatic resources include water extractions, water diversions (blocking of or constricting channels), removal of vegetation, recreation facility development and use, mining, and high linear feature density (such as roads, trails, fuelbreaks, power transmission lines and pipelines, and trans-basin diversions and tunnels). Some watersheds experience many of these factors, underscoring the need to take into account their cumulative effects.

The possibility for damage to riparian ecosystems is greater under those alternatives that would allow more ground-disturbing activities, such as in Alternatives 4 and 5 from road reconstruction and maintenance, recreation facility construction, and resource development. The resource protection measures in the revised forest plans should prevent widespread or long-term deterioration of water, riparian, or aquatic resources under most alternatives. During implementation of the revised forest plans, some short-term impacts can be expected because of the nature of the activities (such as vegetation removal), but no long-term negative effects from authorized uses and activities are anticipated. Unauthorized and criminal activities have the potential to cause long-term effects on riparian and aquatic species under any alternative, although they would likely be more prevalent under Alternative 5 due to the increased vehicular access compared to other alternatives.

The cumulative effects of management activities and urban population growth adjacent to National Forest System lands will result in increased pressure to develop more water resources, both on-forest and adjacent to National Forest System lands. Substantial diversions from national forest streams currently occur for public and private water supply and hydroelectric projects, and additional new proposals are expected. Negative effects on riparian-dependent resources have occurred at these existing sites, and additional wells or diversions would increase these impacts. In order to maintain aquatic species, entire aquatic ecosystems that are degraded need to be restored and protected through cooperation and partnerships both on and off the national forests throughout southern California.

Increased recreation demand resulting from expanded population growth could lead to increased trail density, trampling and degradation of riparian and aquatic species habitat, and other activities that threaten water quality, especially in popular locations. These activities may limit management options in watersheds of mixed ownership, where habitat for aquatic species and water quality is of concern.

Based on ground disturbance, as described in table 225: Potential effects to watershed conditions from management activities and the Effects on Watershed Conditions section, implementation of Alternative 5 would have the highest risk of adverse cumulative effects to water quality, riparian and aquatic species, and overall watershed condition. Alternatives 1, 2, 4, 4a, 3, and 6 would each have successively fewer potential impacts.

Table 225. Potential effects to watershed conditions from management activities

Activity and Measure	Alt 1 (Existing)	Alt 2	Alt 3	Alt 4	Alt 4a	Alt 5	Alt 6
Acres of land disturbance (*)	1,504,134	(Same)	(Less)	(More)	(More)	(Most)	(Least)
Acres of RCAs in land use zones with fewer allowable uses (BCNM, BCMUR, CB, EW, RW)	323,619	333,775	456,129	325,695	440,107	236,623	517,219
Potential acres of watershed restoration	516	Same	More	More	More	Least	Most
Watershed Condition Rating	Moderate	Same	Improve	Improve	Improve	Degrade	Improve
* In this table, acres of disturbance refer to the following activities: vegetation management (prescribed fires, fuel treatments, mortality removal, timber stand thinning), road and trails, Forest Service facilities, utility corridors, active mining, oil and gas, capable livestock grazing land, and recreation areas. RCA=Riparian Conservation Area CB=Critical Biological EW, RW=Existing and Recommended Wilderness BCNM=Back Country Non-Motorized BCMUR=Back Country Motorized Use Restricted							

Species-at-Risk

Potential cumulative effects on species-at-risk were evaluated using factors described above and expressed using viability outcome statements, similar to the analysis described in the section on Overall Effects of Forest Plan Decisions on Biodiversity. The viability outcome statements/codes described on page 383 were used for assessing the likely consequences of projected activities on all lands within the range of the at-risk species. The implications of the evaluation are described separately below for plants, invertebrate animals, and vertebrate animals.

Plants

Assessment of the 93 plant species-at-risk for potential threats revealed that six of the twelve threats most frequently identified are activities that routinely occur on National Forest System lands (see table 203: Threats to Plant Species-At-Risk, page 80): vegetation management, recreation, off-highway vehicle (OHV) use, grazing, roads, and mining. The effects of these activities have been described previously. Private land development and use is also a frequently mentioned threat.

Assessing cumulative effects on 93 plant species is best done on a species-by-species basis because of species-specific conditions and habitat requirements. Most of the species-at-risk have different habitat requirements, different responses to disturbance, different life history traits, and different ranges and distributions. Threats to each species off National Forest System lands, to the extent that they are known, are described in the species accounts (`www.fs.fed.us/r5/scfpr/read/`). The viability outcome statements for each species-at-risk are shown in table 368: Viability Outcomes By Alternative For Plant Species-At-Risk, page 387.

The number of species assigned each outcome by alternative is shown in table 204: Plant Viability Outcomes for All Lands Summed by Alternative. Alternatives 6 and 3 had the greatest number of species assigned A and B (more favorable) outcomes, followed by Alternatives 4a and 2. Alternative 5 had the most species given a D outcome, indicating that it would contribute the most to adverse cumulative impacts to at-risk plant species. Alternative 4 had more B and fewer C outcomes than Alternative 1; these two alternatives would be intermediate in projected cumulative impacts to plant species-at-risk.

Table 204. Plant Viability Outcomes for All Lands Summed by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
A	0	1	8	2	3	0	9
B	22	33	32	25	30	13	35
C	49	37	32	44	38	47	28
D	22	22	21	22	22	33	21

See Viability Outcomes definitions, page 383

Those plant species-at-risk where outcomes for all lands changed from an A, B, or C outcome under Alternative 1 (current direction) to a D outcome in Alternatives 2, 3, 4, 4a, 5, or 6 are indicators of alternatives most likely to substantially contribute to adverse cumulative effects. Eleven plant species met this criterion (table 205: Plant Viability Outcomes for Eleven Species-At-Risk on All Lands). We reviewed the outcomes for these eleven plant species on National Forest System lands (table 206: Plant Viability Outcomes for Eleven Species-At-Risk on National Forest System Lands) to see the degree to which the alternatives varied in their contribution to cumulative effects.

Table 205. Plant Viability Outcomes for Eleven Species-At-Risk on All Lands

Species	1	2	3	4	4a	5	6
Arenaria macradenia var. *kuschei*	C	B	B	C	B	D	B
Astragalus pachypus var. *jaegeri*	C	C	B	C	C	D	B
Dieteria asteroides var. *lagunensis*	C	C	C	C	C	D	C
Galium californicum ssp. *primum*	C	C	C	C	C	D	C
Galium grande	C	C	C	C	C	D	C
Mimulus exiguus	C	B	B	C	C	D	B
Packera bernardina	C	C	B	C	C	D	B
Phlox dolichantha	C	B	B	C	C	D	B
Piperia leptopetala	C	C	C	C	C	D	C
Sidalcea hickmanii ssp. *hickmanii*	C	C	C	C	C	D	B
Sidalcea hickmanii ssp. *parishii*	C	C	C	C	C	D	C

Table 206. Plant Viability Outcomes for Eleven Species-At-Risk on National Forest System Lands

Species	1	2	3	4	4a	5	6
Arenaria macradenia var. *kuschei*	C	B	B	C	B	D	B
Astragalus pachypus var. *jaegeri*	C	C	A	C	B	D	A
Dieteria asteroides var. *lagunensis*	B	B	B	B	B	C	B
Galium californicum ssp. *primum*	C	C	C	C	C	D	C
Galium grande	C	C	C	C	C	D	C
Mimulus exiguus	C	B	A	C	B	D	A
Packera bernardina	B	B	A	C	C	C	A
Phlox dolichantha	B	A	A	B	B	C	A
Piperia leptopetala	C	C	C	C	C	D	C
Sidalcea hickmanii ssp. *hickmanii*	C	C	C	C	C	D	B
Sidalcea hickmanii ssp. *parishii*	C	C	B	C	C	D	B

See viability outcome codes, page 383

For five species (*Arenaria macradenia* var. *kuschei*, *Galium californicum* ssp. *primum, Galium grande, Piperia leptopetala* and *Sidalcea hickmanii* ssp. *parishii*) (see table 205: Plant Viability Outcomes for Eleven Species-At-Risk on All Lands, and table 206: Plant Viability Outcomes for Eleven Species-At-Risk on National Forest System Lands), all of the effects on plants and their habitats occur on National Forest System lands because all or a large majority of the habitat for these species is also only on National Forest System lands (see individual species accounts `www.fs.fed.us/r5/scfpr/read/`). Thus, Alternative 5 is the only alternative that might produce substantial adverse impacts; the activities and uses that produce these effects would be due mostly to habitat conditions on National Forest System lands. The increased emphasis on dispersed recreation, especially motor vehicle-based recreation, would increase the risk that road construction and maintenance and motorized use of these roads along with unauthorized off-route travel would affect habitat of these species. For *Piperia leptopetala*, a decrease in protection would occur as lands currently zoned as non-motorized become zoned for motorized use.

Six other species (*Astragalus pachypus* var. *jaegeri*, *Dieteria asteroides* var. *lagunensis*, *Mimulus exiguus*, *Packera bernardina, Phlox dolichantha* and *Sidalcea hickmanii* ssp. *hickmanii*,) are found on both National Forest System lands and private or other lands. These occurrences are subject to varying degrees of negative effects regardless of ownership (see species accounts `www.fs.fed.us/r5/scfpr/read/`). For these six plant species, the combined effects of uses and activities that would occur on both National Forest System lands and private land would result in potentially substantial adverse cumulative impacts, which would occur only under Alternative 5 (table 205: Plant Viability Outcomes for Eleven Species-At-Risk on All Lands and table 206: Plant Viability Outcomes for Eleven Species-At-Risk on National Forest System Lands).

Under Alternative 5, land use zoning would result in decreased protection for *Packera bernardina* because areas currently zoned as Back Country Non-Motorized would become Back Country. In addition, no Special Area designations would occur that would promote habitat protection for this species under this alternative. The increased emphasis on dispersed recreation, especially motor vehicle based recreation, would increase the risk that vehicles, road maintenance and unauthorized off-route travel would affect habitat for *Astragalus pachypus* var. *jaegeri, Mimulus exiguous, Packera bernardina,* and *Sidalcea hickmanii* ssp. *hickmaniii. Astragalus pachypus* var. *jaegeri* is currently being affected by motorized use, and effects would be greater under this alternative. *Dieteria asteroides* var. *lagunesis* is mostly restricted to a small area on National Forest System lands, populations in Mexico, and possibly a few occurrences on private lands within the Cleveland National Forest boundary. Under Alternative 5, the change of a portion of occupied habitat for *Dieteria asteroides* var. *lagunesis* from the current non-motorized zoning to Back Country, combined with the emphasis of this alternative on motorized recreation and commodity development, would increase the risk that vehicles and road-associated activities would affect habitat for this taxon.

For four plant species (*Arenaria macradenia* var. *kuschei, Astragalus pachypus* var. *jaegeri, Mimulus exiguus*, and *Sidalcea hickmanii* ssp. *parishii)*, the predicted impacts occurring on National Forest System lands as a result of implementation of Alternative 5 would be sufficient to produce potentially substantial effects on these species and their habitat, which would be exacerbated by development of habitat that is found on private land. Under Alternative 5 there would be increased threats to these species as described above. Regardless of the alternative selected, occurrences of these species that are found on private land would continue to be at risk of adverse impacts from urban development.

We assumed that the potential for increased motorized access under Alternative 5 would create increased risks to these plants from road construction and maintenance, dispersed recreation activities, and unauthorized off-route travel. For some of these species, habitat currently protected within non-motorized zones would become motorized. In addition, many of these species would receive no future protection from recommended Special Area designations. Under these circumstances, additional area closures or other deterrents would likely be needed to reduce risks to these plant species.

Invertebrate Animals

Projected viability outcomes for invertebrate animal species-at-risk are given in table 372: Viability Outcomes by Alternative for Invertebrate Animal Species-At-Risk, page 392. The number of species assigned each outcome by alternative is shown in table 207: Invertebrate Animal Viability Outcomes for All Lands Summed by Alternative. Alternative 6 had the greatest number of species assigned outcome A, followed by Alternative 3, then Alternatives 2 and 4a. Alternative 5 resulted in the most species being given C or D outcome, indicating that it would contribute the most to adverse cumulative impacts to at-risk invertebrate species. Alternatives 1 and 4 were similar and intermediate between the others.

Table 207. Invertebrate Animal Viability Outcomes for All Lands Summed by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
A	0	1	2	0	1	0	4
B	5	4	4	5	4	1	3
C	4	4	3	4	4	6	2
D	1	1	1	1	1	3	1

See viability outcome codes, page 383

Those invertebrate species-at-risk where outcomes for all lands changed from an A, B, or C outcome under Alternative 1 to a D outcome in Alternatives 2, 3, 4, 4a, 5, or 6 are indicators of alternatives most likely to contribute substantially to negative cumulative effects. Two invertebrate species matched this criterion (table 208: Viability Outcomes for Two Invertebrate Animal Species-At-Risk on All Lands). We then reviewed the outcomes for these two species on National Forest System lands (table 209: Viability Outcomes for Two Invertebrate Animal Species-At-Risk on National Forest System Lands) to see the degree to which the forest plan alternatives varied in their contribution to cumulative effects.

Table 208. Viability Outcomes for Two Invertebrate Animal Species-At-Risk on All Lands

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
Harbison’s dun skipper	C	C	B	C	C	D	B
Laguna Mountains skipper	C	C	C	C	C	D	B

See viability outcome codes, page 383

Table 209. Viability Outcomes for Two Invertebrate Animal Species-At-Risk on National Forest System Lands

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
Harbison’s dun skipper	B	B	A	B	B	C	A
Laguna Mountains skipper	C	C	C	C	C	D	B

See viability outcome codes, page 383

Harbison's dun skipper and Laguna Mountains skipper would have D outcomes on all lands under Alternative 5. For Harbison's dun skipper, all grazing allotments would remain active in Alternative 5, and areas of known and potential habitat would fall into the Back Country zone. This may increase use of the areas, including the possibility of unauthorized off-route driving into areas of skipper habitat if motorized trails are built nearby (see species accounts `http://www.fs.fed.us/r5/scfpr/read/`). The greater protection provided to known and potential occurrences under Alternatives 3 and 6 would improve the overall situation for the Harbison's dun skipper relative to current conditions, and the increased threat level that would result from Alternative 5 decreases the future outlook for this butterfly. Possible loss of populations off and on National Forest System lands under Alternative 5 means that there would be increased likelihood of extirpation of Harbison's dun skipper.

For Laguna Mountains skipper, the outcome would also be D for National Forest System lands under Alternative 5. This outcome is predicted because areas of known occurrence would fall into Back Country zones, where animals could be accidentally crushed by motor vehicles (as opposed to recommended wilderness or Critical Biological zones that would occur under Alternative 6). Because known populations of Laguna Mountain skipper occur primarily on National Forest System lands, the outcome for the entire range of this species strongly depends on the outcome for National Forest System lands. Maintenance of the current distribution of this species and any chance for recovery relies heavily on Forest Service actions.

Vertebrate Animals

Cumulative effects on 46 at-risk species of wildlife and fish were also assessed as described in the section on plant species-at-risk. Viability outcomes for vertebrate animals are included in table 371: Viability Outcomes by Alternative for Vertebrate Animal Species-At-Risk, page 390.

Table 210. Vertebrate Animal Viability Outcomes for All Lands Summed by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
A	0	0	0	0	0	0	0
B	1	1	3	1	2	0	3
C	12	23	29	15	25	6	28
D	33	22	14	30	19	40	15

See viability outcome codes, page 383

The number of species assigned each outcome by alternative is shown in table 210: Vertebrate Animal Viability Outcomes for All Lands Summed by Alternative. Alternatives 6 and 3 have the greatest number of species assigned outcome B, followed by Alternative 4a. Alternative 3 has the greatest number of species assigned outcome C, followed by Alternatives 6 and then 4a. Alternative 5 results in the most species being given a D outcome, indicating that it would contribute the most to adverse cumulative effects to at-risk vertebrate species.

Table 211. Viability Outcomes for Seven Vertebrate Animal Species-At-Risk on All Lands

Species	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
Bald eagle (breeding)	C	C	C	C	C	D	C
California condor	C	C	C	C	C	D	C
California spotted owl	C	C	C	C	C	D	C
Purple martin	C	C	C	C	C	D	C
San Bernardino flying squirrel*	C	C	C	C	C	D	C
Townsend’s big-eared bat	C	C	C	C	C	D	C
Southern rubber boa*	C	C	C	C	C	D	C

*Outcome is different for the southern margin of species’ range for San Bernardino flying squirrel and southern rubber boa. See species accounts for geographical differences in viability outcomes. See viability outcome codes, page 383

Those wildlife and fish species-at-risk where outcomes for all lands changed from a B or C outcome under Alternative 1 to a D outcome in Alternatives 2, 3, 4, 4a, 5, or 6 are indicators of alternatives most likely to substantially contribute to adverse cumulative effects. Only seven vertebrate species match this criterion (see table 211: Viability Outcomes for Seven Vertebrate Animal Species-At-Risk on All Lands. We reviewed the outcomes for these seven species on National Forest System lands (see table 212: Viability Outcomes for Seven Vertebrate Animal Species-At-Risk on National Forest System Lands) to see the degree to which the forest plan alternatives might contribute to cumulative effects.

Table 212. Viability Outcomes for Seven Vertebrate Animal Species-At-Risk on National Forest System Lands

Species	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
Bald eagle (breeding)	B	B	B	B	B	C	B
California condor	B	B	B	B	B	C	B
California spotted owl	C	C	C	C	C	D	C
Purple martin	C	C	C	C	C	D	B
San Bernardino flying squirrel*	C	C	C	C	C	D	C
Townsend's big-eared bat	B	B	B	B	B	C	B
Southern rubber boa*	B	B	B	B	B	C	B

*Outcome is different for the southern margin of species' range for San Bernardino flying squirrel and southern rubber boa. See species accounts for geographical differences in viability outcomes. See viability outcome codes, page 383

Occurrences of these species (bald eagle, California condor, California spotted owl, purple martin, San Bernardino flying squirrel, Townsend's big-eared bat, and southern rubber boa) are found on both National Forest System lands and private land and are subject to varying degrees of negative effects regardless of ownership (see species accounts `http://www.fs.fed.us/r5/scfpr/read/`). The combined effects of uses and activities that would occur on National Forest System lands and private land result in potentially adverse cumulative effects, which would occur only under Alternative 5 (see table 212: Viability Outcomes for Seven Vertebrate Animal Species-At-Risk on National Forest System Lands). These species would all be affected by increased motorized access and the projected human-caused fire starts, dispersed recreation disturbance in key nesting or breeding areas, and increased ground disturbance from development and unauthorized off-route vehicle use. Increased human access would result in more scattered trash and legal and unauthorized target shooting, which could affect condors if carcasses and lead shot are left in the field. Alternative 5, which makes available more national forest acreage for special-use permitting in support of increasing private land development, would result in effects to these species.

Game Species

Many of the cumulative effects described above for species-at-risk also apply to game species, particularly those relating to water and riparian habitats. Increasing development adjacent to the national forests is reducing habitat and is an impediment to dispersal for some game species. Water extractions may also limit the amount of available water and can be a limiting factor to those species that require permanent sources of water year-round. The effects of the recent drought on game species are unknown, but the drought has been suspected of causing reductions in populations in most places because of a large amount of vegetation mortality and loss of forage and water sources. In the long-term, openings created in montane forests from drought, wildfires, and prescribed burning should benefit many species, but particularly mule deer and upland game birds, which should benefit from the increased herbaceous ground cover and mast-producing oaks in mixed pine/oak stands.

Many of the adjacent land developments and concentrated recreation uses in high elevation zones are occurring on mule deer summer range. This use generally eliminates or reduces the quality of the summer mule deer use areas. Both development and concentrated recreation use on adjacent lands are resulting in less use by mule deer of summer range off the national forests. In addition, these activities may result in a decrease in the quality of summer range on the national forests from over-utilization and spillover effects, such as at-large and feral dogs. Some winter range is being lost to development on the lower edges of the national forests, but this loss generally is not limiting mule deer populations in southern California.

For species that are subject to hunting, trapping, or other directly consumptive use, state and federal regulatory mechanisms play an important role in the population dynamics of the species. The state of California population and harvest objectives, controlled through lengths and types of harvest seasons and bag limits, affect the numbers and distribution of game species on the national forests. Increasing human population and demand may result in the need for the state of California to further regulate numbers of consumptive users, bag limits, or season lengths to provide adequate carryover of breeding animals.

Management Indicator Species

The cumulative likelihood of improved habitat condition for each management indicator species (MIS), based on the management of the national forests projected under each alternative, is displayed in table 216: Cumulative Likelihood of Improved Habitat Condition for Management Indicator Species by Alternative. Cumulative effects on management indicator species that are also considered species-at-risk are described in the species accounts for mountain lion, arroyo toad, and California spotted owl. The cumulative effects on habitats of most MIS are also described in the Environmental Consequences sections on Effects on Vegetation, Effects on Soil, and Effects on Watershed Condition in this chapter. Some of that information is summarized below, along with cumulative effects indications for the other management indicator species.

Table 216. Cumulative Likelihood of Improved Habitat Condition for Management Indicator Species by Alternative

Habitat Condition	MIS	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 4a	Alt. 5	Alt. 6
Ecosystem Health	Mule deer	L	M	H	M	H	L	H
Fragmentation	Mountain lion	L	M	H	M	M	L	H
Aquatic Habitat	Arroyo toad	L	M	H	M	M	L	H
Riparian Habitat	Song sparrow	L	M	H	M	M	L	H
Oak Regeneration	Blue oak	L	L	L	L	L	L	L
Oak Regeneration	Engelmann oak	L	L	L	L	L	L	L
Oak Regeneration	Valley oak	L	L	L	L	L	L	L
Stand Health	Bigcone Douglas-fir	M	M	M	M	M	M	H
Stand Regeneration	Coulter pine	M	M	M	M	M	M	M
Montane Conifer Forest	California spotted owl	M	M	M	M	M	L	M
Montane Conifer Forest	California black oak	M	M	M	M	M	M	M
Montane Conifer Forest	White fir	M	M	M	M	M	M	M

H = High, M = Moderate, L = Low

Mule Deer

Many of the cumulative effects on mule deer were described above under Game Species. The primary threats to mule deer and the habitat they represent are development and urbanization in summer range at the mountain communities, increased vehicle use (especially unauthorized use off of designated routes), and high recreational use of meadows and riparian areas. Alternatives 3, 4a, and 6 have less potential for expanded vehicle access and an emphasis on controlling dispersed recreation, which will benefit mule deer. Alternative 5, with an emphasis on motorized access and resource development, would expose mule deer and their habitat to the greatest potential for negative effects. Mule deer will benefit somewhat from the increased fuels management program, which will open up forest canopies and produce greater forage availability. The benefits will be limited, however, because the fuels treatments would be almost entirely around communities where dogs and human activity already severely limit deer use. Prescribed burning in chaparral, which has great potential to improve habitat for deer, will be limited by the budget and the priority focus on community protection treatments. Under all alternatives, wildfires in chaparral will generally continue to be quickly suppressed and kept small or become very large under extreme conditions. Both small or very large types of wildfires are not as valuable for mule deer habitat enhancement as are well planned, moderately sized, mosaic burns that can be achieved through prescribed burning.

Mountain Lion

The primary threats to the mountain lion and the ecosystem processes they represent are from development, roads and habitat fragmentation. The sum total of effects on and beyond National Forest System lands are likely to result in an increasing loss of habitat and connectivity and increasing mortality from vehicles. This loss would continue under all alternatives, but under Alternatives 3, 4a, and 6 the national forests will be much more active in providing a core of habitat with low to moderate road density that could help maintain mountain lions in southern California. Priority for land acquisition under Alternatives 3 and 6 would be for habitat linkages as well as acquiring inholdings. The national forests are so important to long term maintenance of habitat suitable for large mammals that Forest Service management emphasis can make a difference in the region. Without the national forests and linkages between the mountain ranges and other large habitat preserves, there is not much long term potential for mountain lions in southern California. Alternative 5 would likely have negative effects on mountain lion and other species needing landscape linkages and undeveloped areas due to the increase in motorized access, roads, and dispersed recreation. Alternatives 3, 4a, and 6 would provide benefits to mountain lion and their habitat due to the emphasis on biodiversity in land exchanges, cooperation with other agencies, and habitat improvement.

Arroyo Toad

The arroyo toad inhabits both perennial and intermittent rivers and streams with shallow, sandy to gravelly pools adjacent to sand or fine gravel terraces (U.S. Fish and Wildlife Service 2000). Off-forest streams adjacent to National Forest System lands are in continuing decline, especially in urban areas where development brings an increased demand for water and increased diversion and stream channelization. Riparian and stream habitats on private land would continue to be affected by the predicted rapid urban development. As previously mentioned, changes in the hydrologic regime in drainages where arroyo toads occur, loss and/or degradation of aquatic and upland habitat, predatory exotic species, and blockages to individual dispersal are the primary threats to this and other aquatic species. Urban encroachment into riparian areas and stream channels is expected to continue as human populations increase dramatically over the next 50 years.

The widespread occurrences of invasive nonnative aquatic plant species in many low-elevation streams has affected riparian areas. The native plant structure can be altered as the invasive species encroach into and around the stream channel. The nonnative plant species also consume large quantities of water, which reduce stream flows, cover or block aquatic habitat, and become immediate threats to streams on National Forest System lands. These infestations will continue to have a detrimental effect on aquatic and riparian habitat, as stream conditions are degraded.

National Forest System lands play an important role in protecting a large portion of existing populations of arroyo toad and other aquatic species. Streams and riparian areas on the national forests will serve an important role in southern California through time. Alternative 3, 4a, and 6 would provide benefits for aquatic species due to more intensive recreation management, increased emphasis on habitat restoration, and more acreage managed for non-motorized uses. Alternative 5 would have the greatest impact on aquatic species due to the emphasis on motorized access, resource extraction, and support of special-use permitting for community development.

Song Sparrow

The primary cause for the decline of the song sparrow and the other species and riparian habitat it represents is widespread habitat fragmentation, including extensive loss of both structural components and entire segments of habitat resulting from hydrological changes in low-elevation cottonwood-willow riparian habitat across the species' range (Unitt 1987, U.S. Fish and Wildlife Service 1995). Other factors contributing to habitat losses include urban development, road development and maintenance, livestock grazing, high intensity and frequent wildfire and human recreational activities (Marshall and Stoleson

2000, Loe pers. observation). Additional threats include brood parasitism by brown-headed cowbirds, replacement of native riparian vegetation by invasive nonnative species, pesticide contamination, predation, water management, and probable loss of winter habitat due to tropical deforestation.

Riparian habitat on private land would continue to be affected by rapid development. Restoration of some riparian systems would take place, but there will still be significant losses as the human population in the area continues to grow rapidly over the next 50 years. As a result, riparian areas on the southern California national forests will be even more important for many species. Alternatives 3, 4a, and 6 would provide benefits for riparian species (including song sparrow) due to more intensive recreation management, increased emphasis on habitat protection and restoration, and more acreage managed for non-motorized uses. Alternative 5 would have the greatest impact on aquatic species due to the emphasis on motorized access, resource extraction, and support of special-use permitting for community development.

Oak Woodland Species and Bigcone Douglas-Fir

Oak woodland and bigcone Douglas-fir habitat will continue to decline on National Forest System and private lands due to the factors discussed in the Affected Environment section on Vegetation Condition and Forest Health. None of the alternatives would change this situation to any extent. Alternative 6 would have more emphasis on treatment of bigcone Douglas-fir stands to protect them from wildfire. Private land development will continue to affect oak woodlands due to the amount of gentle topography occupied by this habitat type. Bigcone Douglas-fir will be affected less by development, as much of it occurs on steep slopes and in drainages that are not developable; also, most is at higher elevations primarily on National Forest System lands.

Coulter Pine

Coulter pine habitat will not be substantially affected by any alternative. Coulter pine on private and National Forest System lands will generally not be affected by forest plan decisions. Some habitat on private land will continue to be developed over time, making remaining habitat on National Forest System lands more important to wildland that depend on this vegetation.

Montane Conifer Species

Montane conifer habitat will receive a substantial amount of fuels reduction treatment around communities on National Forest System and private lands. Community protection through fuels treatments will make the habitat in the WUI Defense zones less likely to burn in wildfires, but the habitat for species requiring dense forest (such as California spotted owl), snags, and dead and down woody material would be adversely affected by the fuels work. Although the California spotted owl and its mature dense forest habitat occur predominately on National Forest System lands, some important habitat does occur on private land that is subject to development. The greatest threats on private land are stand-replacing wildland fire, development, and water diversion. Acquisition of private land by the Forest Service and other conservation agencies would be beneficial for the California spotted owl and other forest-dependent species. The cumulative effects of all the ongoing activities and land uses are substantial for the California spotted owl in southern California (LaHaye pers. comm.). Since so much of the spotted owl habitat and use is on National Forest System lands, the national forests are critical to the long term health of this type of habitat and the other species that depend on it. There is not much difference in alternatives for this MIS because of the current emphasis on community protection from wildfire in all alternatives. However, Alternative 6, with its biodiversity conservation emphasis, would provide the most benefits to these MIS.

Conclusion—Cumulative Effects on Biodiversity

Through implementation of actions described in this document and consideration of all the impacts off the national forests, the general habitat quality trend on National Forest System lands is likely to be stable in the long term.

Planning area-wide, most species and their associated habitats will remain within expected ranges of variability under current climatic conditions on the national forests. Species-at-risk with a majority of their habitat on private land would most likely decline substantially at the current rate of land development, which could result in substantial population effects on National Forest System lands. One of the main challenges over the next planning cycle would be to work together with other groups and agencies to reach the goal of reversing the trend of habitat loss and species listings in southern California.

Effects on Invasive Species

Invasive nonnative plant and animal species are abundant and widely distributed across the southern California national forests. The agents that can introduce and spread invasive species ("vectors") are numerous, and seven vegetation communities are especially susceptible as described in the Affected Environment section. The future distribution and abundance of invasive nonnative species across the national forests would primarily be dependent on four factors: (1) the disturbance regime (frequency, intensity, timing and extent of disturbance) and pathway access; (2) the amount of low impact land use zoning and special area designations; (3) the management practices used to reduce the risk of invasive nonnative species introduction and spread; and (4) cumulative effects of factors on and off the national forests.

Three methods were used to evaluate the susceptibility of National Forest System lands to nonnative species invasion under each alternative. A weed risk determination was also made, which is included in Appendix C (see Summary and II. Weed Risk Assessment).

The first analysis compared acres of ground disturbing activities, changes in vegetation structure, and potential vector access as a result of vegetation and fuels treatments, National Forest System roads and the potential to add unclassified roads to the system, and acres of livestock grazing. Proposed activity acreages and the estimated percent of National Forest System lands that would be affected are shown in table 546: Estimated Percent of Southern California National Forest Acres Susceptible to Invasive Species. This analysis revealed that Alternative 6 would be expected to result in the least amount of ground disturbance, only 16 percent over the life of the plan. The other alternatives would result in greater acreages of ground disturbance; however, they do not vary greatly, each having around 30 percent disturbance (table 546).

The second method compared the amount of area in low impact zoning (no motorized public access) and new recommended special designations across alternatives; these areas are expected to be less susceptible to nonnative species invasion. The acreage of existing wilderness zoning and existing special area designations (e.g., research natural areas, special interest areas) is the same in all alternatives and thus not included in this analysis. Back Country Motorized Use Restricted, Back Country Non-Motorized, Critical Biological, recommended wilderness, and experimental forest zoning as well as new recommended research natural areas and special interest areas are expected to contribute to a lower level of ground-disturbing impacts than other zones (see table 547: Percent of National Forest System Lands Less Susceptible to Invasive Species by Alternative). Only 15 percent of the land base would be less susceptible to invasive species infestation under Alternative 1 due to low impact zoning and new special area designation, with increased percentages under Alternatives 4 (16 percent), 2 (19 percent), 3 (40 percent), 4a (42 percent), and 6 (51 percent). Alternative 5 would have less than 1 percent of the land base, outside of existing wilderness and special designations, in areas with lower potential for invasive species spread.

Table 546. Estimated Percent of Southern California National Forest Acres Susceptible to Invasive Species

Proposed Activities	Alt 1	Alt 2	Alt 3	Alt 4	Alt 4a	Alt 5	Alt 6
Vegetation, Fuel Treatments							
Mortality							
Annually	1,500	1,500	1,500	1,500	1,500	1,500	1,500
15 years	22,500	22,500	22,500	22,500	22,500	22,500	22,500
Percent all Forests over 15 years	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Defense/threat zones							
Annually	13,000	13,000	13,000	13,000	13,000	13,000	15,688
15 years	195,000	195,000	195,000	195,000	195,000	195,000	235,320
Percent all Forests over 15 years	5.52	5.52	5.52	5.52	5.52	5.52	6.66
Fuelbreak Maintenance							
Annually	3,500	3,500	3,500	3,500	3,500	3,500	750
15 years	52,500	52,500	52,500	52,500	52,500	52,500	11,250
Percent all Forests over 15 years	1.48	1.48	1.48	1.48	1.48	1.48	0.32
Fuelbreak Construction							
Annually	1,350	1,350	1,350	1,350	1,350	1,350	250
15 years	20,250	20,250	20,250	20,250	20,250	20,250	3,750
Percent all Forests over 15 years	0.57	0.57	0.57	0.57	0.57	0.57	0.11
Thinning							
Annually	1,200	1,200	1,200	1,200	1,200	1,200	1,200
15 years	18,000	18,000	18,000	18,000	18,000	18,000	18,000
Percent all Forests over 15 years	0.51	0.51	0.51	0.51	0.51	0.51	0.51
Prescribed Fire							
Annually	19,000	19,000	19,000	19,000	19,000	19,000	11,000
15 years	285,000	285,000	285,000	285,000	285,000	285,000	165,000 *
Percent all Forests over 15 years	8.07	8.07	8.07	8.07	8.07	8.07	4.67

Proposed Activities	Alt 1	Alt 2	Alt 3	Alt 4	Alt 4a	Alt 5	Alt 6
Livestock Grazing							
Suitable acres annually	585,549	450,082	412,277	448,889	448,956	542,877	87,319
Percent all Forests over 15 years	16.58	12.75	11.68	12.71	12.71	15.37	2.47
National Forest System Roads	14,225	14,100	13,945	14,230	11,865	14,545	9,345
Percent all Forests over 15 years	0.40	0.40	0.39	0.40	0.34	0.41	0.26
Unclassified road acres potentially added to National Forest System next 15 years	4,240	4,185	3,320	4,285	2,830	4,805	2,370
Percent all Forests over 15 years	0.12	0.12	0.09	0.12	0.08	0.14	0.07
Total all roads, all Forests over 15 years	0.52	0.52	0.49	0.52	0.42	0.55	0.33
Estimated total percent of all Forests acreage susceptible over life of Plan due to activities	34%	30%	29%	30%	30%	33%	16%

* Does not account for acres burned in "Fire Use" strategy on the LPNF under Alternative 6.

Table 547. Percent of National Forest System Lands Less Susceptible to Invasive Species by Alternative

Low Impact Land Use Zones and new Recommended Special Area Designations	Alt 1	Alt 2	Alt 3	Alt 4	Alt 4a	Alt 5	Alt 6
Back Country Motorized Use Restricted	0	0	0	0	460,584	0	0
Back Country Non-Motorized	505,948	398,261	823,497	437,169	820,690	0	1,067,583
Critical Biological	3,691	11,502	12,816	11,629	10,094	1,440	14,721
Experimental Forest	15,429	14,145	14,145	15,429	15,498	15,429	15,429
Recommended Wilderness	0	178,605	468,620	80,511	86,857	0	581,656
Recommended candidate Research Natural Areas	9,037	28,798	29,876	11,141	18,731	2,220	32,100
Recommended Special Interest Areas	0	34,809	68,655	24,521	53,289	4,812	77,740
Total acres within low impact zones and recommended Special Area Designations- all Forests	534,105	666,120	1,417,609	580,400	1,465,743	23,901	1,789,229
Total percent of all Forest lands less susceptible over life of Plan due to land use zoning and new Special Area Designations	15%	19%	40%	16%	42%	0.7%	51%

The third method contrasted Alternatives 2 through 6, which include the invasive species strategic goal, the revised set of forest plan standards, and the southern California national forests' Noxious Weed Management Strategy (Appendix M, Part 3 of the forest plans), to Alternative 1, which would just continue current management direction. The Noxious Weed Management Strategy contains tactics for the next three to five years of invasive species control work. Also considered was the level of emphasis in each alternative on invasive species management actions in the integrated conservation strategy. The highest level of emphasis would occur under Alternative 6, followed by Alternatives 3, 4a, 2, 4, 1, and 5, in decreasing order.

The three analyses were combined to create a relative rating of susceptibility to invasive species for each alternative (table 562: Relative Rating of Alternatives to Susceptibility of Invasive Species Spread). This comparison predicts that Alternative 6 would produce the lowest susceptibility to nonnative species invasion, followed by Alternatives 3, 4a, 2, 4, 1, and 5. The weed risk determination reached a similar conclusion (see Appendix C II. Weed Risk Assessment).

Table 562. Relative Rating of Alternatives to Susceptibility of Invasive Species Spread

Susceptibility Rating Variables	Alt 1	Alt 2	Alt 3	Alt 4	Alt 4a	Alt 5	Alt 6
Susceptible acres due to proposed activities (Table 546)	5	4	3	4	4	5	1
Susceptible acres due to motorized zoning (Table 546)	4	3	2	4	2	5	1
Reduced susceptibility due to low impact land use zoning and recommended Special Area designation (Table 547)	4	4	2	4	2	5	1
Susceptibility due to lack of southern California Forests Weed Management Strategy (Part 3, Appendix M), strategic goal, and revised Standards	3	1	1	1	1	1	1
Susceptibility due to emphasis level of integrated conservation strategy *	3	3	1	4	2	5	1
Overall Susceptibility Ranking for invasive species spread by alternative (1-lowest, 5-highest)	3.8	3.0	1.8	3.4	2.2	4.2	1

*Alternative 1 has a high level of emphasis on invasive species management along with a large number of invasive species standards within the Southern California Conservation Strategy.

Direct and Indirect Effects

Factor (1) Disturbance Regimes (frequency, intensity, timing and extent of disturbance) and Pathway Access

The cause-and-effect relationships to the proposed action are described under each activity. Historical effects of activities similar to those under consideration were also used to determine the likely response of activities on invasive species management. Coastal sage scrub, desert woodland and scrub, low elevation chaparral, montane conifer forest, Monterey coastal, oak savanna, and riparian habitats were identified as plant communities that are currently degraded or vulnerable to invasion and at risk of further decline.

Primary activities likely to affect management of invasive species were identified in the Affected Environment section:

- Vegetation, Fuels and Fire Management
- Recreation Management

- Road, Trail and Motorized Route Management
- Livestock Management
- Special-Use Administration Management

Chapter 2 provides a detailed comparison of how these activities are expected to vary by alternative.

<u>Effects of Vegetation, Fuels and Fire Management</u>

The Vegetation Condition and Forest Health section in the Affected Environment and the Effects on Vegetation section in the Environmental Consequences provide descriptions and acreages of vegetation treatments by vegetation type proposed within Wildland/Urban Interface (WUI) Defense and Threat zones and fuelbreaks.

Appendix K in Part 3 of the forest plans describes the level of vegetative manipulation required to meet non-flammability requirements within WUI Defense and Threat zones and fuelbreaks (also see Appendix O. Pesticide Risk Assessment).

Mechanical Treatments Used to Create and Maintain Wildland/Urban Interface Defense and Threat Zones, and Fuelbreaks

Methods used to construct WUI Defense and Threat zones and fuelbreaks would include use of various types of heavy equipment, hand crew use of hand tools, and application of herbicides. Organic materials resulting from treatments would be removed, chipped, or masticated on site. Temporary roads created as necessary for access would be rehabilitated as projects are completed. Large areas of land within the WUI Defense and Threat zones would likely be treated within a short period of time. In the WUI Defense zone and on fuelbreaks, the more intensive treatments would result in conditions that would persist indefinitely due to the intensity of vegetation changes and maintenance to retain these conditions.

On the national forests of southern California, the level of disturbance and the potential for nonnative plants and shrubs to invade treated areas would vary among treatment sites. The rate at which nonnative plants and shrubs invade treated areas would be dependent on numerous factors, some of which include (1) treatment methods, their level of soil disturbance and how well disturbed soils are rehabilitated following treatments; (2) amount of remaining canopy cover, level of shade at the soil level and duff depth; (3) regeneration rate of native forbs, shrubs and trees; and (4) the presence or absence of invasive nonnative plants, shrubs or seed banks within or adjacent to the project area. Fire history and precipitation levels of the area prior to and following treatments, vegetation type, and habitat vulnerability are additional factors that would influence introduction and spread. Additional factors include the frequency, intensity and methods of maintenance and the management of unauthorized motorized and mechanized vehicle use of these sites.

A recent study evaluating the abundance of invasive plants on fuelbreaks, including sites on the four national forests in southern California, found that presence, cover, density, and species richness of nonnative species were significantly higher on fuelbreaks than in surrounding wildland areas (Merriam and others submitted). Weed establishment was highest at low elevations within chaparral and coastal sage scrub types. This is attributed to differences in land use such as road and housing density and the high number of nonnative plants adapted to low elevation climates (Keeley and others 2003; Swartz and others 1996, cited in Merriam and others [submitted]).

Methods used to create fuelbreaks were also found to affect the amount of cover of invasive plants in vegetation communities studied. Fuelbreaks created by bulldozers that reduced canopy cover and litter were found to have a higher cover of nonnative species than fuelbreaks constructed by thinning (Merriam and others submitted). This was attributed to a higher level of soil surface disturbance that may have disrupted native seed banks and the likelihood that nonnative seeds were introduced and transported between sites. They also found that fuelbreaks created by hand crews, which had lower overstory canopy cover, litter cover and duff depth, had higher cover of nonnative species than those constructed by mechanical equipment.

In Montana, increased light levels from loss of canopy cover along logging roads and in clearcuts played an important role in nonnative plant establishment. In some locations, weeds constituted 60 percent of the plant cover in clearcut areas but were not present in undisturbed areas (Forcella and Harvey 1983).

Chipping and masticating vegetation, which is a method to reduce fuels in the urban interface and is a common practice on the southern California national forests, reduces light at the soil level and adds a coarse layer of mulch. Merriam and others (submitted) suggested that an added layer of ground cover produced by chipping or masticating may be effective at reducing the germination and establishment of nonnative plants.

The level of weed infestation may also depend on the ability to maintain a competitive perennial native plant community. Timelines for restoration may be increased if continual disturbance is likely to reduce the perennial cover (Sieg and others 2003). Unauthorized off-route travel by motorized and mechanized vehicles may degrade vegetation conditions within WUI Defense and Threat zones and on fuelbreaks. This could reduce native cover, perpetuate soil disturbance, and increase vectors that disperse weeds. Undisturbed vegetation adjacent to WUI Defense zones and fuelbreaks could also experience weed establishment over time as invaded areas provide sources of seeds to colonize adjacent undisturbed locations. Regardless of the disturbance history of the area, the abundance of nonnative species within the adjacent areas is expected to increase significantly with the age of the fuelbreak (Merriam and others submitted). Wildfire may also make these locations susceptible to infestation.

Forcella and Harvey (1983) found that weeds present in ponderosa pine forest in lower montane zones also spread to adjacent communities of native vegetation. Consequently, if weeds are introduced into treated conifer areas, there is a risk that the infestation would spread into other vegetation types or into untreated stands of the same type. Rate and intensity of spread would depend on the vegetation type and amount of human or natural disturbance present. In some locations, such as WUI Threat zones, where a higher canopy cover is retained and as the canopy cover and duff layer increase over time, weeds may not persist over the long term. For example, a 50 percent increase in the understory density of weedy species occurred after harvest of northern hardwood trees, but by 50 years later tree density reached pre-harvest levels and weedy species had disappeared (Sieg and others 2003).

The conditions described above are also associated with severe wildfires (Sieg and others 2003). In ponderosa pine forests in Arizona, the highest cover of invasive species occurred within high intensity fire areas where fire had killed most trees. In moderately burned areas, where most trees survived, there was an intermediate level of invasive plant cover. Unburned sites had minute amounts of invasive species cover (Crawford and others 2001, cited in Sieg and others 2003). Over time, as historic fire regimes within montane conifer forests are returned, patches may occur over the landscape that are less susceptible to drought, insect mortality, and high intensity stand-replacing wildfire. Forests in this condition may be less susceptible to weed invasion. This could also reduce the likelihood that large fires would increase flood events that could distribute invasive plants, such as arundo, through watersheds.

Vegetation management activities used to create WUI Defense zones and open fuelbreaks, and activities such as tree thinning and prescribed fire within WUI Threat zones and shaded fuelbreaks, would create changes in vegetation structure that favor the introduction of some invasive nonnative mammals, birds and invertebrates. Within heavily manipulated WUI Defense zones and open fuelbreaks, there is a high probability that feral cats and dogs would increase on National Forest System lands adjacent to urban communities. These domesticated animals would be expected to venture farther and farther out into cleared vegetation over time. Cattle could move across across WUI Defense and Threat zones and fuelbreaks if these openings overlap with allotment boundaries or if feral cattle were present. There is also potential for brown-headed cowbirds to invade areas where vegetation has been removed. Baker and Lacki (1997) found brown-headed cowbirds, which were not recorded in uncut stands, increased in abundance on silvicultural treatments that included clearcuts and two types of thinning. These birds increased in abundance in all treatments that removed trees. There is potential for cowbirds to increase at sites that have been intensively thinned to the point that canopy cover and nest sites are exposed during the breeding season within six miles of cattle grazing (Finch and others 1997, cited in Chambers and Germain 2003). The probability, intensity and duration of this occurring within treatment areas in the national forests of southern California would depend on site-specific factors. There is also potential for the red imported fire ant to colonize forest gaps created by vegetation management (Stiles and Jones 1998).

Lack of treatment could also promote changes in forest vegetation that favor invasive animals. While treatments within the WUI Threat zone may produce short-term negative effects, long-term beneficial effects from stand thinning and use of prescribed fire could increase diameter of remaining trees, reduce fuel loading, and restore the vegetative structure. This could result in increased canopy cover and a lower possibility of large, high intensity, stand-replacing wildfires. This would reduce the potential for long-term invasive species establishment caused by conditions that create edge effect and affect soil erosion, canopy cover, and snag reduction. It could also reduce likelihood that large fires would increase flood events that would distribute invasive animals such as African clawed frogs, bullfrogs, and nonnative fish throughout a watershed.

Use of Prescribed Fire, Pile Burning, and Use of Herbicides to Manage WUI Defense and Threat Zones, Fuelbreaks and the WUI Environment

Prescribed fire would be utilized to create WUI Threat zones and used within the WUI environment in an attempt to mimic effects from natural fire. It would also be used along with pile burning and herbicide application to maintain WUI Threat zones and fuelbreaks.

Ecosystem response to prescribed fire would depend on factors such as the fire history of the area, seasonality of burning (spring, summer or fall), fire size, fire intensity, and the composition of the existing plant community (including weeds) at the time of the fire. Prescribed fire exposes mineral soil, reduces shade, and creates a flush of nutrients. Weeds take advantage of these conditions, which can result in a reduction of native plant establishment or recovery after a fire. On the other hand, strategic use of prescribed fire to create vegetation age-class mosaics may help reduce the size of non-wind driven wildfires. That would help reduce the potential that large acreages of young age class vegetation would be susceptible to invasive plant and animal species.

Merriam and others (submitted) found a higher abundance of weeds on fuelbreaks that had experienced several fires over the past 50 years. The abundance of invasive nonnative plants may also change as fire is reintroduced into forest stands. Prescribed burning in Sequoia Kings Canyon National Park promoted such a vigorous invasion of cheatgrass that the burning program was halted in portions of the park (Keeley 2001). Cheatgrass invasion is a concern in montane conifer forests because it has the ability to change the fire cycle. Shorter fire return intervals in ponderosa pine (Monsen 1994) and pinyon-juniper and sagebrush ecosystems (Billings 1994) have been reported following the invasion of cheatgrass. Other studies have also found invasive nonnative species that occupied burned sites were absent from unburned forests (Keeley and others 2002).

Reduction of surface and aerial fuels would produce variations in fire intensity. In locations where fuels are removed, it is expected that lower-intensity fires would occur, either accidentally or as prescribed fires, and this could further perpetuate the seed bank of invasive nonnative plants (Keeley 2002). In locations where chipped or masticated vegetation is distributed over the treatment area and then burned, there is concern that soils may be affected by the temperature and duration of soil heating. Busse and others (in press) found that burning a 7.5 cm deep layer of masticated material during dry conditions resulted in soil temperatures above the biologically lethal threshold. While most sites would not be mulched to this depth, pockets of this density could occur and cause hotspots when burned (Busse and others in press). They also found soil heating can be reduced by burning masticated vegetation when soils are wet. Although water repellency was also a concern, this did not occur after burning masticated manzanita.

There is potential for out of season prescribed fire to negatively affect native vegetation, thus enhancing conditions for invasive species. See the Effects of Vegetation Management discussion in the Biodiversity section of this chapter for a discussion on season-of-burn effects from prescribed fire.

Prescribed burning could potentially be used to control invasive nonnative plants through the use of fire to enhance regeneration of native species. For this to occur, the seasonality of the burn would need to be timed to displace the nonnative plants while not inhibiting the native species (Keeley 2002). This is most likely to occur in locations where the invasive nonnatives are annual plants and native perennial plants are also present. However, prescribed fire may replace one invasive nonnative plant with another. Prescribed fire may not be an effective means of invasive plant control in locations where a well established nonnative plant seed bank is present (Merriam and others 2004).

Herbicides could be used during fuelbreak maintenance to control nonnative plants. On fuelbreaks, it would be beneficial to reduce infestations of noxious weeds that have the ability to alter long-term structure and function of ecosystems before they are introduced into adjacent vegetation. Success of removal would be based on numerous factors, and treating individual plants while maintaining the circumstances of invasion (fuelbreaks) could make control unlikely (Sieg and others 2003).

Under all alternatives, the weed surveys, mapping, and risk analysis completed at the project level would increase the knowledge base and the ability to incorporate mitigation to reduce introduction and spread. Fire suppression would be expected to protect coastal sage scrub, lower elevation chaparral, and desert woodland and scrub from effects of frequent fire. Locations where native organic materials are chipped or masticated on the project site are expected to experience a lower level of weed introduction. However, indirect effects of this practice on the local nitrogen cycle and subsequent plant community composition remain unknown. Effects on soil biota may also occur in locations with thick coverage of chipped or masticated materials that burn when fuels are dry.

In Alternatives 2 through 6, forest plan standards that apply to maximum size of openings created by timber harvest, promote higher crown closure towards the outside of the shaded fuelbreaks, and require mitigation to reduce potential that fuelbreaks would be used by motorized and mechanized vehicles would promote conditions that are less favorable to invasive plants and animals. Application of forest plan standard 47 and Appendix E (Five-Step Project Screening Process for Riparian Conservation Areas) during project analysis and requirements to use weed free sources of seed, feed and mulch as it becomes available would also reduce conditions conducive to invasive species spread.

Under Alternatives 1 through 5 the effects from vegetation and fire management would not vary across alternatives. The major difference between Alternatives 1 through 5 and Alternative 6 are the annual acreages of activities that would be completed, especially the differences in construction and maintenance of fuelbreaks and implementation of the "fire use" strategy in Alternative 6. This would be implemented, as appropriate, across north slopes on approximately 15,000 acres within the Los Padres National Forest where urban communities would not be immediately threatened by wildfire.

WUI Defense Zones and Open Fuelbreaks

In Alternatives 1 through 5, vegetation structure would be highly manipulated within the WUI Defense zone and on fuelbreaks, and this condition would be retained over the long term. Weed establishment and spread is expected to be highest within these zones. Effects are expected to persist over the long term due to maintenance of these locations and projected unauthorized motorized and mechanized use, which would be mitigated to some extent. Undisturbed vegetation of all types that is located adjacent to these areas is also expected to be invaded by nonnative species over time.

The highest weed densities would be expected within low elevation chaparral and coastal sage scrub. Locations that have experienced wildfire, especially areas that receive frequent fire or ground disturbance are expected to have highest weed densities. In forested areas, cheatgrass is expected to advance into adjacent vegetation, as it can expand in disturbed areas and can also thrive in undisturbed locations (Sieg and others 2003). Management of cheatgrass is expected to become less successful once large areas become established. These treatment locations are expected to receive the greatest impact from invasive animals. The effects would increase over time as invasive animals increase in numbers and populate adjacent vegetation.

Under Alternative 6, the treatments within the WUI Defense zone would result in effects similar to those described above for Alternatives 1 through 5. However, because more acres are proposed for treatment annually within this zone under Alternative 6, the desired condition of WUI Defense zone protection would occur earlier than in the other alternatives. This would allow treatments within the WUI environment to occur sooner than in the other alternatives, thus reducing potential for stand-replacing fires.

Alternative 6 could also result in a lower number of weed infested locations for several reasons. Fewer fuelbreaks would be constructed and fewer would be maintained. This would reduce acreages of linear patches degraded by invasive species throughout the national forests, and less undisturbed vegetation would become invaded over time. There is also a risk, however, that without the continued construction and maintenance of fuelbreaks, fires could become larger and expand across several watersheds. This could increase the potential for invasive aquatic plants and animals to be transported through stream corridors within the watersheds during flood events. Implementation of the "fire use" strategy within the very remote areas on the Los Padres National Forest could eventually promote the desired condition of returning low intensity surface fires into conifer stands. This could promote conditions conducive for native species to persist over the long term.

WUI Threat Zone and Shaded Fuelbreaks

A lower level of weed establishment would be expected within the WUI Threat zone, as a higher canopy cover would be maintained as a result of lower levels of thinning and limbing needed to create conditions to limit stand-replacing fire. The longer time interval between maintenance in this zone would also favor native vegetation recovery. In high mortality locations, reforestation with locally collected native tree and shrub species would assist in restoring the forest structure. The resulting increase in canopy cover and duff layer would be expected to reduce susceptibility to invasive species infestation over time.

Areas Burned Using Prescribed Fire

The use of prescribed fire would occur in all alternatives. Over a fifteen year period, an estimated 8 percent of National Forest System lands would be burned under prescription in Alternatives 1 through 5. An estimated 5 percent would be burned under prescription in Alternative 6. In all alternatives, openings created for control lines could create conditions for invasive plants and animals. Other potential effects of prescribed fire were described earlier.

Effects of Recreation Management

Developed recreation sites provide opportunities for environmental education programs on invasive nonnative species through signage, brochures, campfire talks and volunteer programs. These sites may be the most successful locations for public education regarding release of bait fish and their effects. Many national forest conservation education and weed eradication programs are located at developed recreation sites to recruit and organize volunteer assistance. Developed sites also provide opportunities for environmental education through the use of native plant interpretive gardens.

Recreation use also provides opportunities for vectors of invasive nonnative species (for example, humans, pets, bicycles and pack stock animals) to move through National Forest System lands and to contribute to chronic disturbance of vegetation. Invasive plants can become established when ground is disturbed and tree and shrub canopies are reduced during the construction, reconstruction and maintenance of facilities such as trails, trailheads, campgrounds and visitor centers (Marcus and others 1998). These concentrated areas used for human activities are less resistant to invasion by nonnative species of all types.

Developed recreation facilities can indirectly contribute to the introduction and spread of invasive nonnative species when visitors travel out of developed recreation sites and onto less developed land. Hikers, bicyclists, equestrians, hunters, anglers, and motorcyclists can all transport nonnative plant seed onto National Forest System lands. Target shooting at designated dispersed sites affects soils and vegetation, and the intensity of this use creates conditions favorable for establishment of invasive nonnative plants. Introduction of invasive nonnative animals can occur when people lose or abandon pets, and introductions of invasive nonnative fish can occur when people dispose of unused live bait in aquatic habitats.

In Alternatives 2 through 6, forest plan standards would ensure that seed, wattles and livestock feed would be certified to be free of noxious weeds (when available in southern California) and only locally collected native seed or seed that is noninvasive would be used for rehabilitation. This would reduce the chances that weeds would be introduced at developed recreation sites during construction, reconstruction, and maintenance activities. Along streams, dispersed use is high, as is the risk of weed introduction. Standards to mitigate long-term impacts from recreation use to soil, watershed and riparian resources would also reduce the potential for weeds to become established due to excessive ground disturbance. Standards that discourage dispersed camping near meadows and bodies of water and restrict motorized and mechanized vehicles to National Forest System roads and designated trails only would help reduce the spread of invasive species. Place-based standards on the San Bernardino National Forest would also ensure that nonnative plants and wildlife would not be introduced in wilderness areas.

Human populations in southern California are expected to grow by approximately 20 percent during the life of the forest plans. An increase of visitors to the national forests of southern California is expected in all alternatives. The type, location and intensity of visitor use would vary by alternative. To measure the degree to which developed recreation contributes to these indirect effects, we used the unit "people-at-one-time" (PAOT). The combined theoretical capacity of all major developed sites within the southern California national forests (excluding downhill ski areas) is currently 46,462 PAOTs. Alternatives would vary in providing for developed recreation during the life of the plan. The number of PAOTs by alternative increases in the order 6, 3, 1, 2 and 4a, 5, and then 4.

A greater use of recommended wilderness, Back Country Non-Motorized, and Back Country Motorized Use Restricted land use zones would further reduce the risk that motorized access for dispersed recreation would result in the introduction and spread of invasive nonnative species. The alternatives with the highest acreages of these zones are 6, 4a, 3, 2, 4, 1, and 5, in decreasing order.

Alternatives with the fewest PAOTs and the least motorized access for dispersed use would provide the greatest progression toward the desired condition for riparian areas.

<u>Effects of Road, Trail and Motorized Route Management</u>

Invasive nonnative species follow no jurisdictional or administrative boundaries. They can spread through disturbed, early-seral vegetation and through relatively undisturbed, late-seral plant communities such as ones that are found in wilderness and research natural areas (USDA Forest Service 2001). In general, unroaded areas act as refuges for native species against invasion by nonnative species (Gelbard and Belnap 2003). Roads, motorized trails and non-motorized trails all disturb natural landscapes and all provide opportunities for vectors of invasive nonnative species to move through National Forest System lands.

Soil disturbances associated with the construction, reconstruction and maintenance of roads and trails create habitat for weed invasion (Harrison and others 2002). Alteration of hydrological regimes caused by modification of stream habitat at road crossings, increased sedimentation loads, and degradation or removal of native vegetation create conditions that promote establishment of invasive nonnative riparian plant species. In uplands, additional conditions conducive to weed infestation include factors affecting the microclimate of native plants, such as reduction of shade, and hydrological alterations created by berms, installation of culverts, or water harvest from roads and trails.

Weed seeds and plant propagules can be transported onto National Forest System lands via road and trail building equipment and in material such as fill dirt, gravel and straw bales. Existing occurrences of weeds also provide a source of seed or propagules for infestation. Once roads and trails are established, they provide the first point of entry for invasive nonnative species and continue as the pathway for weed invasion into the forest interior (Gucinski and others 2000). Use of the national forest transportation system by vehicles, bicycles, horses, pack animals, livestock, and wildlife that pass through weed-infested locations or feed on invasive nonnative seeds and then eliminate them will continue to provide a source of seed and propagules. At stream crossings, weed seeds or propagules present on the undercarriage or tires of vehicles can wash off into riparian areas. Improved roads spread more weeds than primitive roads (Gelbard and Belnap 2003, Parendes and Jones 2000).

The physical modifications of roads, trails, and their maintenance have widespread effects on native fish and amphibian habitat and provide opportunities for the invasion of nonnative animal species into aquatic systems (Pacific Rivers Council 2002). Degradation of habitat caused by fine sediment, changes in stream flow, and introduction of migration barriers (culverts) along road corridors can reduce population numbers of native aquatic species. This, combined with changes in water temperature through removal of riparian vegetation, loss of riparian cover, and increased channel width, reduces the fundamental components of high-quality fish habitat and provides conditions better suited for invasive nonnative warm water fish and other aquatic predators. Soil disturbance from road construction and maintenance in riparian areas also promotes favorable habitat for the Argentine ant (Natural Resources Defense Council 2003) and the red imported fire ant. In terrestrial systems, the edge effect of roads can extend considerable distance from the road surface, providing access to interior forest patches for opportunistic species such as the brown-headed cowbird.

Roads and trails also provide access into the national forests that facilitate the release of pets, such as goldfish and turtles, and the abandonment of cats and dogs. The introduction of nonnative species such as bullfrogs, goldfish and bait bucket minnows often occurs where access is made easier and faster. Waters located along passenger roads are more likely to receive nonnative introduced species than waters located in backcountry areas. In addition, waters with high recreational fishing use will tend to receive more bait bucket introductions than water located in backcountry areas where access is limited to foot travel (USDA Forest Service 2003).

Road maintenance is a reoccurring disturbance and has greater potential to promote weed establishment than the initial construction or decommissioning of a road. Propagules or seeds of some of the most invasive nonnative riparian weeds (such as arundo, tamarisk, cape ivy, and thistles) have the potential to be spread throughout riparian systems if they are present along roads that are maintained regularly.

Unauthorized off-route driving crushes native vegetation, compacts soils, and creates soil disturbance conducive to the introduction of invasive nonnative plants. Nonnative plant seeds transported by vehicles or wind onto these disturbed soils have a higher chance of becoming established, because competition with native plants is reduced. In several habitats, including those within desert and semi-desert regions of the planning area, plant communities are fragile and their recovery rates are slow. In locations where native plants cover less than 50 percent of the soil surface, the presence of the substrate surface frequently provides soil stability. These surfaces—composed of combinations of delicate soil crusts, lichens, fungal mycelia or rock cobble—are easily degraded when vehicles travel off routes. Off-route driving can produce long-term effects that result in scarred lands that are slow to heal and hillsides that may be permanently marred (Vogl 1995). Disturbed soils provide conditions suitable for invasion by cheatgrass (*Bromus tectorum*) or red brome (*Bromus madritensis* ssp. *rubens*), which may increase fire frequency and promote vegetative type conversion to nonnative grassland (Jones and Stokes 2003).

The magnitude of these impacts is largely related to the density of roads and motorized trails, the frequency of road and motorized trail maintenance, and the frequency of use. The risk for the introduction and spread of invasive species can be related to the acreage designated for motorized use. The opportunity for adding to the motorized road and trail system varies by alternative, and the extent of this opportunity is directly related to the amount of area in which motorized recreation would be a suitable use (table 359: Acres Managed for Motorized Uses as Defined by Land Use Zone, page 284). Alternatives with the highest acreage of motorized land use zoning are 5, 1, 4, 2, 3, 4a, and 6, respectively (this does not include lands within the Back Country Motorized Use Restricted zoning). In this respect, Alternative 5 would pose the greatest risk for the introduction and spread of nonnative species, and Alternative 6 would pose the least risk, followed by Alternative 4a. The other alternatives are intermediate in risk.

There is no existing direction in Alternative 1 that specifically addresses off-route vehicle use. Under Alternatives 2 through 6, forest plan direction restricts motorized and mechanized vehicles to National Forest System roads and designated trails. These alternatives would provide national forest managers and law enforcement officials with clear direction that off-route travel is an unauthorized use on National Forest System lands, except in designated open areas on the Angeles and Cleveland National Forests. Motorized trail and non-motorized trail design and compliance strategies would be developed in an effort to be more successful in achieving user compliance. This would reduce the extent of area affected by motorized and non-motorized vehicles. However, under all alternatives, unauthorized off-route travel and the proliferation of unclassified roads and trails remains a risk for the introduction and spread of invasive nonnative plants. The degree of risk is directly proportional to the number of miles of roads, motorized trails and non-motorized trails available, from which visitors may opt to travel off of roads and trails.

<u>Effects of Livestock Grazing</u>

Effects from livestock grazing include trampling; removal of plants by consumption; introduction and spread of nonnative seed from livestock fur and manure; soil compaction; disturbance of cryptobiotic crusts (Stohlgren and others 2001); and loss of soil moisture and productivity due to the combination of other impacts. Trampling of stream banks can damage vegetation, which can result in reduced shade and increased water temperatures. The combination of manure deposition and increased water temperature can increase growth of algal mats. These conditions allow catfish, sunfish and bullfrogs to prosper. An increase in brown-headed cowbird nest parasitism of native bird species may also occur.

The extent to which domestic livestock grazing and associated management activities contribute to weed establishment depends on the amount of disturbance to native plant communities and soil that occurs and the movement of seed from infested areas by livestock. Grazing practices that reduce the vigor of existing native plants and increase the amount of exposed soil favor the establishment of invasive nonnative plants. Heavily used areas adjacent to water developments, bedding areas, and salt placement locations can provide sites in which invasive nonnative plants can become established.

There is increasing evidence that disturbance to soil crusts accelerates the invasion process (Stohlgren and others 2001). As an example, studies by Howell (1998) and Larsen (1995) found that germination of a native perennial grass (*Stipa* sp.) was not affected by soil crust cover, but cheatgrass (*Bromus tectorum*) was inhibited by intact crusts. When the crusts were broken and left in place, germination of cheatgrass occurred.

Livestock grazing has shown potential for reducing invasive weed populations. Properly timed intensive grazing in May and June by cattle, sheep, or goats resulted in reduced yellow star-thistle growth, summer and fall canopy cover, survival, and reproductive capacity (DiTomasco and others 2000).

Under Alternatives 2 through 6, the design criteria in Part 3 of the forest plans provide for moderate grazing and for meeting or moving towards the desired conditions. The vegetation utilization and soil cover standards minimize the effects of livestock grazing. Each livestock grazing area would need a site-specific analysis to determine the degree and amount of risk of weed invasions. Alternative 1 lacks the revised set of standards that would be utilized in the other alternatives. See Appendix C, II. Weed Risk Assessment for the list of livestock grazing standards included in Alternatives 2 through 6 that would reduce this risk.

The risk of introduction and spread of invasive nonnative plants on grazing allotments is expected to be highest in those alternatives with the largest number of suitable grazing acres. Table 108: Grazing Suitability by Forest by Alternative, page 64, shows that the largest number of suitable acres would be retained in Alternatives 1, 5, 2, 4a, 4, 3, and 6, in decreasing order.

Coastal sage scrub, oak woodland and savanna, and riparian vegetation are ecosystems that have been identified at highest risk from invasive species. Acres that would be grazed within these vegetation types vary by alternative (table 550: Acres Expected to be Grazed by Key Vegetation Types, page 322). Grazing in these vegetation types and the effects on invasive species are discussed in the Effects on Vegetation section of the Environmental Consequences.

Effects of Special Use Administration

Recreation Special-Use Permits

There are 1,709 recreation residences within 62 tracts designated under special-use permit across the four national forests. Many of these cabins were landscaped years ago with nonnative plants that are now known to be invasive species. In some locations, groundcovers such as periwinkle and ivy have replaced the understory vegetation. These plants limit the establishment of native plants and trees, reduce shelter for wildlife, and can spread to other locations. There is a moderate risk for nonnative plants to spread from recreation residences at present because of the number of invasive nonnative plants that are present and established at a wide variety of locations. Continuing to provide environmental education to current and new permit holders and compliance with regional and national native species policy would lead to lower weed risk from horticultural plantings.

Use of organization camps and recreational cabins causes direct removal of vegetation during use, maintenance and construction activities; consequently, soil compaction can occur. At organization camps, the clearing of vegetation for WUI Defense zones, ballparks, corrals, campfire ceremony sites, or group activity sites creates long-term disturbances that have high potential for invasion by weeds. Changes in water quality, such as increased water temperatures and sedimentation from cleared areas, can create conditions for warm water fish. Introduction of nonnative animals can occur. However, organization camps also provide an opportunity to conduct environmental education on invasive species to a young audience, which could be beneficial toward meeting the desired condition and reduce effects over the long term.

A number of areas under special-use permit on the Angeles and San Bernardino National Forests provide downhill skiing, snowboarding, cross-country skiing and snowplay activities. Ground-disturbing activities occur throughout the summer in one location to provide downhill mountain biking opportunities. Ski slope maintenance occurs year round; however, soil disturbance is reduced with snow cover. Straw mulch is placed on slopes to prevent erosion after snow melt. Ski slopes previously seeded with sweet clovers (*Melilotus alba* and *M. officinalis*) and other invasive nonnative plants may be contributing to downslope infestations. There is also the potential for seeds to become lodged in bicycle tires and transported to other locations of the national forest. Weed spread by this mechanism is an ongoing effect that would not change by alternative. Forest plan standards that require the use of weed free materials (when available) for restoration would be help to mitigate effects during watershed restoration projects at the ski areas.

Recreational special-use events—such as trail rides, motorcycle trials, motorcycle or bike races, archery contests, military maneuvers, search and rescue training, historical re-enactments, weddings and filming permits—have the ability to introduce and promote the spread of weeds. Soil disturbance related to such events may occur outside the footprint of roads and trailheads involved because of the nature of the activity or spectators that participate or view the event. Hay bales used for an event or stage props used for filming, such as soil and vegetation, along with support vehicles have the potential to be contaminated with weed seed or propagules. These events require completion of a weed risk assessment and environmental analysis prior to implementation. In locations where the activity is allowed on designated roads and trails, the measures to mitigate risk, such as proper staging of crews to prevent off-route driving and use of certified weed-free feed and hay bales, would contribute to a low level of risk of weed spread from this use. Risk of weed invasion is higher from events that allow off-route driving. Physical effects on native vegetation, increased potential for erosion off user-created trails, and spread of weed seed via motorized or mechanized equipment can occur. An increased risk that spectators or participants in the event would return during non-event times and use the trails also exists.

Permitted use of recreational cabins would remain constant across all alternatives except Alternatives 3 and 6, under which the Cleveland National Forest would evaluate some locations for a higher use of the land. Without knowing the future land use of cabin lots in Alternatives 3 and 6, an assessment of the risk of invasive nonnative species spread is not possible for those areas at this time. Use of organization camps and ski areas is expected to produce areas barren of vegetation that will require continued treatment and pose the risk of weed establishment or spread. Implementation of actions to meet the strategic invasive species goal in Alternatives 2 through 6 would improve this situation over the long term.

Non-Recreation Special-Use Permits

Utility and communication corridors provide pathways for cowbirds and other species that benefit from forest edges to enter lands they had not previously occupied. As gaps in forest vegetation are created, there would be a similar increase in species that benefit from them. Colonization of the red imported fire ants may increase as source populations disperse into forest gaps.

Powerline corridors cross jurisdictions and habitat types, acting as weed vectors by their very nature. The focus on controlling trees from reaching powerlines or clearing around poles to reduce fire hazard has given less emphasis to weed control. A study on the effects of a pipeline corridor in the Santa Margarita Ecological Reserve found that nonnative annual plants dominated the entire length of the corridor. There was little reestablishment of native plant species even after 10 years without disturbance. Invasive nonnative plants had also extended into the adjacent plant communities with the following coverages: coastal sage scrub, 16 percent; grassland, 19 percent; and oak woodland, 13 percent. Nonnative plants had not invaded undisturbed chaparral vegetation (Zink and others 1995).

All existing communications sites and utility and transportation corridors are retained in all alternatives. The proposed Western Utility Group routes for the Cleveland National Forest at El Cajon Mountain (6 miles) is a suitable use in Alternatives 1, 2, 4, 4a, and 5. The Elsinore to San Mateo corridor (23 miles) is within suitable land use zones in Alternatives 1, 4, 4a, and 5.

Acres authorized for oil, gas and minerals exploration and extraction do not vary by alternative. The actual acres affected would depend upon the number of applications received. Mineral and energy development would have a direct effect by removing the existing vegetation and exposing mineral soils, making weed invasions possible. There is a high risk for this to occur, as invasive nonnative plants are more likely to become established on these exposed areas. After exploration or production is completed, the sites would be reclaimed. Reclamation activities also provide the opportunity to eradicate invasive species.

Activities associated with water diversions (hydroelectric projects) include evaluating proposals for licensing or re-licensing of surface water extraction, associated impoundments and storage, diversions and construction and maintenance of these facilities. Transportation systems, power lines and utility corridors, sediment placement sites and gauging stations associated with these activities are included. Long-term displacement of individual plants and trees can result from habitat alteration because of sediment removal for dam maintenance and water impoundment, creating lack of flow. Changes in water quality and quantity can cause declines in native riparian vegetation, creating opportunities for tamarisk, arundo, and other invasive nonnative riparian species to take hold. Water that is impounded creates habitat for aquatic invasives such as bullfrogs and nonnative fish. Once these species become established, they are difficult if not impossible to eradicate; they also become source populations that infest other areas.

Riparian areas are especially vulnerable to invasion by nonnative species. Water diversions and extractions place riparian communities at risk for invasion because of the intensity and duration of their effects. Vast acreages of streams now infested with arundo, tamarisk and tree of heaven occur throughout the planning area. Stohlgren and others (2001) studied nonnative species invasion in Utah within eleven habitat types that are also present on the southern California national forests. They found wet meadow to be the most heavily invaded habitat, despite high cover, high levels of species richness, and soils rich in nitrogen and carbon. Any activity that degrades the health of native vegetation has the potential to increase invasion by nonnative plants. Alternatives that promote such uses are more likely to increase the risk of invasion of riparian communities.

Table 308: Acreage Suitable for Consideration of Non-Recreation Special Uses (page 65) shows that the least acreage would be available for new special-use permits in Alternatives 6, 3, 4a, 4, 2, 1, and 5, in increasing order.

Forest plan standards require instream flows to be favorable to the maintenance and restoration of riparian dependent species and aquatic resources for non-hydroelectric and exempt hydroelectric surface water development proposals. This would mitigate risks of invasive species introduction. In addition, requirements for fish passage, instream flows associated with dams and impoundments, and requirements that utility corridors, bridge upgrades or replacements and canals be designed to provide for fish and wildlife movement would help to meet desired conditions for riparian conditions. Standards relating to surface water diversions and groundwater extractions and use of the standard 47 and Appendix E, Five-Step Project Screening Process for Riparian Conservation Areas would also assist in reaching desired conditions for invasive species management and riparian condition.

Factor (2) Use of Low Impact Land Use Zoning and Recommended Special Area Designations

See table 547: Percent of National Forest System Lands Less Susceptible to Invasive Species by Alternative, page 340, due to land use zoning and new Special Area designations.

Back Country Motorized Use Restricted, Back Country Non-Motorized, Experimental Forest and Critical Biological zones are expected to be less susceptible to invasive species due to reduced motorized use. New special area designations (wilderness, research natural areas, special interest areas) would also receive a lower level of impact and less motorized use, and thus would be expected to be less susceptible to invasive species encroachment. The following tables show land use zoning and recommended special area designation by national forest:

Table 333: Comparison of Alternative Acres by Land Use Zone, page 26.

Table 304. Wilderness Acres (Existing and Recommended) by Alternative

Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
1,148,456	1,327,061	1,617,076	1,228,967	1,148,456	1,730,112	1,235,354

Table 318. Cleveland National Forest Candidate Research Natural Areas Recommended By Alternative

CRNA Name	Acres	Primary Vegetation Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
San Diego River	5,965	Inland coastal sage scrub	N	5,965	5,965	N	N	5,965	N*
Viejas Mountain	3,182	Chamise chaparral	N	3,182	3,182	N	N	3,182	N*
Guatay Mountain	1,337	Tecate cypress	N	1,337	1,337	N	N	1,337	N*
Pleasants Peak	661	Knobcone pine, serpentine vegetation	N	N	661	N	N	661	N

*San Diego River, Viejas Mountain, and Guatay Mountain candidate RNAs would be evaluated further and a decision made within 3 years under Alternative 4a.
N=None

Table 319. Los Padres National Forest Candidate Research Natural Areas Recommended By Alternative

cRNA Name	Acres	Primary Vegetation Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Big Pine Mountain	3,258	Southern California mixed conifer forest	3,258	3,258	3,258	3,258	N	3,258	3,258
Cobblestone Mountain	2,224	Bigcone Douglas-fir	N	N	N	N	N	2,224	N
White Mountain	2,104	Bigcone Douglas-fir	N	2,104	2,104	2,104	N	2,104	2,104
Sawmill Mountain	3,451	Jeffrey pine forest	3,451	3,451	3,451	3,451	N	3,451	3,451
Ventana Cones	2,220	Santa Lucia fir/canyon live oak forest	2,220	2,220	2,220	2,220	2,220	2,220	2,220
Valley Oak	108	Valley oak woodland	108	108	108	108	N	108	108

N=None

Table 320. San Bernardino National Forest Candidate Research Natural Areas Recommended By Alternative

CRNA Name	Acres	Primary Vegetation Type	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Cleghorn Canyon	1,662	Western sycamore-alder riparian forest	N	1,662	1,662	N	N	1,662	1,662
Arrastre Flat	1,451	Pebble plains	N	1,451	1,451	N	N	1,451	1,451
Broom Flat	417	Singleleaf pinyon/California juniper woodland	N	N	417	N	N	417	417
Wildhorse Meadow	1,255	Wet meadow vegetation	N	1,255	1,255	N	N	1,255	1,255
Blackhawk*	2,805	Carbonate plants	N	2,805	2,805	N	N	2,805	2,805

*1,561 acres are on NFS land; the balance is BLM land.
N=None

Factor (3) Management Practices Used To Reduce The Risk of Invasive Nonnative Plant and Animal Species Introduction and Spread

The effects of invasive species were identified as an issue in the southern California national forests plan revision scoping process. The emphasis on invasive species management was also elevated in response to the national priority and the management challenges identified for the national forests of southern California.

Under Alternatives 2 through 6, invasive species management would be implemented to meet the national forests' desired condition for invasive species management related to the national forest and national goals. In addition, the southern California national forests' Noxious Weed Management Strategy was completed for Alternatives 2 through 6 (see Appendix M, Part 3 of the forest plan for a detailed program description). Invasive species management is also identified within the integrated conservation strategy; alternatives would vary by the rate at which the national forests would accomplish tasks in this strategy. Alternatives with the greatest emphasis on the strategy are expected to have the greatest reduction of effects from invasive species over time. Standards are expected to help sustain the plant communities at high risk of weed infestation, and strategies would be implemented to improve habitat conditions within these communities. See Appendix C for a list of standards and strategies that would be applied.

Common to all alternatives, the highest priority would be on surveying for the early detection of invasive species in order to contain and control them in riparian areas, in threatened, endangered, proposed, candidate, and sensitive species habitat, and in areas where there is a high potential for rapid rate of spread. Methods to control invasive nonnative species do not vary by alternative. Site specific environmental analysis would occur prior to all projects, and design criteria (standards, manual direction and laws), and strategies would be applied to reduce weed infestation to the greatest extent possible. Monitoring would help verify the accuracy of the assumptions and to detect inadequate performance. Monitoring would focus on measuring movement towards desired conditions over the long term, would measure individual invasive species program accomplishments annually, and would measure how well project implementation follows forest plan direction. All three parts of the forest plans use an adaptive management approach designed to lead to continuous improvement.

Factor (4) Cumulative Effects

The present distribution and abundance of invasive nonnative species are directly related to historical land uses (grazing, mining, timber harvest and burning); the presence of new invasive species vectors (post-European-settlement humans and associated livestock and vehicles); and increased habitat vulnerability resulting from changed disturbance regimes. Today, the national forests of southern California are surrounded by one of the most intensively developed urban areas in the country, and these developed areas with their large human population will continue to be a source of disturbance for land on and off of the national forests. Urban infrastructure, including state and county roads and highways that pass through National Forest System lands, will also continue to carry invasive nonnative plants and animals into the planning area.

The presence of a large human population around the national forests of southern California also serves to stress habitats found on National Forest System lands. These stresses come from air pollution, altered fire regimes and altered stream flows. Stressed habitats are more vulnerable to invasion by nonnative plants and animals. These past, current and future impacts on the both private and public lands in the planning area combine to produce a high risk of introducing and spreading nonnative plants and animals. Recent and foreseeable reductions in the California Department of Agriculture's noxious weed programs are expected to reduce or eliminate biological control projects that might otherwise help control infestations of yellow star-thistle, brooms, bull thistle, spotted knapweed and other invasive nonnative plants. Thus, it appears that current and reasonably foreseeable actions to control nonnative plants and animals are not sufficient to stem this "invasion in slow motion." The recent national recognition of the problems invasive species cause and the costs associated with control after they have been introduced will help to focus attention and funding for management in the future. Incorporation of the national strategic goal and creation of the forest goal in the new southern California management plans would help to focus attention towards meeting the desired condition for invasive species management.

The cumulative effect of ground-disturbing activities linked by roads has created a system highly conducive to invasive nonnative animal and plant establishment. As invasive nonnative animals and plants become established both on the national forests of southern California and adjacent private and public lands, propagation can accelerate exponentially. Further establishment of invasive nonnative species would jeopardize the health of ecosystems by altering ecosystem processes that affect soil chemistry, hydrology, nutrient cycling, intensity and frequency of fire, sediment deposition and erosion. Additionally, gene pools of both native plants and animals would be altered when hybridization occurs (Bossard and others 2000).

Invasive nonnative species would affect recreation opportunities and natural scenic values, reduce biological diversity and degrade wildlife habitat. Declines in a number of threatened, endangered, and sensitive wildlife and plant populations on the southern California national forests would be directly attributable to invasive species. Toxic compounds found in brooms, yellow star-thistle and spotted knapweeds on the national forests could affect human and animal health (Hickman 1993, Niefoff 1997) and affect lands grazed by livestock. With the loss of plant diversity, wildlife habitat, and forage values comes a host of impacts on the uses of such resources, such as hunting, wildlife and wildflower viewing, wilderness values, and livestock grazing. With the loss of these uses and values come the economic losses to the human communities surrounding the national forests.

Effects on Watershed Conditions

Direct and Indirect Effects

Generally, adverse impacts to watersheds can be minimized or eliminated when all applicable measures as described under resource protection measures are effectively applied. Riparian conservation areas (RCAs) are not intended to exclude management but rather to protect areas of high importance and sensitivity that need strong consideration to maintain and improve conditions for water quality and riparian-dependent natural resources. At the project level, based on application of forest plan standards and site-specific condition analysis, activities may be conducted within RCAs.

The forest plans indicate acres of treatment but are not specific about the location of treatment units, roads or facilities. Actual location of the treatment units, the activities within them and the timing of the treatments are more useful in predicting actual impacts on water and riparian resources. These will all be considered during site-specific, project-level environmental analyses as projects are proposed.

Watershed condition ratings, acres of ground disturbance, acres protected through land use zone designations and acres of restoration were all considered during the analysis and comparison of the seven alternatives relative to effects on riparian and water resources. RCAs were used literally as buffers during modeling for this planning effort to determine a reasonable estimate of the remaining landscape acreages available for a variety of activities. Specifically, acreage available to vehicle access (such as Back Country and other land use zones allowing access) and acreage protected through special designations (such as existing wilderness, recommended wilderness and critical biological zones) were some of the most powerful indicators of potential impacts to RCAs and water quality.

Off-forest developments, fire, vegetation management, road and trail management, mining and oil and gas operations, recreation activities and administrative uses of water can all affect groundwater and result in increases or decreases in water quantity and quality. Unless mitigated, the consequences can include less water available for human and resource use and reduced water quality, either short-term or long-term. National Forest managers will follow national and regional direction for water development and, where applicable, develop local management plans or guidance to preserve and protect sustainability of surface water and quality and quantity of groundwater and aquifers.

Alternatives that use increased amounts of groundwater may contribute to overdraft, because water levels in some wells are already dropping and groundwater resources are finite. Changes in demand for and use of both surface water and groundwater are likely to occur both on and adjacent to National Forest System lands in all alternatives. National Forest managers can control issuance of special-use permits for water uses on National Forest System lands by requiring analysis of environmental consequences of all extraction applications. Cleanup of contaminated aquifers, deteriorating wells, abandoned mines, oil fields and landfills will be a high priority under most alternatives. Water extractions occurring off-forest that may impact national forest resources can be assessed and contested by the Forest Service.

Pressures from increasing populations and national forest users are likely to increase levels of water use above current levels. On-forest consequences include reduced flow in streams, drying up of wells, groundwater contamination and habitat shrinkage. Off-forest extractions can cause the same consequences, especially near national forest boundaries and private in-holdings. The ability of the Forest Service to mitigate effects rests on the ability to adequately assess potential impacts and make decisions about granting permits for proposed or existing activities. The largest impacts will be from the largest and closest extractions, which will likely be water bottling operations and commercial developments near national forest boundaries. Consequences of on-forest uses are usually less pronounced, because extractions are relatively small; however, in aquifers with limited available quantities, even small extractions can be detrimental to sustainability of the aquifer. The number of special-use permits for groundwater use—including existing permits, new permits or proposed uses for on-forest recreation or administrative needs—is expected to increase in the next 15 years.

It is recognized not only by the Forest Service but also by state water agencies that in many instances insufficient data are available to adequately analyze the effects of groundwater developments. "In many basins, our ability to optimally use groundwater is affected by overdraft and water quality impacts, or limited by a lack of data, management, and coordination between agencies" (Department of Water Resources 2003). The types of data needed are accurate records of extraction sites, types and amounts of groundwater use, and subsurface conditions that give clues to aquifer volume, extent and conditions and potential sustainable quantities of groundwater. The consequences are that either decisions are made with insufficient information to adequately understand the environmental effects of proposed actions, or last-minute, often costly, analyses must be conducted to attempt to gather and analyze the needed data. Sometimes, however, relatively simple geo-hydrologic interpretations can be made based on existing geologic maps, well data, aerial photography and information from similar terrains that are sufficient for isolated or obvious situations. Changes in risks to surface water, groundwater and associated aquifers can occur by: (a) changing the amount of water flowing instream; (b) changing the amount of water going into (recharging) an aquifer; (c) changing the amount of groundwater taken out (extracted) from an aquifer, which can result in overdrafting the sustainable aquifer capacity or flow (quantity); (d) contaminating the surface water or groundwater (quality); (e) damaging the aquifer (physical integrity); or (f) having insufficient data acquisition and management of water resources resulting in any of the above.

Judgments about the conservation and sustainability of water and riparian resources under each alternative are based on the assumption that the following management direction would be consistently implemented across southern California national forests for all alternatives:

- Use site-specific information in project planning to conserve or enhance water and riparian-dependent resources;
- Mitigate adverse impacts on water and riparian-dependent resources; and
- Restore disturbed areas as needed.

Effects of Forest Plan Decisions on Watershed Conditions

All alternatives except Alternative 1 provide riparian area protection through forest plan standards and the use of the Five-Step Project Screening Process for Riparian Conservation Areas, which delineates riparian conservation areas for special management. Alternative 1 uses the existing Riparian Conservation Strategy.

Alternative 1. With its continuance of existing management activities to avoid aquatic environments and mitigate potential effects from proposed projects, Alternative 1 would not substantially change the risk to surface water, riparian conservation areas, groundwater quantity or quality or aquifer integrity from their current conditions. Prevention of watershed degradation and maintenance of water quantity and quality would be emphasized. There would continue to be slow and steady progress towards protecting watersheds.

Alternative 2. Watershed management is similar to Alternative 1 but watershed environments receive added emphasis through the use of an adaptive management approach. Conservation education and development of partnerships focused on understanding and protecting watershed dynamics and functions are emphasized. Resources receive additional protection through the designation or recommendation of some special areas. There will be steady progress toward protecting watersheds, at a little faster pace than in Alternative 1, through the implementation of the revised forest plans.

Alternative 3. Water and riparian resource quantity and quality would be expected to increase under this alternative because of the continued emphasis on prevention of watershed degradation, in combination with less developed recreation, more watershed restoration and improvement and the designation or recommendation of additional special areas. Watershed restoration primarily relating to stream channel conditions, flow management and riparian vegetation health receive focused attention. Mine and oil field reclamation, landfill restoration and the transportation system decrease would all also contribute to improved surface water, riparian area, groundwater quality, and watershed condition.

Alternative 4. Watershed management would focus on maintaining water quality and quantity and on protecting watershed health from the effects of increased recreation uses; priority would be given to those areas where detrimental effects are occurring or could occur. Similar to Alternative 2, an adaptive management approach would be used for watershed protection. Restoration activities would be accomplished primarily at prioritized recreational use areas in association with environmental education and interpretation, hardening of recreation sites, increased Forest Service presence, and restriction of unauthorized uses. There may be an increased demand for groundwater at these improved recreation sites.

Alternative 4a. Watershed management under this alternative would be similar to Alternative 4, focusing on maintaining water quality and quantity and on protecting watershed health from the effects of limited growth in facilities and recreation uses. Management priority would be given to those areas where detrimental effects are occurring or where they could occur. Similar to Alternative 2, an adaptive management approach would be used for watershed protection. Restoration activities would be accomplished primarily at prioritized recreational use areas in association with environmental education and interpretation, hardening of recreation sites, increased Forest Service presence, and restriction of unauthorized uses. There may be a limited increased demand for groundwater at these improved recreation sites.

Alternative 5. Watershed management would focus on reactively protecting watershed health from the effects of increased motorized recreation uses and commodity development such as water diversions. Maintaining water quality and quantity for recreation and commodity uses would be a priority. The decrease in restrictions on motorized use, increase in the transportation system, increase in commodity uses, and increase in urban development public uses would bring more people, more land disturbance and more pressure to develop water sources on the national forests. Those factors could increase fire danger and flood potential and would be likely to adversely affect water and riparian area quality and quantity and aquifer recharge. Alternative 5 would present the highest risk to water resource quantity and quality and to aquifer integrity.

Alternative 6. Prevention of causes of watershed degradation would be strongly emphasized. Three key goals would be to protect the remaining high-quality areas, prevent further degradation of any area on the national forests and, through time, restore the overall ecological condition and function of the watersheds. Resources would receive additional protection through the designation or recommendation of some special areas. This alternative would have the lowest risk to water and riparian resources and would involve the most diverse types of restoration efforts.

Potential adverse effects on watersheds are directly tied to activities that impact and disrupt the proper functioning of the resource. Such activities include disturbances to soils and vegetation, especially when occurring close to stream channels; alteration of surface and/or subsurface water flow; and disturbances to the actual stream channel. Those management activities and uses that have the greatest potential to influence surface water, riparian-dependent resources and groundwater are listed specifically in the following tables:

- Table 218: Potential Effects to Riparian Vegetation from Management Activities, page 209
- Table 219: Potential effects to streambanks from management activities, page 202
- Table 220: Potential effects to channel morphology from management activities, page 203
- Table 221: Potential effects to the ability of the RCA to catch sediment before it enters the stream from management activities, page 203
- Table 222: Potential effects to water quantity from management activities, page 204
- Table 223: Potential effects to water quality (from toxins) from management activities, page 205

Table 224. Potential loss of NF ownership of RCAs from management activities

Type Of Disturbances:	Actions involving land exchanges and disposition of isolated NFS land parcels
Type Of Management Activities:	Land exchanges and sale of NFS land
Effect:	RCA and stream fragmentation (loss of connectivity)
Consequence To Water And Riparian Dependent Resources:	Loss of habitat for aquatic and riparian dependent species

Table 225. Potential effects to watershed conditions from management activities

Activity and Measure	Alt 1 (Existing)	Alt 2	Alt 3	Alt 4	Alt 4a	Alt 5	Alt 6
Acres of land disturbance (*)	1,504,134	(Same)	(Less)	(More)	(More)	(Most)	(Least)
Acres of RCAs in land use zones with fewer allowable uses (BCNM, BCMUR, CB, EW, RW)	323,619	333,775	456,129	325,695	440,107	236,623	517,219
Potential acres of watershed restoration	516	Same	More	More	More	Least	Most
Watershed Condition Rating	Moderate	Same	Improve	Improve	Improve	Degrade	Improve

* In this table, acres of disturbance refer to the following activities: vegetation management (prescribed fires, fuel treatments, mortality removal, timber stand thinning), road and trails, Forest Service facilities, utility corridors, active mining, oil and gas, capable livestock grazing land, and recreation areas.

These activities and uses include watershed restoration, vegetation management, prescribed burning, fuelbreaks, wildland fire suppression, recreation, transportation system, land use authorizations, land ownership, roadless, wilderness and special designations, mineral and energy development and unauthorized or criminal activities. Additional detail about management effects is provided by functional area after the table, as necessary.

Effects of Vegetation Management on Watershed Conditions

Vegetation management in the form of prescribed burning and removal of vegetation using mechanical methods, with all the related activities, can affect the extent, health and vigor of riparian vegetation. Although the objectives for fuels treatments and dead tree removal will be different from those for silvicultural treatments, the effects on water quality and riparian-dependent resources from treatments will be similar. Primary watershed impacts from vegetation, dead tree removal and fuels treatments generally come from the diversion and concentration of natural runoff along roads, landings and skid routes. On steeper slopes, water diversion can occasionally super-saturate soils and cause slope failures, which results in loss of long-term soil productivity and large transported sediment loads. Trees and other vegetation serve as thermal buffers along a stream. When removed, average stream temperatures can increase in the summer and decrease in the winter, stressing fish populations during these periods (Matthews and others 1997). Riparian vegetation removal can lead to bank erosion during high streamflows and reduce the availability of important fish habitat components.

When designed to enhance watershed conditions, proactive vegetation treatments within riparian conservation areas can serve to decrease the risk of total loss in the event of a wildfire. Most streams have a component of downed coarse woody debris within the stream system, depending on the composition of the riparian vegetation adjacent to the channel. Its functions include sediment retention, energy dissipation, nutrient contribution, and shade and pool creation for fish and other aquatic habitat (Berg and others 1998). Removal of riparian vegetation can reduce the supply of coarse woody debris critical for stream health (Warren and Kraft 2003). Conversely, if slash and debris are allowed to enter a stream system in sufficient amounts during vegetation management projects, they can choke a stream channel and reduce dissolved oxygen levels as the material decays (Hornbeck and Kochenderfer 2001). Fish passage can be adversely affected and anoxic conditions toxic to fish and other aquatic organisms can result.

Generally, forest health prescriptions, such as thinning vegetation stands, would create fewer effects because of the distribution of treatments across the landscape and because of new plant and grass growth following the activity. Major increases in erosion from treatment areas are unusual because of ground roughness and downed vegetation available to contain sediment-ladened runoff. The exception is increased risk of erosion and sedimentation from road and skid trails associated with vegetation treatment activity. Riparian vegetation also serves to stabilize streambanks and provide hiding and resting cover for fish. Chemical applications with herbicides can be used as an effective tool for managing vegetation and forest health. Herbicides would typically be used in relatively small areas within the Wildland/Urban Interface (WUI) Defense zones around communities, on fuelbreaks to treat resprouts of chaparral and for use in controlling invasive nonnative weeds throughout the national forests. Chemicals can have detrimental effects on water quality and lethal effects on non-target organisms that live within the riparian conservation areas and stream courses. Increased erosion and sedimentation, during the short term, can result while new vegetation gets established.

Effects of Invasive Nonnative Species on Watershed Conditions

Regulated flows, altered stream channels and ponded water can create suitable conditions for invasive nonnative species. Nonnative plant species often outcompete native riparian vegetation and dominate stream channels and areas behind impoundments. Nonnative fish and other aquatic species (such as bullfrogs) also compete with native species for habitat and food resources and often actually prey on native species.

Effects of Watershed Management on Watershed Conditions

Soil and watershed restoration is accomplished on an annual basis to correct problems caused by past land management or by natural events (earthquakes, wildland fires, etc.). Watershed restoration activities include treatments such as clean-up, stabilization and revegetation of disturbed areas within the riparian conservation areas and in adjacent uplands. Projects can include but are not limited to: closing, obliterating, and revegetating roads; seasonal wet-weather closures to minimize rilling and erosion on roads; redesigning drainage structures on existing roads to reduce soil loss and stream sedimentation; stabilizing damaged streambank segments using vegetation and/or structural support; improving the overall vegetative condition of riparian areas; and removal of invasive nonnative plants species. In particular, arundo (giant reed) and tamarisk (salt cedar) are invasive plants that are outcompeting native riparian vegetation, clogging the stream channels and, in the case of arundo, actually consuming large quantities of water in some streams on the national forests. These invasive species can be introduced to the national forests through a variety of different methods, but most commonly they are carried in by vehicles, equipment, and bike tires; through use of livestock and pack stock; and from adjacent lands.

In all, these activities may result in short-term effects such as soil compaction, decrease in riparian vegetation (removal of nonnative plants), water quality degradation from herbicide application (daubing cut stumps of nonnative plants), increased erosion and sedimentation and long-term improvement in water quality.

Disturbed areas within a watershed can be a result of past management actions or the result of unlawful activities such as unauthorized off-route travel by motorized or non-motorized equipment, or by dumping of trash and debris at shooting areas, undesignated day-use areas and along roads. They can also occur following criminal activities such as paraphernalia accumulation and disturbance from cultivation of marijuana, abandoned drug lab waste from active drug labs and other activities that have the potential to dramatically affect water quality and riparian areas.

The accelerated watershed restoration program in Alternative 6 presents the highest risk of short-term adverse effects, with Alternative 3 being the next highest. However, both these alternatives will also have the best long-term positive effects on the overall watershed conditions. Alternative 6 would have the maximum amount of watershed restoration per year and Alternative 3 would be the second highest. Alternatives 2 and 1 would continue with about the same amount of restoration as is currently being completed, which averages about 516 acres per year. Alternative 4 and 4a would complete fewer acres than Alternatives 1 and 2, but more than Alternative 5. Alternative 5 would provide the least amount of restoration. Water and riparian quantity and quality are expected to increase the most under Alternative 6. This increase is due to emphasis on limited use of roads, less commodity production and developed recreation, in addition to more watershed restoration accomplishments completed at a faster pace. Alternative 3 emphasizes healthy watersheds through protection and restoration, with a positive trend moving toward the watershed desired conditions at a faster pace than Alternative 1, but at a slower pace and through a different mix of treatments than found in Alternative 6.

The consequence of watershed restoration activities is improved water quality and quantity, and in some cases improved aquifer integrity. These improvements may lead to a reduction in the number of impaired waters over time. Contaminated mines, landfills and wells will be cleaned up; landslides will be stabilized or avoided; roads and trails will be well-drained and carefully located; disturbed areas will be revegetated; streambanks, stream channels and floodplains will be stabilized; and there will be net positive effects on water and riparian resources.

The potential for hazardous material incidents is expected to be the same as currently exists in Alternatives 1 and 2, increased in Alternatives 4, 4a, and 5, and decreased in Alternatives 3 and 6.

The Forest Service is in the final stages of revising policy on the extraction of groundwater. Forest-level decisions on groundwater extraction will be tiered to this policy.

Effects of Management of Geologic Resources and Hazards on Watershed Conditions

Management of geologic resources, which includes applying geologic information to management of ecosystems, adds valuable and often critical information for protecting and improving the condition of watersheds. It also assists in determining the physical characteristics and engineering properties of different soil and rock types, and aquifer and surface drainage characteristics that then guide project development.

Management of geologic hazards, such as areas highly susceptible to landsliding, debris flows, rockfall, flooding or seismic activity, and features such as abandoned mines and toxic mineral deposits, provides information about the hazards and safety issues that affect watershed condition, water quality, and public safety. Mitigations for landslides, burned area impacts, unstable road foundations, and watersheds in degraded conditions can then be developed and applied.

Effects of Land Ownership Adjustment on Watershed Conditions

Land exchanges and acquisitions can affect riparian conservation areas and water resources as a gain or loss of quality habitat depending on the conditions of the land being exchanged or acquired. A project-level environmental analysis is performed, which identifies resource management needs as part of the project decision.

Changes in land ownership can result in more or less control over water needed for other national forest resources, depending on which part of a given stream, aquifer or recharge area is disposed of or acquired. Alternatives 3 and 6 emphasize acquisition of additional land for habitat linkages and would be likely to improve conditions for water and riparian resources by restoring stream connectivity.

Effects of Special Designation Areas on Watershed Conditions

Roads have long been recognized as the primary human-caused source of soil and water disturbances in forested environments (Egan and others 1996). Wilderness, critical biological zones, research natural areas and other special designation areas can provide an added amount of resource protection because they generally have limited vehicular access and have restrictions on other types of uses. The exception to this assumption is when these areas become more popular because the special designation draws more use to the area, resulting in riparian conservation area degradation.

Alternatives 3 and 6 would have the highest amount of special designations, resulting overall in fewer roads across the landscape and improved watershed conditions, especially through the limited amount of road use anticipated road in Alternative 6. These alternatives would emphasize watershed and species habitat restoration.

Water and riparian resources generally are better protected by increased numbers of special designation areas (such as recommended wilderness) because these areas usually involve fewer roads, less direct vehicular access to sensitive areas, reduced estimated unauthorized activities adjacent to roads, reduced management activities in sensitive areas and inherent resource protection through specific direction in the actual designations. The opposite may turn out to be true, however, if a recommended wilderness actually becomes a popular attraction and experiences overuse after it is adopted.

Wild and scenic river (WSR) designation would preclude development of hydroelectric power or new water supply dams. In designated river corridors, structures and facilities under Forest Service control would be managed in accordance with the WSR classification. Because WSR designation would prevent hydroelectric and water development, its effect would be positive for watersheds in terms of preserving native riparian ecosystems. The more mileage recommended as WSR in an alternative, the greater the potential for these positive effects. Conversely, with more designation there is potential for a negative economic or social effect on communities because of the inability to develop water resources.

Effects of Recreation on Watershed Conditions

Although only about two percent of the land base across the national forests is suitable for recreation activities, the demands placed upon national forest riparian areas for recreation use will continue to increase. In southern California, riparian areas and lakes, reservoirs and streams are the most sought-after locales for much of this recreation use. Water provides basic needs in campgrounds and other recreation sites. Most wilderness visitors also travel to and camp near lakes or streams. The availability of water enhances most recreational uses and, conversely, recreational pursuits have varying degrees of impact on these resources. Many developed and dispersed recreation sites, summer homes and organization camps are located near lakes and streams.

Because use is concentrated on the few available sites near water, over-use can reduce the health and vigor of riparian vegetation and compact soils. Recreation sites and riparian areas both have a limited capacity to meet the demands being placed upon them. Concentrated overuse typically affects riparian conservation areas; it results in trampling of streambanks and riparian vegetation, leads to soil compaction, and causes erosion and sedimentation. The risk of water pollution from human waste, dishwashing, trash accumulation and horse use is also higher where people congregate. In general, most areas across the southern California national forests experience only minor amounts of these effects, except at areas of concentrated use that are mainly associated with dispersed recreation. Although there is a component of year-round use composed mainly of dispersed use and hiking, most national forest visitation decreases between October and April when many developed campgrounds and day-use areas are closed for the winter season. Camping is not allowed within 100 feet of water bodies, and there are processes to assess current use of an area and to determine corrective measures when impacts do occur. Dispersed camping that takes place off-road has become an increasing problem that causes degradation to both riparian areas and streams.

Shooting areas on the four southern California national forests represent areas of concentrated use that can lead to riparian conservation area and water quality effects. Trampling of the area, uncontrolled vehicle use, erosion, sedimentation and physical damage to riparian vegetation can result from this activity. In addition, water quality degradation can occur from high concentrations of lead shot targets left in these shooting areas. The national forests have experienced an increasing problem with large amounts of trash such as refrigerators, scrap metal and old cars being left on a site after shooters use them for targets.

Impacts from group events, including outfitters and guides, are unique to the particular activity and differ with respect to location, size of group, time period and type of activity. These activities can also have effects similar to those described for other ground-disturbing activities, although the effects are generally of short-term duration and can be mitigated by the terms of the permit. Recreation residences are of long-term duration and can have effects similar to those described for other ground-disturbing and water extraction activities, depending on the terms of the permit and how they are administered.

When adverse changes in vegetation structure, fish and wildlife populations, stream channel stability or water quality indicate that habitat is declining beyond acceptable levels, the alternative is to use adaptive management techniques to modify, disperse, decrease or eliminate existing use based on the Adaptive Mitigation Protocol for Recreation. In some cases the management options are limited and the challenges are compounded when there are no comparable areas nearby to which existing uses can be accommodated.

The term "persons-at-one-time" (PAOT) is used to describe the capacity of a developed recreation site. Alternative 6 results in the fewest PAOTs of all the alternatives. Alternatives 6 and 3 both provide for the decommissioning of existing facilities, which benefits riparian-dependent resources in many cases.

Alternative 6 should result in a reduction in recreation use effects over the general planning area due to the reduced public access from national forest roads. However, the opposite projection is a possible increase in detrimental effects on areas that will remain accessible, are currently popular, and possibly are at their capacity to handle more use. There could be a shift in patterns of national forest visitation, meaning that the peak periods for recreating, which are currently weekends and summer months, could be extended to weekdays and into the spring and fall. This shift could result in overuse of riparian conservation areas and effects on riparian-dependent resources and water quality.

The added emphasis on day-use recreation in Alternative 2 could increase demands of water wells within recreation areas. When people pay a fee to recreate, they generally expect services such as water for consumption, bathing, toilets, etc. The emphasis in Alternative 4 on sustainable recreation through improvement of existing recreation facilities and/or by development of some new recreation facilities in high-need areas would potentially reduce existing riparian impacts and help minimize future degradation. Improvements and new developments would result in an increased demand for water, at greater rates than in the past, due to the more frequent installation of flush toilets and showers, except where water is already known to be scarce and recreationists are required to import their own sources of water. Alternative 4a also emphasizes sustainable recreation but provides for a slower rate of facility development.

Unauthorized vehicle use associated with dispersed camping could literally occur in all alternatives but is more likely to increase in those alternatives that emphasize access, such as Alternatives 4 and 5. Alternative 4 would likely result in more Forest Service presence or additional user restrictions to maintain sustainable recreation. Recreation uses that arise from improving or adding developed recreation facilities will result in additional demands for water. The need to develop more, larger or deeper water sources would increase, sanitation could decrease, and the potential for aquifer contamination and overdrafting would increase proportionally. Soil compaction from vehicles and concentrated use areas will cause small reductions in infiltration and increase runoff, resulting in less aquifer recharge. Other potential changes include alteration of local surface water temperature and chemistry; less groundwater availability to resupply surface water systems and riparian areas; and changes in rates of erosion, mass movement and soil creep. Indirect effects of water extractions just outside national forest boundaries in support of recreation activities can drain forest aquifers and take water needed by forest resources. Alternative 4a would limit to some degree the opportunities for unauthorized vehicle use associated with dispersed camping that could be anticipated in Alternative 4.

Overuse and unauthorized uses of riparian conservation areas by developed and dispersed recreation have a potential for affecting water quality, riparian habitat and the ability of the stream channel to function properly. Similar effects can result from overuse and unauthorized uses in open off-highway vehicle areas and along trails, including motorized, non-motorized, mechanized, pack stock, and hiking forms of recreation.

Effects of Law Enforcement on Watershed Conditions

As mentioned in different portions of this chapter, unauthorized activities that occur on the national forests can have detrimental effects on riparian conservation areas and water quality. Many of these activities are somewhat dependent on water sources, such as unauthorized water extraction for personal use or criminal endeavors like irrigating marijuana plantations. These extractions can interfere with a stream's hydrologic function and water quantity and quality, and they can cause habitat loss or degradation. Other unauthorized activities that generally can be considered ground-disturbing activities include off-route driving by motorized, non-motorized, and mechanized equipment, as well as dumping of trash and debris at shooting areas, day-use areas, and along roads. Those activities that affect water quality are described in potential effects on water and riparian resources from management activities tables.

As the population in southern California increases, the Forest Service can anticipate increasing numbers of national forest visitors and a related increase in the number of unauthorized and criminal activities. The effects from these activities are widespread and somewhat unpredictable. Control of effects will be heavily dependent on funding and staffing.

Effects of Roads and Trails on Watershed Conditions

Roads are the most significant source of increased sediment into stream channels on the national forests. Precipitation run-off from roads is a concern because of the efficiency with which it can reach a stream. In an unroaded area, or when there is an adequate buffer between the road and the stream, run-off from rain or snowmelt typically infiltrates into the soil of a vegetated slope before it can reach a stream channel. This process is interrupted when a road traverses a slope and collects and diverts the run-off. If no effective mitigations are applied to disperse the run-off collected on a road, it can serve as a conduit where water travels down the road surface and flows directly into nearby channels, increasing the turbidity and rate of streamflow. In turn, the available energy of a stream increases, resulting in accelerated erosion of banks and the streambed.

Generally, higher densities of roads within a watershed result in quicker run-off to the stream network and greater the risk of channel erosion and downstream sedimentation. Although overall road densities across the four southern California national forests are low, see table 117: Road Density With Road Miles By Forest Roads (NFSR, Temporary And Unclassified), And State And County Roads, page 113, roads can affect riparian conservation areas and water resources. See the Facility Operations and Maintenance section of Chapter 3 for more information. Deposition of sediments, or sedimentation, occurs where or when flow rates are not sufficient for their transport in suspension. It can cause adverse ecological and economic consequences if the amount of sediment exceeds the transport capacity of a stream system. Sedimentation can inhibit flow through diversion structures, reduce reservoir capacity, increase sediment removal costs from sediment catchments and increase the costs of water treatment. It also can adversely affect aquatic habitat by burying important gravels needed for spawning, filling interstitial spaces in a streambed inhabited by aquatic insects, reducing pool depths and changing the balance of scouring and deposition within a stream system. Impacts of sedimentation will be analyzed during project-level analyses.

The primary water concerns in road management are location, design, layout and maintenance. When located adjacent to or across a stream, roads and trails can act as constriction points when flows are directed through undersized culverts and can serve as direct conduits of sediment-laden run-off into a stream, leading to sedimentation. Roads and trails constructed along an unstable slope can weaken its structure, resulting in landslides and creating a source of sediments from the disturbed material. Low-water road crossings (armored and unarmored fords, cement slab crossings, etc.) can disrupt streamflows, affect channel geometry and function and deliver sediment directly into the stream from the approaches to the stream crossing.

Inadequate distances or improper drainage between an unsurfaced road and a stream can produce additional sediment loading. Side-cast construction, unstable berms, poor quality surface aggregate or improper road maintenance can result in damage to riparian vegetation as well as increased stream sediment loads. These problems can persist long after a travel way is closed if measures are not taken to disconnect erosive run-off pathways into a stream channel and/or onto a road surface. Proper design and location of travel ways can significantly reduce the risk of damage from flood flows, slope failures, sedimentation and channel degradation. Each time a road is re-graded for maintenance, the soil is disturbed and perched on the roadside as berms, resulting in increased potential for erosion and sedimentation into nearby streams.

Roads are a major source of erosion because of the extent of exposed soil on the road surface, cut slopes, fill slopes, and berms and ditch lines. Unpaved, they are vulnerable to rainfall and run-off that erodes their surface. Native-surfaced and gravel-surfaced roads are often severely damaged in the fall and winter following wet weather when visitors attempt to access National Forest System lands with their vehicles. Paved or unpaved, they serve to accelerate run-off, which when concentrated can cause erosion on unprotected down slope surfaces. In addition, without any means of detention such as vegetation or downed material, water coming off roads can efficiently convey sediments into a stream system. To prevent a direct delivery of sediment into a stream, run-off must be diverted either onto a stable and well-vegetated slope or into an adequately sized sediment basin. Greater distance between the road and the stream generally results in less sediment delivery to the channel (MacDonald pers. comm.). Once sediment enters a drainage network, either an ephemeral channel or perennial stream, it will be transported through the system as streamflow rates allow.

Most roads (1930s CCC era) and trails were built prior to the adoption of the current watershed conservation practices. Priorities for road maintenance are set annually based on resource protection criteria and annual budget. Roads maintained by the national forests range from native surface to gravel and paved. Of the total 3,780 miles of National Forest System roads, 440 miles are paved. Many of the native-surfaced roads are managed using traffic restrictions during wet weather and temporary closures to protect the road surfaces from degradation. Other travel ways within the national forest include about 1,755 miles of user-created roads and trails, which have been inventoried but are not managed within the national forest's official transportation system. Some of these travel ways are wider than 50 inches and thus are considered roads; the remainder are trails.

Restoration of riparian conservation areas may include obliteration or relocation of roads away from stream channels, riparian areas, steep slopes, high-erosion-hazard areas and areas of mass movement. Realignment of roads and other travel ways to cross riparian areas and streams at a perpendicular rather than acute angle also reduces chronic sedimentation and improves the quality of riparian and aquatic habitats in presently affected stream reaches. Road reconstruction may be necessary to provide stable cut-and-fill slopes and adequate drainage that will allow run-off to be filtered through vegetated buffers or sediment traps before entering the stream channel. Effective seasonal road closures are also a viable management tool that can reduce severe road damage from ruts and serve to maintain a road's integrity, thus reducing road maintenance needs while decreasing riparian and water quality impacts.

Alternatives 1, 2, 4, and 5 would have more of the land base accessible via motor vehicle as unclassified roads are incorporated into the transportation system than Alternatives 3, 4a, and 6 would. This may expose functioning riparian areas to more adverse effects from vegetation removal, streambank and channel bed alteration, soil compaction and increased erosion and sedimentation. Alternative 4a retrains much of the present road mileage but limits use.

Alternatives 6 would have the least amount of land available for the construction of new roads and for the incorporation of unclassified roads into the transportation system, followed by Alternatives 3 and 4a.

Alternatives 2, 3, 4, 4a, and 6 are likely to mitigate effects from existing uses at a faster pace than other alternatives, because of their greater emphasis on biodiversity protection. Alternatives 3 and 6, with an emphasis on conservation and recovery of species-at-risk would also relocate conflicting uses from riparian areas.

Increased mileages of roads or trails, increased road surface widths or paving will lessen infiltration to aquifers and increase surface run-off. Improper drainage can result in concentration of water that may cause slope instability and increased erosion and sedimentation, and may also alter aquifer recharge infiltration. Large surface excavations or transportation tunnels could intercept and damage aquifers.

Effects of Non-Recreation Special Uses on Watershed Conditions

The loss of stream channel and riparian area connectivity is an important issue in southern California. This is most critical for the streams that historically were continuous from the headwaters to the ocean. Today, many tributaries to the large rivers on the national forests are isolated from other tributaries by dams, dewatered areas, concrete-lined channels and developed areas on public or private land. Those species that are not able to travel long distances across unsuitable habitat or are restricted to only high-quality riparian and aquatic habitats become isolated from other populations.

Localized impacts can include inundation of stream habitat upstream of impoundments; altered streamflow downstream of the impoundment that affects the timing, magnitude and duration of flows; and channelization of land adjacent to impoundments for diversion of water. Water transmission ditches can breach, causing erosion, gullying, slope failures and sedimentation downstream. They can affect conditions for both aquatic species and riparian vegetation and create impediments for terrestrial species movement and migration. Far-reaching effects can include habitat fragmentation such as the loss of connectivity of water flowing downstream to the Pacific Ocean.

Generally, uses such as utility corridors (including power lines, communication lines and pipelines) have similar effects as those described under the roads section. These corridors are usually maintained to be relatively free of vegetative cover and therefore can serve as erosion and sediment sources on the landscape. Unauthorized vehicle, motorcycle and mountain bike use on these corridors can lead to acceleration of these effects if left unchecked.

Filming permit and military maneuver effects are unique to the particular location, size of group, time period and type of activity. These activities can have effects similar to those described for other ground-disturbing activities, although effects are generally of short-term duration. Impacts from special uses on watersheds would typically be mitigated through avoidance and engineering design and by terms of the permit.

There will be anticipated increases in special-use permits in Alternatives 4, 4a and 5, a somewhat stable level in Alternatives 1 and 2, and a decreasing level in Alternatives 3 and 6.

Alternative 5 emphasizes high commodity production and has the greatest emphasis on vehicular access. This alternative will likely result in more temporary roads associated with an increased emphasis on special-use permits. There is a point of diminishing returns, however, where there is a risk that protective measures fail to be fully effective. Hence, alternatives that propose greater levels of management activity may increase the risk of adverse impacts on water and riparian resources.

As the population in southern California increases, we can anticipate an increasing interest in water impoundments for both hydroelectric generation and for municipal, agricultural and industrial use. Reservoirs can increase groundwater levels above and immediately below the dam site, and water flows can be managed to increase or decrease streamflows and groundwater levels downstream during different times of the year (Berg and others 2004). This generally is advantageous to groundwater flow and riparian sustainability, if managed for that purpose. However, riparian vegetation can encroach on stream channels when water is managed for very low flows and can cause reduced channel capacities. Diversions that remove water from an area can lower groundwater tables and surface water flow, which in turn affects habitats, riparian resources and other resources.

Alternative 5 would have the highest potential for additional water rights and developments (extractions or diversions) or additions to and retrofitting of existing projects. Alternatives 6 and 3 would have the least potential for this type of development. Beneficial use of water (purpose of the extraction) in the form of water diversions from existing streams would not vary by alternative. Potential adverse effects on water from future uses would increase with each water rights application, which is expected to be the highest in Alternative 5. Water use is authorized through riparian rights or by state-issued water rights; however, normally a water right does not obligate the national forests to authorize a diversion structure. When authorizations expire and when new diversion structures are proposed, water impacts would be addressed during screening application analysis processes.

Alternative 6 prohibits all new hydroelectric projects and other water developments, surface water and groundwater alike, with the goal of sustaining late-season streamflows. Within 5 years of the approval of the land management plans, existing dams will be evaluated for removal. Restoration efforts will emphasize improving water quality-limited stream segments.

In Alternatives 4, 4a, and 5, the increased demand for water as a high value and scarce commodity will cause competition for these scarce resources. Potential overdraft of aquifers, with accompanying reduction in surface water and groundwater quantity, can result in a reduction in water availability to national forest resources. Overdrafting can occur in bedrock fracture aquifers, alluvial aquifers or deep porous and permeable rock zones. It results primarily from pumping from vertical wells or withdrawal of water from horizontal wells, at a rate greater than that which is naturally, or in some cases artificially, replaced by aquifer recharge. Within or near the national forests, potential sources of overdraft are water wells for campgrounds, recreation residences, snowmaking and water bottling operations, administrative sites, range and wildlife sources and nearby agriculture and urbanization. In general, the more wells that tap an aquifer, and/or the more water pumped, the higher the likelihood of overdraft and the more likely that surface resources would be affected, especially riparian areas, springs and meadows. If more water is kept on-forest to maintain forest vegetation, keep aquifer levels high, support streamflow and riparian area integrity, support wildlife and grazing needs and provide drinking water for national forest recreationists, then less is available for down-gradient domestic, municipal, agricultural and commercial uses. Alternatives that use increased amounts of groundwater may contribute to overdraft.

The Forest Service has little control over external water extractions, and the consequences will be similar in all alternatives. Indirect effects of water extractions just outside national forest boundaries from increasing urban developments and increasing commercial developments such as water bottling, can drain forest aquifers and take water needed by national forest resources.

Effects of Minerals and Energy on Watershed Conditions

Oil and gas and other mineral exploration and developments have the potential to adversely affect water quality by adding sediment and/or toxic substances from road and drill pad construction and drilling and boring activities. The potential exists for spills of blasting agents, drilling fluids and oil and gas products to enter surface and groundwaters (USDA 2001).

Both historical mining operations and abandoned mine lands continue to affect riparian conservation areas and water quality from run-off, erosion and sedimentation, as well as from leaking chemical compounds. Placer mining on the national forests generally is located along streams within riparian conservation areas. Placer mining activity involves removal of any riparian vegetation and processing of gravel substrates. Past placer mining practices on the national forests have led to introduction of heavy sediment loads into the stream channels and, in some cases, alteration of the stream channel and flood plain system. Forest streams particularly affected by past placer mining activities include: Piru, Plaskett, Mill and San Francisquito Creeks and the San Gabriel, Big Sur and Little Sur Rivers. Disturbance and stream sedimentation effects from current operations are small compared to these remnants of past activities. Generally, effects from large- and small-scale mining can include type conversion, soil compaction, riparian vegetation removal, physical habitat destruction, interference with hydrologic function, alteration of water quantity, water quality degradation, increased run-off, erosion and sedimentation.

Mining activity can cause significant long-term impacts on surface and groundwater quality. Metal ores can contain sulfides of metals such as iron, zinc, lead and copper. Deep in the ground, sulfides are normally stable, but mining exposes these ores to air or water and the result is oxidation to metal sulfates and sulfuric acid. Metals that come in contact with acidic run-off dissolve easily and enter a water body in solution. Aquatic life and riparian vegetation are poisoned by acidic water. Without protective vegetation along streambanks, channel erosion also will also occur. Some mining activity, such as exploration, simply disturbs the soil, leaving surfaces exposed to erosive forces. Future activities may occur but will be required to mitigate impacts on water resources.

Current mining occurring on the national forests is limited primarily to a few small gold mines scattered throughout the national forests and a few gravel pits and rock quarries. The placer gold operations mostly use small suction dredges that work instream to separate gold from stream gravels. These operations can cause some alteration of substrates within the stream channel. Gold operations working outside stream channels are required to use settling ponds for process waters and to rehabilitate and revegetate mined areas on completion of mining. When vegetative cover is removed or when soils are disturbed or compacted, there is a short-term increase in sedimentation. Natural precipitation and flood events can also cause sedimentation. Natural occurrences of chemical compounds in surface water reduce water quality. Mining operations thus have the potential to contaminate surface and ground water.

Numbers of mining and oil and gas operations do not vary by alternative, but the level of minerals and energy resources activity is likely to increase under Alternative 5, which would result in increased use of surface water and groundwater and potential effects on aquifers.

There would be less land available for oil and gas leasing on the Angeles and Los Padres National Forests under Alternatives 3 and 6 than under Alternatives 5, 1, 4, 4a, and 2, which provide consecutively lower potential to affect water quality and riparian conditions. This is related to the amount of land classified as Back Country in each alternative. For the Los Padres National Forest, further restrictions will be placed on lands available for oil and gas leasing in accordance with the Record of Decision (ROD) for the Los Padres National Forest Oil and Gas EIS. The Oil and Gas EIS ROD, with its geographic limitations and stipulations for leasing, is incorporated into the ROD for the forest plan for the Los Padres National Forest that accompanies this document.

Mining operations—especially adits, shafts and pits—can alter aquifer integrity, groundwater quality and quantity. Plans of operation and reclamation plans are designed and administered to mitigate adverse impacts. Lode mining, which involves digging of tunnels, adits and shafts, can intercept and change groundwater flow and aquifer physical properties. Placer mining, gravel pits and rock quarries that move large quantities of sediment within a stream channel or alter the stream channel and floodplain system could affect the quantity of water infiltrating to the aquifer. Ground disturbance and stream sedimentation from most current operations, except for the carbonate mines on the San Bernardino National Forest and gravel operations on the Angeles National Forest, are small. Oil and gas development has the potential to adversely affect groundwater quality and aquifer integrity because wells may intersect both aquifers and oil or gas formations, causing contamination. The potential exists for drilling fluids and oil and gas products to enter surface and groundwater. Oil and gas operations are prohibited by stipulation in areas subject to slope instability, riparian areas and wetlands, which reduces the risk to riparian areas and surface water quality.

Effects of Livestock Grazing on Watershed Conditions

Grazing can occur in and near riparian areas where forage, water and cover are in close proximity. Continuous season-long grazing in these areas during long, hot and dry months may result in deteriorated riparian systems and lead to water quality degradation if livestock are allowed to remain too long. The impacts can include vegetation type conversion, soil compaction, increased stream bed disturbance, physical destruction of aquatic habitat, bank chiseling, erosion and sedimentation, reduction and/or loss of wildlife and fish habitat and decreased water quality (Meehan and Platts 1978, Platts 1981). When the impacts of livestock grazing are substantial, modifications in the timing and/or amount of grazing activities can reduce the overall impact in critical areas. Removal of livestock or reduction of the season or number of livestock from the affected area typically remedies over-grazed areas (Schulz and Leininger 1990). Cattle grazing cause visual changes in oak-woodland spring structure. However, spring composition is stable over time, and hoof-caused hummocks do not result in detrimental changes to composition, productivity or water quality (Allen-Diaz and others 2004). Sensitive resources are protected through application of the design criteria in Part 3 of the forest plan, best management practices (BMPs), and permit terms and conditions that are designed to allow for moderate grazing that meet or move towards desired conditions.

Waterborne transmission of the pathogens is a water contamination concern. Livestock can contribute to the transmission of pathogens, along with humans and various wildlife species (Atwill 1995). In general, wildlife regardless of age including striped skunks, coyotes, California ground squirrels, and yellow-bellied marmots were substantial sources of *Cryptosporidium parvum* oocysts. In contrast, only the young stock of beef and dairy cattle were substantial sources of oocysts; adult cattle appear to excrete only limited numbers oocysts relative to either calves or wildlife (Atwill and others 2002).

Compaction of soil, removal of vegetation, re-channeling of surface water along livestock trails and breaking down of streambanks can result in gully formation in sensitive areas and lowering of the groundwater table. While the concentration of cattle along stream banks during the dry season resulted in a significant increase in bare ground, researchers were unable to detect streambank erosion in a study on cattle grazing impacts on stream-channel erosion in oak woodlands. However, cattle trails are an important mode of sediment transport into stream channels (George and others 2004). The degree and location of the effects of livestock grazing are identified in a site-specific analysis and not at the forest plan level. Grazing that leaves adequate amounts of residual dry matter (RDM) in the uplands is generally not an important source of sediment (George and others 2002). Properly managed RDM can be expected to provide a high degree of protection from soil erosion and nutrient loss (Bartolome and others 2002). The design criteria in part 3 of the forest plans are in place to meet or move towards all desired conditions and minimize livestock effects.

Numbers of active grazing allotments do not vary in Alternatives 1 through 5; however, suitable acres for grazing does vary by alternative. Alternative 6 reduces the number of active grazing areas (see table 108: Grazing Suitability by Forest by Alternative, page 64). The number of vacant grazing areas that are retained for potential restocking does vary by alternative. Alternative 1 has the most vacant allotments. Alternative 5 has the next highest level, followed by Alternatives 2, 4, and 4a with similar levels. Alternative 3 and 6 have the lowest levels (see Effects on Livestock Grazing for more detail). Livestock grazing will be provided for in all alternatives, except in areas such as Critical Biological zones, coastal California gnatcatcher critical habitat, peninsular bighorn sheep range, and San Dimas Experimental Forest (see Appendix P. Livestock Grazing Suitability Analysis). Comparing the suitable acres available for grazing among alternatives can help assess risks to water and riparian-dependent resources. The alternatives range from highest to lowest suitable acres available for grazing in order of 1, 5, 2, 4a, 4, 3, and 6. Prior to authorizing grazing on any vacant grazing area, a site-specific environmental analyses will be completed. As a result, vacant grazing areas that are retained will not be authorized without further site-specific analysis; there is no change in the risk from grazing to watershed resources as a result of the forest plan decision.

Effects of Fuels Management on Watershed Conditions

Fuel loading on the four southern California national forests has increased over most of the century from densely vegetated stands and tree mortality. The potential for large, stand-replacing wildfires has grown substantially, especially in high-elevation forests where fire suppression has been most effective. Prescribed fire provides a means to burn under more controlled circumstances that determine a fire's location, size, timing and intensity. In most cases, the intensity of a prescribed fire is less than that of a wildfire, leaving more ground cover and reducing the potential for erosion. Management-ignited fires typically occur under wetter soil moisture conditions than exist at the time of wildfires. These conditions are preferable for avoiding the formation of water-repellent soils (DeBano 1981). The intent of prescribed burns generally is to reduce fuel loading without fire intensities so hot that they cause significant loss of vegetation or incur soil erosion or water quality problems. Areas with reduced fuel loading provide greater opportunities for more effective application of fire suppression techniques, sometimes limiting the size and severity of wildfire on the landscape. Reductions in downstream flooding, sediment and debris production are often seen in watersheds where prescribed fire has been used as watershed management tool.

Low-intensity fires typically leave sufficient organic matter to protect the soil surface. In contrast, high-intensity fires can consume duff, litter and much of the vegetation. A high-intensity wildfire has a greater potential to burn through riparian areas than a prescribed fire. A prediction of the acreage of high-intensity wildfires that might be expected over the life of the revised forest plans was not made. However, the Forest Service can compare the impacts typically related to wildfire with those from prescribed fire treatments. The major differences between wildfire and prescribed fire are the percentage of the watersheds burned at one time, the overall burn intensities, and the unknown timing of heavy rainfall events. Prescribed burns are designed to emulate natural forest openings by creating a mosaic pattern of burned and unburned areas within each watershed. Treatments generally result in moderate fire intensities across most of the project area, with scattered sections of high- and low-intensity burned areas.

Fuelbreaks are wide strips or blocks of land on which the native or pre-existing vegetation has been permanently modified so that fires burning into it can be more readily extinguished. The vegetation changes from one type to another, which is called a type conversion. Mechanical methods and hand labor are typically used to construct and maintain fuelbreaks. However, herbicide applications on fuelbreaks may be used to treat resprouts of chaparral and reduce maintenance costs. Long-term maintenance of fuelbreaks generally is done through the periodic application of fire on the average of once every five years. Construction of fuelbreaks can have effects similar to other ground-disturbing activities; however, these effects would be short-term. In some locations on the Angeles National Forest, fuelbreaks are maintained by grazing livestock. Although soil compaction occurs, mostly along major fuelbreaks, it appears not to affect vegetation regrowth, although on occasion it can intensify drainage diversion and erosion rates along the fuelbreak route. Unauthorized driving on fuelbreaks by vehicles, motorcycles and mountain bikes traveling off-route can cause rilling, rutting and gully formation and accelerated erosion.

Fuelbreaks can directly lead to a reduction in downstream flooding and sediment yield by helping to limit the size of wildfires. They are strategically placed on the landscape for just that purpose, and under less than the most severe wildfire conditions significantly reduce the size of wildfires. A reduction in wildfire size within a watershed can be directly related to reductions of flooding, channel and debris damage that might occur in and downstream of that watershed.

All alternatives are generally similar with regard to vegetation and fuels treatments and fuelbreak construction and maintenance. Mortality removal will generally be done on the periphery of towns and homes in WUI Defense and Threat zones within 1.5 mile of threatened communities, and along evacuation routes within 1/3 mile from public and permitted facilities and developed recreation sites. Alternatives 3 and 6 might provide a slightly smaller number of total fuelbreak miles constructed and maintained than the others.

All alternatives provide for prescribed burning relatively similar numbers of acres and should have similar watershed effects. Acreages of treatment represent both a short-term risk to watershed resources as well as a long-term protection measure from higher-intensity wildland fires.

Consequences of dead tree removal and WUI zone treatment (mostly mechanical), forest health/thinning (some mechanical), fuelbreaks (hand, some mechanical, some chemical), and prescribed burning treatments tend to have overall beneficial consequences for water and riparian resources. Vegetation removal that reduces transpiration will leave more available water in the ground for stream recharge, other vegetation growth or riparian resources. However, these increases are short term and are not measurable in the long term at the watershed scale. In addition, if soils are hydrophobic, infiltration to aquifers will be reduced and runoff increased. Short-term reductions in riparian vegetation can result when prescribed fire enters the riparian conservation area. Disturbance of soil from roads, skid-trails and landings can cause increased landsliding, erosion and sedimentation. Vegetation and fuels management techniques, prescribed burning and mechanical removal of vegetation would not vary significantly among alternatives. Overall, short-term adverse effects on water and riparian resources would be slight to moderate, but the long-term benefit of reduced fuel loading and the risk of loss to a wildfire would be high.

Effects of Wildland Fire Suppression on Watershed Conditions

Wildland fire is a natural process in the ecosystems of southern California. The four southern California national forests average about 563 wildland fires per year. Wildland fires are mostly on the low- and mid-elevational band. Many of these fires originate adjacent to the national forest boundaries, often starting below the national forests and traveling up into National Forest System lands (see the Wildland Fire and Community Protection section). Fire prevention efforts such as Forest Service presence in the field, agency articles and new releases and environmental education can be effective at preventing human-caused fire starts. The severity of impacts from wildfire and prescribed fire on water and aquatic and riparian resources depends on the fire's intensity and the degree of any suppression efforts. Hot fires can eliminate the erosion protection afforded by vegetation and soil organics, which can cause increases in erosion, dry ravel and sediment transport caused by rainfall and sheet erosion; these can affect water quality. In some instances a hydrophobic (water-repellent) soil layer or impermeable crust is created, which can reduce the potential for short-term infiltration, increase overland flow, and greatly increase erosion and erosion effects. The loss of riparian vegetation removes the buffers next to the streams.

Effects of increased sediment in a stream will depend upon the composition of channel types within the watershed. Although most watersheds in southern California are over-steepened and have naturally-occurring water erosion, these watersheds can also experience an increase in dry ravel after wildland fires that can eventually make its way to the stream courses (Wells 1987b). Watersheds with high gradient channels will tend to flush the sediment out, whereas watersheds with a high percentage of low gradient channels will retain the sediment longer. Effects on channels generally include a reduction in sediment after the first three years. Landslides and downstream flooding from severely burned watersheds are also of concern where dwellings and other structures located in a floodplain are at risk (Barrows and others undated, Highland and others undated). Natural regrowth of forbs and other understory vegetation generally occurs rapidly, often with good coverage in place the following year.

Wildland fire suppression efforts can have impacts on watershed resources. Fire lines built with heavy equipment generally are constructed on ridgelines to assist in the control of wildfires. However, during initial attack, fire line construction typically can be indiscriminate with regard to sensitive riparian areas and erosive or unstable soils. Fire lines disrupt subsurface flows and can cause a direct delivery of these flows and precipitation run-off to the stream. Applications of fire retardant and Class A foam can have effects on water quality and on aquatic and riparian-dependent resources (Gaikowski and others 1996).

Wildland fire and suppression practices can result in soil baking or compaction, which leads to increased run-off, erosion and sedimentation and potentially to increased flooding.

Cumulative Effects

The cumulative effects analysis for watershed resources pertains to the planning period of 15 years, which is generally a shorter period of time than many natural watershed processes. This analysis for water and riparian resources pertains to the watersheds that contain all or a portion of National Forest System lands administered by the southern California national forests. Many of the watersheds originating on National Forest System lands are held in mixed ownership at their lower elevations, commonly with urban developments near and adjacent to the national forests, which contributes to cumulative watershed impacts. Through active coordination and cooperation with local community groups, governments and other agencies, watershed restoration projects could reduce the effects of connected, disturbed areas that have led to a loss of riparian and water connectivity with off-forest stream channels and could reduce the potential for future adverse cumulative effects.

Projected human population growth throughout all of southern California is expected to bring major increases in pressure on national forests' natural resources, including development and use of resources to support community growth (such as water, energy and transportation). Demand is expected to continue for new or upgraded interstates, state highways and/or large utility or water projects crossing the national forests. Increased adjacent urban development has the potential to affect national forest water and riparian resources through increased run-off and pollutants from roads, roofs, driveways, fertilized yards and agricultural uses. This development also raises the potential for an increase in unauthorized uses and criminal activities on the national forests. During the short-term there will be an expected increase in accidental or unintentional human-caused wildland fires due to the inability to remove and treat vegetation associated with the cyclical tree mortality issue on the four southern California national forests. All of these issues will present effects that can detrimentally affect water and riparian areas.

Water and riparian resources receive protection from national forest management under all alternatives through the application of design criteria (standards) that would limit the extent and duration of any adverse environmental effects. Nevertheless, some adverse effects are unavoidable.

The possibility for damage to the riparian ecosystem is greater in those alternatives with more ground-disturbing activities (such as road building and reconstruction, recreation facility construction and commodity development), such as in Alternative 5 and somewhat in Alternative 4 and 4a. The resource protection measures described above should prevent widespread or long-term deterioration of water or riparian resources. During implementation of this plan, some short-term adverse effects can be expected, but no long-term negative effects are anticipated. It is impractical to complete a cumulative watershed effects analysis at the scope and scale of this strategic level of forest planning. Cumulative watershed effects analyses using the USDA Forest Service, Region 5 methodology (FSH 2509.22) will be developed and discussed at the project level.

Potential cumulative effects on water and riparian resources resulting from past, current and future management are based on the total amount of disturbance. The same watersheds where management activities historically have been concentrated would continue to incur most of the activities under any of the alternatives.

Nearly all the management activities conducted on the national forests have the potential to affect water resources. Their cumulative effect on a watershed depends upon the effects of past and present management as well as the watershed's inherent ability to absorb additional disturbance to its biological and physical processes and elements. The impacts of management activities on watershed health can be detected by assessing the conditions of its water and riparian resources. As such, these resources are excellent indicators of cumulative effects. Presently, most of the national forest watersheds are rated as being in good to moderate condition. As previously stated, where multiple ownerships exist in a watershed, the Forest Service will work with the appropriate agencies, communities and individuals to protect and restore and watershed resources. High-risk watersheds will be evaluated and prioritized for rehabilitation based on feasibility, funds available and overall benefits to watershed health.

Activities that have a higher risk of adverse watershed effects include water extractions; water diversions (blocking of channels); removal of vegetation; recreation facility development and use; mining; and high linear feature density (roads, trails, fuelbreaks, power transmission and pipelines and trans-basin diversions and tunnels). Some watersheds experience many of these effects, underscoring the need to take into account their cumulative effects.

The cumulative effects of management activities and the expansion of urban populations toward National Forest System lands trend toward increased pressure to develop more groundwater resources, both on-forest and adjacent to National Forest System lands. The results are increased risks of damage to groundwater quality, decreased levels of groundwater availability, and increased costs of developing and maintaining deeper and larger wells. An increase in water diversions and impoundments can affect water quality and the functioning of streams, ponds, lakes and wetlands. Potential cumulative effects as a result of water put to beneficial use through diversions of surface water would depend on the demand for future water rights. Substantial diversions from forest streams occur at this time for public water supply and hydroelectric projects, and additional new proposals are expected. Adverse effects on riparian-dependent resources have occurred at existing sites, and additional diversions would increase these effects.

Most special designation areas on the national forests are virtually untouched by roads or large-scale management activities and generally retain pristine watershed characteristics.

Increased recreation resulting from expanded population growth can lead to increased trail density, trampling and degradation of riparian areas and other activities that threaten watershed health, especially in popular locations. These activities may limit management options in watersheds of mixed ownership where watershed condition and water quality is of concern.

Based on ground disturbance, implementation of Alternative 5 would have the highest risk of adverse cumulative effects on the water and riparian resource and overall watershed condition. Alternatives 1, 2, 4, 4a, 3, and 6 would each follow with successively fewer impacts.

Effects on Soil

Direct and Indirect Effects

Soil protection measures will continue to be implemented in order to assure the maintenance of soil quality and long-term productivity. These protection/mitigation measures are found in watershed analyses, environmental assessments, soil quality standards, and best management practices (BMPs) and are incorporated into the design criteria found in Part 3 of the forest plan.

Several management tools can be used to prevent unacceptable soil loss resulting from management activities. These tools include an Interagency Erosion Hazard Rating system, (USDA Forest Service 1990) for identifying soil erosion hazards and Soil Quality Analysis Standards (SQS); the SQS are threshold values that are established to protect soil productivity from significant change or impairment of the soil's productivity capacity through land management practices on those lands dedicated to growing vegetation (USDA Forest Service 1995).

These protection measures apply to all alternatives. Once an alternative has been selected and implementation starts, monitoring will be initiated to determine if the appropriate protection measures have been implemented and if the measure is adequate as described in Part 3 of the forest plan. Changes in either the method of implementation or the protection measures will occur if they do not adequately protect the soil quality or productivity.

Effects on soil productivity are the result of either the removal or the change in the physical characteristics of the upper organic and mineral productive layers. In most cases, the greater the soil disturbance, the greater and longer lasting the impact on soil productivity. Both on-site natural disturbances from wind, fire, natural erosion and landslides (as well as human activities) can affect soil productivity.

Management activities that purposely remove the upper soil layer and vegetation result in the elimination of soil productivity. These activities include construction of roads, trails, gravel pits, parking areas and recreation and administrative facilities. The total area involved in gravel pits, parking areas and recreation and administrative facilities is relatively minor. Roads and trails involve a much greater area of soil disturbance. Road densities are moderate to low in the four southern California national forest area, and the soil impacts of road density are accounted for in the development of watershed condition class.

Development of access routes to sites that attract users to streams and wetlands accelerates impacts to stream banks and the fragile organic soils in the wetlands, unless mitigated by the application of best management practices and other management guidelines that protect streams and riparian areas. Nevertheless, past and current practices related to off-road vehicle use, unauthorized vehicle use of National Forest System lands and mining have resulted in lost soil productivity.

Soil disturbance occurs from both natural and human causes. Too much disturbance can remove individual particles through surface erosion or remove large masses of soil through dry ravel or landslides. Dry ravel caused by gravitational forces is the downhill movement of soil and debris during dry periods. This rolling, bouncing and sliding of individual particles down a slope is a dominant hill slope sediment transport process in steep arid and semiarid landscapes, especially after fires. High rates of geologic uplift in the Transverse Ranges can trigger high rates of erosion. Along with the geologic setting and rapid uplift, together shallow soils, low available water holding capacity, low vegetative growth capacity, often less than 100 percent ground cover and frequent fire intervals leads to a naturally high erosion rate regardless of management activities.

Erosion results in the loss of the nutrient-rich surface organic layer and the productive upper layers of the mineral soil. Eroded soil particles sometimes degrade the water quality in streams and lakes or are deposited elsewhere to impact ecosystems. Mineral soil exposed and compacted from overuse by people and animals adjacent to streams and at remote campsites can be a serious consequence to other resources including fisheries and water quality.

Compaction and puddling are dependent on soil texture, soil structure, soil moisture, ground cover and activity type. Compaction potentials vary because of these variable factors within all land type association groups and landscapes on the four forests. In general, wet or moist soils with loamy or clay textures and weak structure are inherently more susceptible to detrimental compaction and puddling, regardless of ground cover or type of activity.

Removal of the surface organic layer and repeated trampling or driving over the soil causes compaction of the upper layers that reduce their porosity and permeability, resulting in less plant cover and greater water runoff. These conditions occur most frequently on off-road vehicle areas, skid trails in vegetative treatment areas, foot trails and areas adjacent to hardened campsites.

Effects of Vegetation Management on Soil

All alternatives would allow for fuelwood and tree mortality (dead tree) removal. Dead tree and fuelwood harvest would affect the soil directly through skidding, decking or transfer sites, and site preparation for reforestation. Skid trails would compact soil or remove the upper, nutrient rich, soil layers. Soil microbial populations do not seem to be altered by compaction, as pointed out by Shestak and Busse (2005) and Doerr and others (1984). Areas of exposed bare mineral soil would reduce soil productivity and allow for increased soil erosion. However, dispersed ground skidding in the harvest area tends to mix the upper mineral and organic soil layers during harvest, which can reduce vegetative competition, aid in natural reforestation and provide planting sites for reforestation.

Temporary roads are usually created for tree mortality harvest; these roads would then be obliterated and rehabilitated after mortality removal and reforestation are complete. The effects on soils are a short-term increase in soil compaction and erosion and a short-term loss in soil productivity.

An inadequate closure of temporary roads and skid trails associated with logging activities occurs the consequences or they generally develop into unclassified roads or trails which are used by the recreating public to travel deeper into areas that were previously accessible only by National Forest System roads and trails. When located adjacent to communities, these features provide ready access to National Forest System trails; past history has shown a tendency to develop into moto-cross type experiences for local residents. Subsequent degradation of soil and vegetation resources in a localized area then occurs. The use of BMPs generally prevents this occurrence when projects are completed.

WUI Defense and Threat zones (maintained and new) may reduce or, in some cases, eliminate the soil from being productive, both on a short- and long-term basis. Thinning reduces soil productivity on a short-term basis, but can free use soil resources for vegetation to use more effectively.

An increased vegetation management program in all alternatives in the next 12 to 14 years would lead to a increase in soil disturbance. In the long term this increase would be offset through lower burn intensities and retention of more vegetation cover following wildland fires (see the Vegetation Management and Fire and Aviation Management sections for details on how the vegetation management program changes by alternative).

Effects of Recreation Use and Management on Soil

Potential projects under the different alternatives allow for a variety of recreation development. All these activities tend to concentrate people and increase soil compaction and erosion from soil-disturbing activities. Facility designs account for this tendency with varying success. Indirect consequences resulting from potential over-use by people are trampling of the stream banks of fishing rivers, trail development in fragile wetlands, and establishment of non-developed campsites. This eventually results in reductions of vegetation, which leads to erosion, sedimentation into streams, and a loss in soil productivity.

Increased soil erosion and compaction from dispersed camping not only occurs from the campsite but also from the roads used to access the campsites. Disturbance from developed recreation is usually associated with road and facility construction and with concentrated use by people. Campgrounds, day-use facilities, administrative sites, parking lots and viewing sites are usually planned to remain for the long-term. These sites, along with associated permanent roads, vehicle parking and intensive use areas result in long-term loss of soil productivity.

Recreation uses will continue to increase as the surrounding populations swell (see discussion in the Recreation section of this document for details regarding levels of recreation use). Alternatives 4 and 4a provide direction to increase controls on recreation use through hardening of developed sites. This investment in resource protection at recreation sites would minimize soil disturbance at developed sites. Alternative 6 and 4a would reduce access to more remote areas of the national forest, which would reduce impacts on soils in these areas. All other alternatives would lead to a steady increase in use and, therefore, soil disturbance following existing patterns of access.

Effects of Road Use and Management on Soil

Soil disturbances can result from construction, reconstruction, maintenance and decommissioning of roads. The travel surface of roads eliminates soil productivity in the long-term. Cut-and-fill slopes or borrow ditches temporarily reduce productivity for the time it takes for vegetation to reestablish to the pre-disturbance state. Abandoned roads often result in chronic sedimentation or, in some instances, may wash out or fail altogether, resulting in a massive surge of sediment.

Road construction provides the potential for soil disturbance and a loss in soil productivity. New roads would be constructed with strict standards and guidelines, especially those that could influence riparian conservation areas and landslide-prone areas and cause soil erosion.

Most of the National Forest System roads in each national forest are rated high or very high for erosion hazard. Proper maintenance and care of these roads are critical to minimizing effects due to erosion.

Development and use of roads are expected to be related to the miles of road that fall within land use zones allowing motorized use. The Roads section of this document details how National Forest System roads are affected by land use zoning decisions. Alternative 5 has the fewest road and land use zone suitability conflicts and would retain all National Forest System road miles. Alternatives 4a and 6 have fewer roads in the long-term, and subsequently fewer impacts to soils due to roads. Alternatives 1 through 6 reduce the National Forest System road miles by 213, 236, 251,216, 561,160, and 1130 miles, in order.

Proper decommissioning of roads produces short-term disturbances and positive long-term effects through removal of chronic sources of erosion, sedimentation and hydrologic modification. Alternatives 1, 2, 3, 4a and 6 decommission unclassified roads. Alternative 6 (in addition to decommissioning) also calls for complete obliteration, re-contouring and site restoration. Under Alternative 6 for the land management plan period, 36 miles per year of unclassified would be removed each year for 15 years, depending on fund availability. Under Alternative 4a approximately 500 miles of roads in restricted use are established, which would reduce the effects from constant use. Soil disturbance would continue until all obliterated roads are stabilized. Thus, in Alternative 6 while roads are under active restoration, short-term disturbances are greatest and would occur in phases of three to five years as the roads are decommissioned over the next 15 years.

Effects of Non-Motorized Trails on Soil

Currently there are 2,549 miles of National Forest System trails, which have lost their long-term soil productivity. Alternative 6 proposes the largest amount of disturbance from construction of non-motorized trails, with a long-term loss in soil productivity of 1,444 miles for all four southern California national forests. The Los Padres and the San Bernardino National Forests have the most potential increase in miles, with 494 and 474, respectively, and a short-term reduction of the area adjacent to the trails. Alternative 5 would have the smallest potential for disturbance from non-motorized trail construction, with a long-term loss in soil productivity of 364 miles on all four southern California national forests. Again, the Los Padres and San Bernardino National Forests would have the highest mileage increase under Alternative 5.

Mountain bike use is one of the fastest growing usages on the national forests. Although this type of use does not have the same impact of motorcycles, this new usage can in the long run impact trails once used for hiking, jogging and equestrian activities. Current studies have conflicting points of view on the impact of mountain bikes (see Effects on Biological Diversity and Effects on Non-Motorized Trails sections). As use is evaluated on non-motorized trails, the best available information will be considered.

Most trails are on soils with either high or very high erosion hazard ratings. Trail maintenance and care are necessary to keep the integrity of the trails at a level to be used by the public in an uninterrupted manner. Under all the alternatives, an increase to some extent of non-motorized trails would have the potential to increase erosion in areas available for trails.

Unclassified trails are trails on National Forest System land that are not managed as part of the transportation system, such as unplanned trails, abandoned travel ways, and off-road vehicle tracks that have not been designated. There are approximately 450 miles of unclassified trails mapped on the national forests. In addition, others exist but are yet to be inventoried. Many of these routes are old roads and fuelbreaks that no longer serve the purpose for which they were intended and that were never properly closed. Many have been created by recreation use from communities immediately adjacent to the national forests. These trails contribute to lost soil productivity and increased soil erosion and compaction, both long- and short-term.

Effects of Off-Road Vehicle Use on Soils

The national forests currently have a total of 879 miles of off-highway vehicle (OHV) routes consisting of roads and trails designated for use by non-highway licensed vehicles, and 3,088 acres of National Forest System land designated as open to off-road vehicle travel on the Cleveland and Angeles National Forests. There are approximately 2,500 miles of maintenance level (ML) 2 roads that are open for use by licensed highway vehicles, including opportunities for 4-wheel drive (4WD) use. These routes represent a long-term loss in soil productivity.

OHV use affects soils properties in several ways. OHVs increase soil compaction, which in turn affects infiltration and water erosion, soil moisture, wind erosion and soil chemistry. Many soils (including many sands) are susceptible to intense compaction if driven on a sufficient number of times. Areas that are heavily used by OHVs such as pit and trails areas generally are highly compacted. Compaction produced in most soils depends on vehicle characteristics, amount of activity and soil moisture at the time of impact. Intense OHV use in steep areas (generally on slopes over 20 percent) yields large increases in water erosion as well as mechanical displacement of soil. Where highly compacted trails run for long distances down gentle slopes, significant erosion can occur on relatively level terrain even with slopes as gentle as three percent. Potential erodibility varies considerably within and among soils as a result of variations in texture, organic matter content and aggregate structure. In general, erodibility increases with increasing sand content and decreases with clay content. In addition, biological crusts and non-vascular plants that grow on or just below the soil surface (which serve an important role as cover and stabilization of soil surfaces) are largely determined by soil physical and chemical characteristics and seasonal precipitation patterns. In rangelands, biological soil crusts function as living mulch by retaining soil moisture and discouraging annual weed growth.

The proliferation of unclassified roads and trails by off-road vehicle travel is an ongoing problem and results in unacceptable effects to soils and other resources. Of particular concern is the potential for an increase in the unclassified road and trail network associated with the dead tree removal on the San Bernardino National Forest and to a lesser extent on the Angeles and Cleveland National Forests. Skid trails and temporary roads offer easy access into the national forests where this activity is located adjacent to mountain communities. Under Alternatives 3, 4a and 6, OHV opportunities are reduced. Alternative 5 would potentially have the most impacts on resources with a projected increase in unclassified roads and trails (see Effects on Motorized Trails section for management focus by alternative).

Effects of Minerals and Energy Management on Soil

The national forests have a long history of prospecting for and development of precious minerals (gold and silver); energy resources (oil and gas); high quality metallurgical, chemical and cement grade carbonate rocks; and mineral materials (crushed sand and gravel).

Mining (both on the surface and underground) eliminates soil productivity for the area where the soil is removed and the area where the tailings are placed. Normal practices require stockpiling the topsoil. The stockpiled soil is then placed back on an area once the mining has been completed and the area has been rehabilitated, this in turn helps accelerate revegetation and restore the soil productivity.

Oil and gas exploration can result in detrimental compaction, displacement, erosion and potential contamination of soils from the drilling process. Future exploration will occur only in leaseable areas on the Los Padres National Forest identified in a Record of Decision for an Oil and Gas EIS to be incorporated by reference into this document. Exploration will be limited geographically and be subject to the stipulations of the EIS. Further environmental review will also be required at the project level preceding exploration, development and operation of oil and gas related facilities.

The degree of soil resource disturbance from mining is expected to be directly related to the number of acres within mining operations. Alternatives 3 and 6 have the greatest land area that would be withdrawn from mineral entry due to special designation decisions (see the Minerals section of this document for details regarding the expected level of mining activity and how land use zoning could affect lands available for mineral entry).

Effects of Management of Geologic Resources and Hazards on Soil

Soils and geologic information are complimentary to each other. Management of geologic resources (which includes gathering and interpreting maps of geologic bedrock features and geomorphic information) greatly assists the consecutive mapping and correlation of soil units. It also assists in determining the physical characteristics and engineering properties of different soil types that then guides project development. Management of geologic hazards (such as areas highly susceptible to landsliding, debris flows or rockfall)compliments soils studies that predict erosion rates, flood potential and soil productivity.

Effects of Livestock Grazing on Soil

Unstable stream conditions occur naturally but can be amplified by livestock grazing. Because of the availability of water, forage and thermal cover, and certain periods of the year (especially the summer and fall months), livestock may congregate in riparian areas during the hottest parts of the day (Belsky and others 1999, Kauffman and Krueger 1984) The degree and amount of disturbance by livestock can lead to a reduction of soil structure, soil compaction and damage or loss of vegetative cover. Plant species with deep soil-holding root structures can be replaced with less desirable shallow-rooted plants in certain areas, leading to less stable stream banks that are more inclined to erosion. Also, recruitment of young willows, cottonwoods and other desirable riparian plant species may be reduced from direct livestock grazing. This can alter streamside vegetation and diminish vegetative and soil productivity. The standards and guides in Part 3 of the forest plan are in place to meet or move towards desired conditions and minimize the effects of livestock grazing in riparian areas.

There are a few sites where soil crusts exist on the national forests in southern California. These locations have had grazing activities present for the last 100 years. The impact to soil crust from grazing can be adverse, but if managed properly based on soil type, timing, etc. a healthy soil crust can be maintained. Crusts on all soil types are the least susceptible to disturbance when soils are frozen or snow covered. In general, it is recommended that light to moderate stocking occur in the early to mid wet weather season. Researchers suggest that winter grazing more closely replicates that of native herbivores (Belnap and others 2001). These areas (as with any other project area) would use soil resource protection measures as listed in Part 3 of the forest plan under design criteria.

Over the past century, fire intervals on rangeland dominated by exotic annual grasses, cheat grass and medusa head have become more frequent, resulting in bare soil and greater susceptibility to erosive events (Monsen 1994).

All these processes contribute to an increase in surface runoff. The degree of soil erosion associated with livestock grazing is related to slope, aspect, soil type, vegetative cover and accessibility to livestock.

Well-designed and implemented grazing programs can move rangelands that are functioning at-risk toward a condition where native plant communities occur in natural mosaic patterns and have relatively uninterrupted disturbance regimes. This can provide favorable conditions for soil hydrologic functions and watershed processes, as well as for associated aquatic organisms. These changes can result in improved soil, water, riparian and aquatic conditions.

The degree of soil resource disturbance from grazing is expected to be directly related to the number of acres within grazing allotments. Implementation of suitability criteria in Alternative 6 would lead to removal of a majority amount of grazing (see the Effects on Livestock Grazing section for estimated changes in levels of grazing in Alternatives 1 to 6).

Effects of Non-Recreation Special Uses on Soil

Sediment placement sites are available for consideration by county public works and state roads departments to place excess earth material within the national forests. The materials are removed from roads because of flood debris, annual maintenance and landslides. Sediment placement sites can help reclaim soil productivity by providing soil for restoration projects. The identification of specific sites is a project-level decision requiring detailed site surveys to establish the volume of material to be deposited at the site, mitigation measures that will apply and landscape objectives in the form of a grading plan when the site is filled to capacity. Such sites should have project decisions done in advance, in anticipation of emergency events (such as landslides on major roads) that will need immediate removal of materials to a designated site.

Soil disturbance from development related to special use authorizations is likely to increase in all alternatives as demand for urban infrastructure support to communities increases. Land use zoning would limit the land area where this development could occur. (See table 333: Comparison of Alternative Acres by Land Use Zone, page 26, which identifies the number of acres in land use zones that would prohibit issuance of non-recreation special use authorizations.) Alternative 6 provides the greatest increase in area protected from development followed by Alternative 3. Alternatives 2 and 4 have moderate increases in areas protected from development. Alternative 5 would have the only increase in developable acres.

Effects of Wildland Fire Management on Soil

In Alternatives 1 through 6 current fire suppression practices are continued, except there is a greater emphasis in community protection. (See detailed alternative descriptions in Chapter 2 for differences between alternatives.) Wildland fire effects on soils are not anticipated to vary by alternative.

For all alternatives, wildfires can burn with a mosaic of burn intensities ranging from low to moderate to high. High-intensity burns leave soils exposed for erosion, which reduces soil productivity, and can create hydrophobic soils. Hydrophobic (water-repellent) soils have a higher probability of forming under wildfire conditions and are created as the fire breaks down organic matter and chemicals in the soils, releasing a gas that coats soil particles and reduces water penetration. Sandy soils are particularly susceptible. This condition reduces water infiltration rates and moisture storage capacity, resulting in increased run-off and erosion rates, with rills and gullies forming during the rainy season. This could lead to increased sediment and debris flow to stream channels.

Using prescribed burns generally results in smaller, less intense fires that often burn in a mosaic patterns, which leaves intermittent soil cover that reduce the overall soil erosion potential, as compared to wildfires. These less intense burns tend to leave more ground cover and do not expose soils to increased erosion, as would a wildfire.

The incidence of fire temporarily reduces the beneficial effects that plants provide in reducing soil erosion. Plants provide cover that intercepts and reduces rainfall impact, which is the primary mechanism for soil erosion. Vegetation also increases the infiltration of water into the soil, reduces run-off velocities, filters out sediment and provides plant roots to hold the soil together. Without vegetation and its benefits, there is an increase in sediment production and run-off in fire-affected areas and in their delivery down slope.

During fires, particles can be mobilized by the collapse of sediment wedges that have accumulated behind vegetation, especially on very steep slopes. On a daily basis, small landslides may mobilize particles. Where fire burns the vegetative cover, the mechanical resistance to gravitational forces decreases and the soils become more susceptible to this type of erosion. Accordingly, dry ravel is a major erosional force in post-fire conditions. Soil and debris accumulates at the base of slopes and remains stored until mobilized by intense runoff, a process known as channel loading.

The development of rill networks and gully erosion increases post-fire soil loss during the rainy season when soils are wet or saturated. Infiltration rates are decreased on bare slopes; therefore, run-off or overland flow increases and sediment carrying capacity increases. This type of erosion results in the movement of sediment and debris into stream channels, causing clogged drainage ways, mudflows and debris flows. The higher rate of sediment runoff and debris loads increases the potential for flooding as a result of fire. Soil slippage can also occur during heavy rains when the amount of water entering the soil layer exceeds the capacity of the parent rock to transport water. This leads to supersaturated soils; soon the stress on the soil exceeds its strength, resulting in sloughs and slumps. After fires, even moderately heavy rainfall can supersaturate soils denuded of vegetation. Post-fire conditions can also result in reduced-stability landslides and other geologic hazards.

Wind can also be an erosive force. After a fire, vegetative cover no longer protects the soil from effects caused by turbulent air. Under these conditions, slopes can be blown clean of loose soil particles. Windblown soils are usually deposited down slope and in stream channels for later movement during storms.

Cumulative Effects

Cumulative effects represent the loss in soil productivity that would occur at the completion of the 15-year planning period, after full implementation of soil-disturbing activities. Cumulative effects include the amount of long- and short-term soil disturbance from potential road construction to support fuelwood and tree mortality harvest, recreation facilities, off-highway vehicles and trails.

Projected population growth throughout all of southern California is expected to bring major increases in pressure upon national forests' natural resources, including development and use of resources to support community growth (such as water, energy and transportation). The potential pressure on the national forests to provide access and recreation opportunities for these new communities could greatly affect resources on the national forests, especially soils. Counterbalancing the urbanization trend surrounding the national forests is the increased value of National Forest System land as undisturbed open space within the urban landscape and as species habitat. Management guidance associated with protecting and even restoring habitat for threatened, endangered, proposed, candidate and sensitive species could negate or severely limit further development of transportation and utility corridors to support urban populations. This is true in all alternatives. Increased urbanization does have a high potential to result in an increase in unauthorized use experienced by the national forests, which could have the potential to damage national forest soils. The amount of activity and the location determine the general and cumulative effects.

Effects on Air Quality

Direct and Indirect Effects

The Clean Air Act establishes three classes of air with varying levels of protection: classes I, II and III. Class I provides for the highest level of protection and includes Forest Service wildernesses larger than 5,000 acres that were in existence August of 1977. Within these Class I wilderness areas, the Forest Service has specific responsibilities for protection of air quality. This responsibility is carried out in part through the prevention of significant deterioration (PSD) permit process. The Forest Service evaluates PSD permits for their potential adverse effects on sensitive receptors in Class I wildernesses within a minimum distance of 100 km of the wilderness boundary.

The Clean Air Act requires federal land managers to identify air quality related values (AQRVs) to help evaluate potential impacts of air pollutants on the Class I areas within their jurisdictions. One of the required AQRVs is visibility. The national forests presently operate four interagency-monitoring-of-protected-visual-environments (IMPROVE) stations representative of these seven mandatory Class I areas.

Pollution from wildland fire and prescribed burning is probably the single largest air pollution source from National Forest System land in southern California. As prescribed burning becomes a more commonly used tool on national forests, smoke and particulate matter issues may require more attention. Burning projects have inherent risks of smoke and heat injury, to both workers and the public. Effects on workers range from eye irritation, coughing, and shortness of breath, to severe burns that can leave permanent scars and cause mortality. Also, there are risks that chronic exposure of smoke to workers could lead to long-term adverse health effects, such as emphysema or lung cancer. There are cancer risks from wood smoke, from the polyaromatic hydrocarbons (PAHs), which include at least five chemicals that are considered carcinogens (USDA Forest Service in press).

Smoke from prescribed fires is managed under federal, state, local laws and an agreement between the State of California and the Forest Service. Prescribed burning is planned on days when air quality degradation can be minimized. Smoke dispersion is a key consideration in any decision to implement and use prescribed fire. Submission of smoke management plans and daily Air Pollution Control District (APCD) authorizations are required for every prescribed fire in southern California.

Implementing these requirements does not completely eliminate the risks associated with wildland fire and smoke management, but it can significantly reduce their impacts. Unforeseen changes in weather or equipment failures are often the root cause of unanticipated smoke intrusions.

Where wildland fire pollutants (like ozone) cause an exceedance of the federal or state Ambient Air Quality Standards, two outcomes are likely: if the fire is a wildland fire, the exceedances can be classified as "exceptional events" and have no impact on the reporting APCDs state or federal attainment status; however, if the cause is a prescribed fire, it may require a change in the state and federal attainment status and/or severity rating for the reporting APCD. A change like this in attainment status usually entails additional restrictions, additional rules and additional enforcement actions by the affected APCD. These actions usually take place over a period of several years before the APCDs regain their original attainment status. It should be noted that the APCD reporting the exceedance may not be the APCD permitting the exceedance causing event.

Fugitive road dust is evaluated on projects where it is determined to be an air quality issue. Mitigation measures could include changing the type of road surface, time use restrictions, road closures and the use of dust abatement products or road watering.

None of the alternatives considered are expected to substantially change the existing long-term, large scale, forest-wide ambient air quality. However, ongoing national forest management activities do have the potential to adversely impact short-term, local air quality and regional visibility and ozone concentrations. Wildland fires have an affect on regional air quality, particularly regional haze. National Forest management has a direct influence on many sources of air pollution generated on the national forests, including the amount, specific location and timing of wildland prescribed fires, recreation vehicle traffic, special-uses, size and type of recreation sites, and use and speed on unpaved national forest roadways.

Table 233. General Comparison of Alternative Air Quality Emissions

	Engine Emissions	Fugitive Dust	Prescribed Fire	Wildfire
Alternative 1	0	0	+	0
Alternative 2	+	0	+	-
Alternative 3	-	-	+	-
Alternative 4	+	+	+	+
Alternative 4a	+	0	+	+
Alternative 5	+	+	+	+
Alternative 6	-	-	+	-

"+" = some increase in emissions from present conditions are expected"0" = little change in emissions from present conditions are expected"-" = some decrease in emissions from present are expected

An overall comparison of alternatives is displayed in table 233: General Comparison of Alternative Air Quality Emissions. The assumptions used to compare the difference in air quality emissions between alternatives are:

- Emissions from internal combustion engines in vehicles used on the national forests include emissions derived from commuter vehicles passing through the national forests on federal, state, county, and city roads. In all alternatives, a small overall change in national forest visitor vehicle use is expected with increasing regional population growth and improved recreation facilities. The national forest road network and traffic are expected to increase more in Alternative 5 then the other alternatives and be more restricted in Alternatives 3 and 6. Pollution from internal combustion engines used in commercial activities like mining, ski areas operations, construction, communication sites and off-road recreation are included in this evaluation category. Emissions from these sources are expected to change little in all alternatives, except 4, 4a and 5 where an increase in expected.
- Most of the fugitive dust is generated by driving on unpaved roads; the number of miles driven on unpaved National Forest System roads is directly related to the miles of unpaved road open to public use traffic. The amount of traffic occurring on unpaved roads is likely to decrease in

Alternatives 1, 3 and 6 and increase in Alternatives 4, 4a and 5. Alternative 5 is also expected to have the largest amount of land exposed to wind erosion and experience the highest level of earth moving of any of the alternatives.

- Prescribed wildland fire use is expected to increase in all alternatives from the present. Of the remaining alternatives, Alternative 6 is expected to have the lowest level of prescribed fire use.
- The smoke emissions from National Forest System lands are dominated by wildland fires. And the number of wildland fires is assumed to be directly related to the amount of access people have to National Forest System lands. The number of national forest users and their access to National Forest System lands is expected to increase in Alternatives 4a, 4, and 5, with relatively less access expected in Alternatives 1, 3 and 6.

All alternatives address air quality in a positive manner. Depending on the alternative implemented, the rate of progress toward the air resource desired condition would vary. Implementation of Alternative 5 is expected to move toward the air resource desired condition at a slower rate than the other alternatives. Alternative 4 would be expected to display an intermediate rate of progress less than Alternatives 3, 4a or 6, but greater than Alternative 5. Alternatives 3 and 6 would be expected to move toward the desired air resource condition at a faster rate than the other alternatives. Alternatives 1 and 2 would continue to make progress toward the desired air resources condition, but at a slower rate than Alternatives 3 and 6.

Effects of Vehicle Use (Emissions) on Air Quality

The amount of pollution generated by vehicles can be considered directly proportional to the number of miles driven. The average mileage driven within all of the air basins surrounding the national forests is approximately 472,699,000 miles per day. Comparing this figure to Alternative 4 (the alternative with the largest estimated national forest user daily mileage), the miles driven by the national forest users are inconsequential, amounting to about 1% of the total miles driven within the surrounding air basins (see table 234: Estimated Daily Forest Visitor Mileage Driven Within The National Forests). At no time is it anticipated that vehicle emissions from on-forest uses will have more than a local effect. Localized concentrations of hazardous air pollutants, CO and ozone precursors under some circumstances could buildup in areas of high-use, such as highway corridors and large parking areas.

Table 234. Estimated Daily Forest Visitor Mileage Driven Within The National Forests

	LPF	ANF	BDF	CNF	Total
Alternative 1	77,000	178,000	108,000	40,000	403,000
Alternative 2	81,000	186,000	113,000	42,000	442,000
Alternative 3	85,000	195,000	119,000	44,000	443,000
Alternative 4	92,000	213,000	129,000	48,000	482,000
Alternative 4a	88,000	204,000	124,000	46,000	463,000
Alternative 5	85,000	195,000	119,000	44,000	443,000
Alternative 6	62,000	142,000	86,000	32,000	322,000

Estimates of the total miles driven by national forest visitors were made using three assumptions:

- All visits will require driving;
- Round-trip mileage per visit is estimated to be 50 miles of driving within the national forests; and
- Each visit will have 2.7 national forest visitors per vehicle.

A general increase in vehicle miles driven on the four southern California national forests is expected in all alternatives. The reduction in total road miles accessible to the public in Alternatives 1, 3 and 6 (and to some extent Alternative 4a) are expected to result in fewer miles driven under these alternatives than in Alternatives 2, 4 and 5.

Effects of National Forest Activities Which Generate Dust on Air Quality

Unpaved road surfaces are sources of fugitive dust, which may have both local and regional impacts on human health and welfare. Dust has far-reaching effects that can include: reducing photosynthesis; affecting respiration and contaminating herbivore food sources; and impacting local and regional visibility. Fugitive dust can be generated from traffic and wind erosion on unpaved roads. It is expected to be much the same for Alternatives 2, 4 and 4a, an increase would be expected in Alternative 5, and some decrease is anticipated with the reduced traffic on unpaved roads expected in Alternatives 1, 3 and 6.

Effects of Vegetation, Fire and Aviation Management on Air Quality

Smoke (particularly from wildland fires) has the potential to temporarily affect both local and regional air quality. Depending on its concentrations, fine particulate matter found in smoke can directly affect highway and aircraft safety and visitor enjoyment, and can cause respiratory distress and disease in some individuals. Ozone is commonly found near the top of smoke columns where the column is exposed to sunlight. When this upper-level smoke comes in contact with the ground, enhanced levels of ground level ozone can occur. Smoke in the presence of nitrogen oxides and high temperatures can also increase local ground level ozone concentrations (Chameides and Cowling 1995). Given the relatively high atmospheric levels of nitrogen oxides found throughout these national forests, smoke from wildland fires (including prescribed burning) can in some cases be expected to increase local ground level ozone concentrations.

Unlike most industrial and urban sources, wildland fire smoke is usually transitory in nature, lasting only a few days at a single location. However, in overall pollution loading, it can represent a substantial part of the background pollution occurring in some air districts. In counties such as Los Angeles, Orange, Riverside and San Bernardino (essentially the South Coast Air Quality Management District), it is historically equivalent to a rather small fraction of the total particulate emissions estimated for the area, less than 3%; whereas in more rural counties like Monterey and San Luis Obispo, wildland fire emissions can exceed 17% of the total estimated annual county-wide emissions (see table 232: Air Background emissions, page 221).

Over the past 20 years, 1,313,700 acres of wildlands have burned in wildland fires on the four southern California national forests (see table 236: Annual Wildfire Acres Burned).

Table 236. Annual Wildfire Acres Burned

Forest	Wildfire acres
Los Padres	37,169
Angeles	10,056
San Bernardino	6,491
Cleveland	11,971

Historically, prescribed fire acreage on the four southern California national forests has averaged about 2,900 acres per year. Estimates of annual wildland fire emissions (averaged over the past 20 years) and the annual proposed fully implemented prescribed fire emissions are presented in table 102: Estimated Annual Wildland Fire Emissions—tons/year.

In all alternatives, prescribed fire emissions are much less than estimates of recent historic wildland fire emissions, see table 102: Estimated Annual Wildland Fire Emissions—tons/year. Approximately 200,000 acres of potential wildland fire use (WFU) areas have been identified in the northern APCDs of the Los Padres National Forest. Emissions from these scattered areas would be similar to those derived for prescribed fire and are not expected to substantially increase the total wildland fire emissions in any of the air districts affected. In fact WFU and prescribed fire use are designed to reduce wildland fire emissions in the long run, as well as reduce the risk of wildland fire damage to humans and infrastructure. One of the roles that prescribed fire is designed to play in wildland management is to decrease the intensity and number of large wildland fires. In this light, the pollution generated by prescribed fires can be viewed as a way of leveraging a reduction in future wildland fire emissions. Additionally, newer technologies are available making it possible to mechanically reduce chaparral biomass without the use of prescribed fire over much larger areas then previously possible.

Table 102. Estimated Annual Wildland Fire Emissions—ton/yr

Prescribed Fire

Air Districts										
Emission Type	San Diego	South Coast	Mojave Dessert	Antelope Valley	San Joaquin Valley Unified	Ventura	Santa Barbara	San Luis Obispo	Monterey Bay Unified	Total
Alternatives (1-5)[1]										
ROG	305	2,084	169	47	11	239	265	48	92	3,168
NO_x	53	364	30	8	2	42	46	8	16	499
PM_{10}	268	1,838	149	42	10	211	233	42	81	2,518
Alternative (6)[1]										
ROG	177	1,126	90	32	8	169	187	34	65	1,589
NO_x	31	197	16	6	1	29	33	6	11	314
PM_{10}	156	993	79	28	7	149	165	30	57	1,578

Wildfire

Air Districts[2]										
Emission Type	San Diego	South Coast	Mojave Dessert	Antelope Valley	San Joaquin Valley Unified	Ventura	Santa Barbara	San Luis Obispo	Monterey Bay Unified	Total
ROG	1,843	3,469	540	331	39	2,085	1,127	2,943	1,805	14,182
NO_x	308	579	90	55	7	348	188	491	302	2,216
PM	1,303	2,453	382	234	28	1,475	797	2,081	1,277	10,002

[1]Emission estimates from Air Quality Conformity Handbook: A Handbook for Land Managers, 1995
[2]Emission estimates from AP-42 Miscellaneous
Sources `http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s01.pdf` accessed on 8/3/2003
ROG: Reactive Organic Gases
NO_x: Nitrogen Oxide
PM_{10}: Particulate Matter less than 10 Microns
CO: Carbon Dioxide

Smoke and dust are major contributors to reductions in visibility within the national forests. A reduction in visibility from these sources can range from a barely perceivable change in color and contrast of a distant view to a traffic hazard reduction of visual range of a few feet.

Effects of Recreation, Special-Uses and Minerals Management on Air Quality

A majority of the emissions of concern from these sources are generated by internal combustion engines and earthmoving. Flaring from operations like oil and gas development is another source.

Emissions from large stationary sources, large generators, compressors and emergency power facilities are permitted by the APCDs to assure regulatory compliance and that up to date pollution control technologies are in use. In conjunction with the APCDs, special-use authorizations can be a condition to meet specific emission standards.

Emissions from general recreation are normally seasonal in nature, widely dispersed throughout the national forests and short in duration. Access to and use of some concentrated recreation facilities and events can be controlled by special-use authorizations and parking area size.

Cumulative Effects

Cumulative effects on air quality include the combined effects of: (1) the air pollution from surrounding urban communities; (2) fugitive dust and vehicle emission from people traveling along federal, state, county and National Forest System roads; (3) wildland burning from wildland fires and prescribed fires on national forests and adjacent federal, state and private lands; (4) large special-uses activities and other sources like major mineral extractions; and (5) the continued improvement in ambient air quality throughout the state. The need for large off-forest power and processing support facilities is considered a minor cumulative effect in all alternatives except Alternative 5. The number of PSD permits requiring evaluation by federal land managers is expected to grow with increasing population and improving air quality.

Any air pollution originating from national forest wildland fire management activities would be temporary in nature and managed under APCD permit and be within the appropriate state air quality implementation plan (SIP) and APCDs air quality management plans (AQMPs). Air pollution from all national forest management activities is managed through state and local permitting and APCD rule making. Under the 1990 CAAA, federal agencies in federal nonattainment areas must evaluate their implementation plans to determine compliance with the AQMP and SIP; they must determine that their project emissions will not have an adverse impact on the APCDs attainment status and schedule. All impacts are addressed and mitigated during these evaluations and permit reviews before projects can proceed. If a project is consistent with the AQMP and SIP, no significant cumulative air quality effects are expected.

Effects on Geologic Resources and Hazards

Direct and Indirect Effects

The intent of the Geology Program is to improve the understanding of interrelationships between geologic resources and hazards and the many aspects of ecosystems, and then to develop management plans and projects that conserve, restore and interpret the resources, and conduct assessments and develop mitigations that reduce the risk to resources and the public from geologic hazards.

Fossil resources, cave resources and geologic special interest areas are protected by inventorying the resources, creating management plans for those resources and managing each by appropriate measures, which could include restricting access, restoration, public education and various forms of interpretation. When preserved and interpreted, unique fossil resources can be studied, explained for the public and collected and curated in approved museums or educational institutions for the benefit of science and future generations. It is difficult to evaluate the consequences of collection of such fossils because fossil collectors and caving groups do not often share information with the national forests about their knowledge and use of those resources. Unique caves can receive appropriate protection, if needed, to maintain their special features and interpret when and how they formed, why they exist where they do and other geomorphic or cultural or heritage aspects.

To maintain the various ecosystem functions and processes of stable landforms and slopes, surface disturbances that destabilize the landscape are minimized.

Alternatives which emphasize watershed restoration, lower surface disturbance, increase special area designation, and emphasize environmental education would increase protection and interpretation of geologic resources, and decrease risks to humans, facilities, and other resources from geologic hazards. Those alternatives which alter landscapes (due to ground disturbance, change in water flow characteristics, or change in vegetation cover) increase visitor use and de-emphasize environmental education, would be more likely to damage geologic resources and exacerbate geologic hazards.

Alternative 1. With its continuance of existing management practices, this alternative would not substantially change current levels of geologic resource protection nor interpretation. Geologic hazards would continue to be identified and analyzed on some projects, and highest priority risks would be mitigated.

Alternative 2. With its added emphasis on biological resources, day-use recreation and the mitigation of effects to other resources (especially threatened, endangered, proposed, candidate and sensitive species habitat protection), Alternative 2 would be likely to have a slight positive effect on protection and interpretation of geologic resources and no net change in the risk from geologic hazards. Increases in recreation use would be balanced with increases in public education and (geologic) resource interpretation. The increased emphasis on fire and vegetation management is not expected to have a net effect on geologic resources nor hazards.

Alternatives 3 and 6. Geologic resource protection is expected to increase while risks from geologic hazards are expected to decrease under these alternatives due to emphasis on less developed recreation, more special areas, and more watershed restoration and improvement. However, the decrease in the transportation system (especially in Alternative 6) would have a direct effect of decreasing human caused landslide risks, primarily along roads. Naturally caused landsliding and floods would increase due to more difficult access for fire control and flood hazard mitigation associated with wildland fire. If larger wildland fires result from poorer access, there is more likelihood of more landslides in steep areas, and higher potential for flooding. The net effect would depend on which roads are closed and obliterated, and how large and destructive the fires and floods are. The need to assess these impacts would require more evaluation of slope stability and geologic conditions in order to prioritize which roads need closure and which watersheds need restoration. Geologic resource interpretation would only increase where it coincidentally supports biological resources. Since protection is emphasized, the number of paleontologic sites evaluated and permits for collection and curation is expected to increase as management of paleontologic resources increases in public awareness and importance.

Alternative 4. This alternative has a higher risk to geologic resources protection and higher risk from geologic resources because more people would be in places where resources could be damaged and hazards exist. The theme of a strong emphasis on recreation and improving or adding developed recreation facilities would result in increased emphasis on, and opportunities for, interpretation of geologic resources. The increase in the transportation system would put more people at risk from geologic hazards. Geologic hazards assessments would increase in order to address risks to the public, and geologic resources assessments would increase gradually in order to meet needs for geologic interpretive services.

Alternative 4a (selected). The shifting of land use zones to less Back Country and emphasis on fewer new recreation facilities will likely be beneficial to both geologic resources and geologic hazards. Improvements to both motorized and non-motorized trails will offer more opportunities for interpretation of geologic resources, although some additional protection may be required in sensitive areas. Less traffic in Back Country Motorized Use Restricted will likely reduce public contact with some higher hazard areas. However, if roads and trails receive lower levels of maintenance, risks could increase in those areas from debris on roads, erosion problems, and inattention to unstable slopes.

Alternative 5. This alternative has the highest risk to geologic resource protection. The decrease in restrictions on motorized use, increase in the transportation system, and increase in emphasis on commodity developments and uses (with associated utility corridors and transmission systems) would bring more people and land disturbance to National Forest System lands. Interpretation of geologic resources is not emphasized. Risks from geologic hazards are highest in this alternative. The number of landslide or other geologic hazard assessments would be highest under this alternative to address the increased risks to the public and to keep areas open for public use. The numbers of geologic resource evaluations would be least due to decreased emphasis on resource protection.

Effects of Watershed Management on Geologic Resources and Hazards

Watershed condition management is generally about improving watershed and ecosystem health, including conservation of geologic resources (aquifer and recharge area conditions, fossil resources management, cave resources protection and management of minerals development) and lowering risks from geologic hazards (all kinds of landslides, rockfalls, subsidence and damage from seismic activity, reclamation of abandoned mines and landfills, management of natural hazardous materials, etc.). It also includes interpretation of areas of unique geologic value for the public and for ecosystem managers.

Water management is generally about maintaining and improving water quality and quantity, including protection and restoration of aquifer and recharge areas; water developments (wells, springs, dams); hillslope stability; and excavations (tunnels, mines, landfills, etc.). Activities tend to focus in watersheds of concern or highest priority where development is proposed, watershed conditions are degrading or water quality or quantity are being adversely affected.

Therefore, as these activities improve watersheds or water conditions, they generally improve conditions for protection and interpretation of geologic resources and lower risks from geologic hazards. Alternatives 2, 3, 4, 4a, and 6 emphasize watershed condition improvement and increased water management.

Effects of Special Designation Areas on Geologic Resources and Hazards

The effects of these designations will generally be helpful for protecting unique or sensitive geologic resources and for limiting activities that might increase risks from geologic hazards. Education and interpretation opportunities will be enhanced. Conversely, wilderness restrictions could cause some resources to be lost. A current example is the vertebrate fossils that become exposed to weathering elements and natural erosional processes in the Cuyama badlands (Chumash Wilderness) of the Los Padres National Forest. Wilderness designation limits or restricts collection and curation of those fossils by approved repositories, and they quickly deteriorate and are lost to science. Some of the recommended wilderness areas, research natural areas, special interest areas and wild and scenic rivers have special geologic values in addition to their other special designation values. Alternatives that increase special area designations (2, 3, 4, 4a, and 6) would provide additional protection for geologic resources such as unique fossils and caves and have less potential to exacerbate geologic hazards. Alternative 5 (which maintains or increases public uses and commodity development and does not emphasize resource protection) would be more likely to increase potential abuse of these resources.

Effects of Land Ownership Adjustment on Geologic Resources and Hazards

If existing geologic resources and hazards are not assessed prior to land exchanges or purchases, important geologic values could be unknowingly transferred out of federal protection; hazardous conditions or features could be acquired; or a valuable mineral estate and its associated management obligations could be transferred. The consequences of land acquisition are greater control over protection of valuable geologic resources and management of geologic hazards. Land acquisition continues under all alternatives, but with varying objectives from consolidation of National Forest System land to emphasis on acquiring land for habitat linkages (see Land and Real Estate section).

Effects of Recreation and Non-Recreation Special-Uses on Geologic Resources and Hazards

The general effects of recreation on geologic resources have aspects of enjoyment, preservation and destruction. Rock, mineral and fossil collection provides great enjoyment and satisfaction by all ages of the public. Study, research, and/or collection of geologic resources results in varying degrees of "taking" of some geologic features, but also preservation of those resources (in personal and scientific collections). Collecting makes the non-renewable resource scarce for future collectors or scientists.

The effects on geologic hazards are generally negligible, except where overuse changes water runoff patterns, which could have an effect on slope stability.

Recreation management can enhance interpretation, understanding and protection of geologic resources and hazards. However, when those features are fragile, over-use and vandalism can destroy their unique values. Examples include: off-road vehicle use in unique badlands topography or other sensitive areas, unauthorized collecting of vertebrate fossils, destruction of fragile cave ecosystems, over-use of limited groundwater resources, etc. Recreation management is strongly emphasized in Alternatives 4 and 5, which are the most likely alternatives to affect geologic resources. Recreation management is moderately emphasized in Alternative 2, and decreased in Alternatives 3 and 6. However, Alternatives 4 and 4a emphasize environmental education, which mitigates the additional impacts. All alternatives that increase interpretive services (2, 3, 4, 4a, and 6) would provide additional understanding of the values of geologic resources, including unique fossils and caves. Furthermore, they could help preserve and restore those features through increased understanding and cooperation. Alternative 5 (which promotes increased dispersed recreation use and does not emphasize interpretation or use controls) would be more likely to increase uneducated use and potential damage of these resources.

Where utility corridors cross through areas of high instability or seismic activity (such as the I-5 corridor on the Angeles National Forest), risks of instability increase from excavations, utility service roads, pipeline ruptures, fires from faulty electrical lines, and altered surface and subsurface drainage characteristics. Utility corridors are likely to increase in Alternative 5.

Effects of Facility Operations and Maintenance on Geologic Resources and Hazards

The general effects on geologic resources can be both positive and destructive. Excavations for road cuts and quarries often open exposures of geologic features that are valuable to geologists, miners and collectors. At the same time, those excavations can destroy unique geologic features that previously may or may not have been recognized. Geologic hazards can be exacerbated, increasing landslide frequency and sedimentation.

The environmental consequences of excavating rock and soil construction materials will be to remove materials in one area in order to make improvements, usually to roads or for watershed improvement projects, in another area. The excavation creates a scar on the landscape, which usually can be blended in with surroundings during reclamation. Environmental assessments are conducted to assure impacts on other resources are negligible or mitigated. Effects can range from minor to major. Management of other resources generally has no effect on the quality of these materials, but restrictions on their use may be imposed if they occur within riparian or sensitive species areas, geologically unstable areas, areas withdrawn from mineral entry or containing other important geologic resources, or areas where other important resources would be affected by their excavation. Road building in areas containing unique geologic features can damage or destroy geologic non-renewable resources.

Improper placement or obliteration of roads and trails, as well as improper design, construction and maintenance of drainage can cause landslides, increase erosion, damage landscapes and destroy non-renewable geologic resources. Increased roads and motorized or non-motorized trails access (legal or illegal) can result in new discoveries of geologic resources and possible vandalism or illegal collecting (for example, vertebrate fossils). Unrestricted off-road vehicle use can have major effects on areas that contain sensitive geologic resources, some of which have not yet been discovered or inventoried. These effects are more likely in Alternatives 2, 4 and 5 where motorized and non-motorized trail mileage would increase the most.

For the four southern California national forests' planning area, the transportation system would increase in Alternatives 4 and 5 through the incorporation of non-system roads, be slightly reduced in Alternatives 1 through 3, reduced in Alternative 4a, and greatly reduced in Alternative 6. Since 25-30% of existing roads are in high or extreme classes of land instability, those alternatives which reduce road mileage in unstable areas will reduce risks to people and resources the most. Alternative 6 would most quickly progress toward the desired condition of reducing risks from geologic hazards, while Alternative 5 would make the slowest progress.

Effects of Minerals and Energy Development on Geologic Resources and Hazards

The management of commodities produces tradeoffs related to geologic resources and hazards. Production of minerals, oil and gas and livestock produce commodities that are extremely valuable to the public and are used by practically everyone. Conversely, land disturbance caused by production of those commodities can have negative effects on both the resources and hazards.

The consequences of rock and mineral collecting are that certain types of rocks or minerals become harder to find by those who collect them. Jade along the Big Sur Coast, semi-precious gemstones in the San Gabriel Mountains, and highly valued gemstones around the Pala mining district on the Cleveland National Forest are examples. Management activities can affect collecting activities by occasionally opening up new exposures of specimens, or by making access for collection easier when roads are constructed or improved. The result can be more collectors searching for specimens and using the national forests. Impacts are usually very minor; however, if people take large amounts of material from a given area (for example, river rock or boulders from a streambed) impacts on other resources could become excessive. Unless otherwise designated, collecting areas are essentially the same as areas open to mineral entry. Special management designations such as wilderness, research natural areas, and certain others on a case-by-case basis usually preclude collecting rocks and minerals from those areas.

Geologic hazards can result in increased risks to humans, facilities and other resources when management activities destabilize slopes, alter water flow, construct facilities in hazardous areas, create increased human contact with toxic minerals or are unable to control wildland fire in areas that adversely affect slope stability. Road construction and reconstruction, mining and tunneling are the primary activities that destabilize slopes and alter water flow. Facilities that either are located in hazardous areas where landslides, debris slides, rock falls, flooding and other geologic hazards are present or which excavate pads or foundations or trenches in unstable terrain increase risks from those hazards.

Machinery, vehicles, animals or wind that create dust in rock formations or soil types that contain heavy metals or cancer-causing minerals can be hazardous to humans and animals. When those metals or minerals get into domestic water sources, they can cause health problems. Fortunately, such hazards are relatively rare, but examples on the Los Padres National Forest include an abandoned mercury mine that dumped mercury into a public water supply, and an area of serpentine bedrock containing small amounts of asbestos and crossed by unsurfaced roads.

Fossils and other geologic resources can be damaged or destroyed by mining activities. If mining operations intersect caves, occur in significant fossil areas, or conduct blasting or road building nearby, the consequences could be to damage or destroy cave or fossil resources. Some forms of mining excavate and utilize mineral material resources, which are needed for various construction and watershed restoration uses, making those resources available for use, while at the same time depleting a non-renewable resource. Mining and oil and gas operations can adversely affect groundwater quantity and quality, and impact aquifers. Risks from geologic hazards could be increased, especially due to over-steepening of slopes, construction of adits and shafts, and exposure of toxic minerals. All effects will be assessed in plans of operation and avoided or mitigated to the extent practical. The number of active mines is not expected to change between alternatives. More restrictions on mining activities in Alternatives 3 and 6, and less restrictions in Alternative 5 may have large effects on the types of activities allowed and procedures used, but minor effects on the number of acres disturbed by mining and oil and gas operations.

Effects of Livestock Grazing on Geologic Resources and Hazards

Grazing activities could alter slope configuration due to compaction and erosion from animal trails, damaged stream banks, altered groundcover and effects on groundwater levels, and altered drainage. The consequences can be increased risk of slope instability and degraded channel systems. Alternatives 1 and 5 would pose the highest risks to geologic resources and hazards, while Alternatives 6, 3 and 4 would be least likely to cause damage.

Effects of Wildland Fire Management on Geologic Resources and Hazards

Wildland fire occasionally burns the vegetation from steep unstable slopes, which destabilizes soils, increases groundwater levels, and increases the risks of landslides and rockfall. Suppression activities can disturb sensitive geologic features. Dozer trails can alter precipitation runoff and potentially increase saturation of soils that could then cause landslides. Post-burn rehabilitation efforts attempt to reduce risks; however, often there are few or no cost-effective solutions.

Vegetation management activities that alter or destroy root strength, change surface and groundwater flow, uncover or disturb the ground surface or alter slope configuration or equilibrium can destabilize slopes and affect aquifer recharge, especially in areas that are naturally unstable. Clearing of vegetation from large areas, such as by mortality removal, prescribed fire or wildland fire (especially in steep terrain) often causes landslides and flooding, primarily during wet periods following fire season. The landslides, erosion and flooding directly increase risks to humans, facilities and other resources. Increased vegetation and fire management are emphasized in Alternatives 2 through 5.

Cumulative Effects

The cumulative effects of more people traversing more areas of the national forests provide opportunities for increased environmental education and cooperation in caring for the land. However, at the same time, there will be increased risks of geologic resources being damaged, and risks to the public, facilities and other resources from geologic hazards.

Pumping groundwater on private lands near national forest boundaries may drain aquifers and lower groundwater table levels in aquifers that extend beneath National Forest System land. The effect will be to deprive national forest resources of water. The degree of the effect can be difficult and costly to determine; it can be determined only on a case-by-case basis but effects on resources could be significant. Since national forests have limited to no control of water well pumping outside of National Forest System lands, few differences are expected among the alternatives. However, on-forest consequences of wells for campgrounds or exporting of water can be monitored and controlled. Those alternatives (4, 5) that emphasize water use for recreation, commodity production or other uses are more likely to adversely affect aquifers (see the Water section for more details).

Economic Impact

This discussion focuses on the direct and indirect impacts of Forest Service expenditures and employment in the regional economy. Typically, this involves accounting for monetary expenditures by industrial sector within the regional economy and tracing the direct and indirect impacts on local industry and employment. The four southern California national forests are truly urban in the context of being adjacent to and within the influence of the Los Angeles/San Diego/Santa Barbara metropolitan areas. The economic activity of these areas is truly immense and diverse, dwarfing the economic activity generated by the four southern California national forests.

Table 172. Income and Employment Impacts

County	County Federal Employment[1]	Forest Employment Base Level[3]	County Total Personal Income (MM$)[1]	Forest Expenditures Base Level (MM$)[3]	Total Tax Collections (MM$)[1]	USFS Federal Payments in Lieu of Taxes 1999 (MM$)[2]
SOUTH COAST						
San Diego	42,600		83,183.4		296.4	0.14
Imperial	1,800		2,549.8		12.5	0
Los Angeles	57,900		263,814.8		1,484.0	0.514
Orange	13,000	980	93,332.5	85.9	194.8	0.029
Riverside	6,800		35,619.8		140.4	0.068
San Bernardino	11,400		34,984.1		130.2	0.234
sum	133,500		513,484.4		2,258.3	0.985
		0.7%		0.02%		0.04%
CENTRAL COAST:						
Kern	9,800		12,776.5		134.4	0.233
Monterey	5,000		10,927.1		62.1	0.022
San Luis Obispo	800		6,134.2		64.5	0.013
Santa Barbara	4,000	260	11,817.3	22.0	82.6	0.044
Santa Cruz	700		8,223.9		48.2	0
Ventura	8,200		22,083.0		96.1	0.04
sum	28,500		71,962.0		488.0	0.352
		0.4%		0.03%		0.07%

Source:
1) California Department of Finance, data for 1999;
2) Angeles, Cleveland, Los Padres, and San Bernardino business plans;
3) USDA National Finance Center
MM$: Millions of Dollars

Looking at table 172: Income and Employment Impacts, the first measure of Forest Service impact is the proportion of Forest Service employment in full-time equivalents to total federal employment in the region. The south coast counties (which contain the Angeles, San Bernardino and Cleveland National Forests) are host to a federal workforce of which the Forest Service constitutes less than 1 percent. In the central coast counties, where the Los Padres National Forest is located, Forest Service employment is less than 1/2 of 1 percent of the total federal workforce. Primarily because of the large presence of the military in southern California, the Forest Service has a small presence personnel-wise in spite of managing a large land area.

The next measure of economic impact is the ratio of total Forest Service expenditures to total county personal income. For both the south and central coast counties, Forest Service expenditures are very small in proportion to the total personal income generated by the regional economies, being less than 1/10th of 1 percent. In other words, in southern California the Forest Service exists within a much larger regional economy and is not a significant economic driving force.

Another measure of economic impact is Forest Service contribution to county tax revenues. Federal "payments in lieu of taxes" are paid to counties in recognition of revenues foregone were the lands held in private ownership. In 1908, it was enacted that 25 percent of the revenues derived from National Forest System land would be paid to states for use in counties in which the lands are situated for the benefit of schools and roads. Recent legislation (the Secure Rural Schools and Community Self-Determination Act of 2000, Public Law 106-393) stabilizes these payments in light of declining revenues from sales of timber harvested and, in certain cases, allows expenditures of 15 to 20 percent of these funds for search and rescue, community service work camps, purchase of easements to secure access to public lands, forest-related public educational opportunities, fire prevention and community forestry projects. Table 172: Income and Employment Impacts shows these payments by county attributable to Forest Service revenues for the year 1999. While these payments are used for worthy purposes, they are again small in comparison to total county tax collections and are less than 1/10th of 1 percent for both the central and south coast counties. The *Atlas of Social and Economic Conditions and Change in Southern California* analyzes payments in lieu of taxes to counties from all federal sources and in no case do they exceed 1percent of county expenditures. Thus, the Forest Service in southern California is neither a driving force to the regional economy nor a significant contributor to county revenues.

The indicators from the table of income and employment impacts show how small the impacts are from national forest budgets, employment and from payments to counties in lieu of taxes as related to the magnitude of the regional economy in which the national forests are located. However, while the presence of the national forests has little influence on the gigadollar economy of southern California, national forest budget expenditures, special uses and fees collected, and national forest visits to recreate, hunt and fish all contribute to regional employment and personal income. These contributions are calculated using the impact analysis for planning (IMPLAN) economic model.

IMPLAN was originally developed by the Forest Service in cooperation with the Federal Emergency Management Agency and the USDI Bureau of Land Management to assist in economic assessments associated with agency programs. The model is called an input-output model because it traces the financial interactions between the industrial sectors of a defined area. A dollar spent in any given industrial sector (direct effect) can then be tracked to all the other sectors as the dollar is, in turn, spent for supplies, labor, etc. (indirect effects). The income to the other sectors generates yet more economic activity as they spend their portions of the original dollar (induced effects). Direct, indirect and induced effects are calculated in terms of both personal income and employment. A national database of technical coefficients for input-output modeling is now maintained by MIG, Inc. at the University of Minnesota. The national database is available by county for the year 2000, which was used for this analysis. The data are derived from county transactional data and could be used for smaller areas only with great caution. But they are very well suited for county-level analysis and can be aggregated with other counties into larger models.

To better reflect the economic structure of the respective area of influence for each national forest, four impact models were constructed. The Angeles National Forest model includes structural data from Los Angeles, San Bernardino and Ventura counties. The Cleveland National Forest model includes structural data from San Diego, Orange and Riverside counties. The Los Padres National Forest model includes structural data from Ventura, San Luis Obispo, Santa Barbara, Ventura and Kern counties. The San

Bernardino National Forest model includes structural data from San Bernardino and Riverside counties. Three of the counties (Riverside, San Bernardino and Ventura) are present in more than one model because portions of these counties lie in more than one national forest. This only means that there is an aggregate structural similarity in the economic area of influence for neighboring national forests. There is no double counting of expenditures resulting from this convention.

Input into the impact models includes national forest expenditures in the form of projected budgets. Projected budgets were developed from base levels only slightly higher than current budgets, as developed in business plan studies which indicated slightly higher budgets were needed to meet minimum management standards. This constrained budget level was similarly used for the efficiency analysis below and has a reasonably foreseeable chance of being the operational budget for the immediate future. The impacts calculated from this level of budget expenditures are thus conservative in nature and could easily be greater if higher operating budgets materialized in the near future. The budgets are expressed by resource area and are based on actual national forest expenditure data from fiscal year 2002. The budget data were then projected by resource area to fit the theme of each alternative. Having such data grounded in the reality of actual expenditures is of great value to the impact model. Response coefficients have been derived based on expenditure profiles keyed to the resource areas. Thus, budget expenditures by resource area are applied to the structural coefficients in the most appropriate manner for calculation of the cumulative effects. Accurate budget data going into the model are thus essential to retain the integrity of the response coefficients.

The next form of input includes revenues collected for special uses on the national forests. Again, response coefficients have been derived for the various types of fee collections to account for the economic activity that generates those fees. In southern California, special-uses and fee collections are significant. There are a host of communication sites, utility corridors, recreation residences, ski areas, grazing allotments, rock quarries and miscellaneous other activities under special use authorization. They are a reflection of the value of the national forests to a great many commercial users besides the more traditional hunting, recreation and viewing opportunities that one might associate with the national forests. The total of collected fees is used to calculate the 25 percent payment to counties in lieu of taxes. The contribution of special-use collections to labor income is thus accounted for under payments to states and counties in the tables referenced below.

The final form of input is national forest usage associated with commodities such as timber, grazing and all the various recreation activities including hunting, fishing and viewing. These inputs are expressed as units of output including head-months of grazing and national forest visits to participate in camping, mechanized travel, hiking and water play, winter sports, hunting, fishing and wildlife viewing. Again, response coefficients have been derived for the model that account for the expenditure patterns of visitors to the national forests, and for commercial activity associated with the production of red meat from the grazing activity. There is no scheduled green timber harvest for the national forests of southern California, so no timber outputs are recorded. Incidental timber salvage in the aftermath of fires and fuelwood sales are accounted for under special uses.

Table 173. Regional Direct, Indirect, and Induced Employment Attributable to National Forests

Angeles NF	Total Jobs							
	Current	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Forest Service expenditures	528	647	652	646	652	649	642	652
Payments to States/Counties	15	15	15	15	15	15	15	15
Public recreation expenditures [1]	3,705	3,705	3,890	3,520	3,951	4,075	3,334	3,890
Public wildlife and Fish expenditures [1]	1,757	1,757	1,845	1,669	2,109	1,933	1,581	1,845
Commercial minerals expenditures [1]	59	59	59	59	59	59	59	59

Angeles NF	Total Jobs							
	Current	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Public grazing expenditures [1]	3	3	2	2	2	2	0	2
Total Employment Attributable to FS	6,067	6,186	6,463	5,912	6,787	6,734	5,632	6,463
Cleveland NF	**Current**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 4a**
Forest Service program expenditures	373	461	460	459	459	463	460	459
Payments to States/Counties	11	11	11	11	11	11	11	11
Public recreation expenditures [1]	1,244	1,244	1,307	1,182	1,493	1,369	1,120	1,307
Public wildlife and Fish expenditures [1]	789	789	828	750	947	868	710	828
Commercial minerals expenditures [1]	0	0	0	0	0	0	0	0
Public grazing expenditures [1]	7	6	6	5	6	6	2	6
Total Employment Attributable to FS	2,423	2,511	2,612	2,406	2,915	2,716	2,303	2,611
Los Padres NF	**Current**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 4a**
Forest Service expenditures	461	586	617	615	611	620	630	611
Payments to States/Counties	8	8	8	8	8	8	8	8
Public recreation expenditures [1]	1,395	1,395	1,466	1,326	1,674	1,535	1,256	1,466
Public wildlife and Fish expenditures [1]	729	729	765	692	875	802	656	765
Commercial minerals expenditures [1]	129	129	129	129	129	129	129	129
Public grazing expenditures [1]	62	61	53	48	52	55	8	52
Total Employment Attributable to FS	2,783	2,907	3,037	2,817	3,349	3,148	2,686	3,030
San Bernardino NF	**Current**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 4a**
Forest Service expenditures	557	720	720	720	717	724	716	717
Payments to States/Counties	9	9	9	9	9	9	9	9
Public recreation expenditures [1]	2,590	2,590	2,720	2,461	3,108	2,849	2,331	2,720
Public wildlife and Fish expenditures [1]	722	722	758	686	867	794	650	758
Commercial minerals expenditures [1]	8	8	8	8	8	8	8	8
Public grazing expenditures [1]	19	18	7	7	7	18	2	7
Total Employment Attributable to FS	3,906	4,068	4,222	3,891	4,716	4,403	3,716	4,220
Four-Forest Area Totals	**Current**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 4a**
Total Employment Contributions	15,179	15,673	16,334	15,026	17,768	17,000	14,338	16,324
Percent Change from Current	—-	3.3%	7.6%	-1.0%	17.0%	12.0%	-5.5%	7.5%

[1]Employment effects resulting from private sector expenditures related to activities on FS lands.

Following are the results of the impact analysis by national forest. Table 173: Regional Direct, Indirect, and Induced Employment Attributable to National Forests shows employment in number of jobs attributable to the presence of the Forest Service and its administrated lands. These jobs are the direct, indirect and induced effects of economic activity generated by national forest budget expenditures and by the expenditures of users of National Forest System lands. The categories for which these job effects are calculated are national forest budget expenditures, payments to counties in lieu of taxes, expenditures by recreation users, expenditures by hunters and watchers of wildlife, expenditures by permitted minerals operations and expenditures by permitted grazing allotment holders. There is no category for timber because there is no long-term scheduled timber harvest.

By far the most important economic generator of jobs is from recreation use on all four southern California national forests. Using recreation as an example, the output indicators of developed and dispersed recreation visitor days are applied to nationally derived expenditure patterns to derive expenditure impacts on various local sectors as direct effects. In other words, the spending habits of visiting recreationists for food, fuel, equipment, and other related items are profiled from national data. The input-output model then derives the direct and indirect effects given the regional economic structure. Similarly, employment effects are derived for the other categories. Expenditures related to wildlife and fish are the second most important activity in terms of jobs generated on all four southern California national forests. Minerals and grazing expenditures account for the most variation among national forests. The Los Padres National Forest, with its greatest number of grazing allotments and its oil and gas production (accounted for as a mineral) is highest in both areas. The other national forests vary as a function of their respective programs.

Overall, a total of 17,812 jobs are attributable to Forest Service-related activities under current management. The maximum potential for employment occurs with Alternative 4 with the greatest positive change from current management, which is clearly the result of the emphasis on recreation in this alternative.

Table 174. Regional Direct, Indirect, and Induced Labor Income Attributable to National Forests (in Millions of Dollars)

Angeles NF	Current	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Forest Service expenditures	$30.2	$37.1	$37.3	$37.1	$37.4	$37.2	$36.8	$37.4
Payments to States/Counties	$0.6	$0.6	$0.6	$0.6	$0.6	$0.6	$0.6	$0.6
Public recreation expenditures [1]	$111.8	$111.8	$117.4	$106.2	$117.8	$123.0	$100.6	$117.4
Public wildlife and Fish expenditures [1]	$62.5	$62.5	$65.7	$59.4	$75.1	$68.8	$56.3	$65.7
Commercial minerals expenditures [1]	$3.6	$3.6	$3.6	$3.6	$3.6	$3.6	$3.6	$3.6
Permittee grazing expenditures [1]	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Total Labor Income Attributable to FS	$208.9	$215.7	$224.7	$207.0	$234.5	$233.3	$198.0	$224.7
Cleveland NF	**Current**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 4a**
Forest Service expenditures	$23.3	$28.8	$28.7	$28.6	$28.6	$29.0	$28.6	$28.6
Payments to States/Counties	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5
Public recreation expenditures [1]	$39.8	$39.8	$41.8	$37.8	$47.8	$43.8	$35.8	$41.8
Public wildlife and Fish expenditures [1]	$26.8	$26.8	$28.1	$25.5	$32.2	$29.5	$24.1	$28.1
Commercial minerals expenditures [1]	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Permittee grazing expenditures [1]	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.0	$0.1
Total Labor Income Attributable to FS	$90.5	$96.0	$99.2	$92.4	$109.1	$102.8	$89.1	$99.1

Los Padres NF	Current	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Forest Service expenditures	$25.5	$32.4	$34.1	$33.9	$33.7	$34.4	$34.6	$33.7
Payments to States/Counties	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3
Public recreation expenditures [1]	$40.6	$40.6	$42.7	$38.6	$48.8	$44.7	$36.6	$42.7
Public wildlife and Fish expenditures [1]	$22.3	$22.3	$23.4	$21.2	$26.8	$24.5	$20.1	$23.4
Commercial minerals expenditures [1]	$6.5	$6.5	$6.5	$6.5	$6.5	$6.5	$6.5	$6.5
Permittee grazing expenditures [1]	$1.0	$1.0	$0.9	$0.8	$0.9	$0.9	$0.1	$0.9
Total Labor Income Attributable to FS	$96.4	$103.3	$108.0	$101.4	$117.0	$111.5	$98.3	$107.6
San Bernardino NF	**Current**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 4a**
Forest Service expenditures	$25.8	$33.4	$33.4	$33.5	$33.3	$33.6	$33.4	$33.3
Payments to States/Counties	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4
Public recreation expenditures [1]	$67.3	$67.3	$70.6	$63.9	$80.7	$74.0	$60.5	$70.6
Public wildlife and Fish expenditures [1]	$21.0	$21.0	$22.1	$20.0	$25.2	$23.1	$18.9	$22.1
Commercial minerals expenditures [1]	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5
Permittee grazing expenditures [1]	$0.3	$0.3	$0.1	$0.1	$0.1	$0.3	$0.0	$0.1
Total Labor Income Attributable to FS	$115.2	$122.8	$127.0	$118.3	$140.2	$131.7	$113.7	$127.0
Four-Forest Area Totals	**Current**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 4a**
Total Personal Income Contributions	$511.0	$537.8	$558.9	$519.0	$600.8	$579.3	$499.1	$558.3
Percent Change from Current	0.0%	5.2%	9.4%	1.6%	17.6%	13.4%	-2.3%	9.3%

[1] Income effects resulting from private sector expenditures related to activities on FS lands.

Table 174: Regional Direct, Indirect, and Induced Labor Income Attributable to National Forests is similar to the table for employment effects but is presented in terms of labor income attributable to the Forest Service and its administered lands. As with employment, the above table charts the direct, indirect and induced contributions to labor income as a result of expenditures by the Forest Service and by the users of Forest Service lands. Similarly, recreation continues to dominate followed by wildlife and fish. Again, Alternative 4 creates the highest labor income on all national forests and the highest percent change from current management.

There is a close relationship between employment and labor income, so the magnitude of change between alternatives for both is quite similar. The comparison between alternatives is displayed in table 462: FS Generated Impacts.

Table 462. Forest Service-Generated Employment and Income Impacts

	Current	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
% Change, Jobs	0.0%	3.3%	7.6%	-1.0%	17.0%	12.0%	-5.5%	7.5%
% Change, Income	0.0%	5.2%	9.4%	1.6%	17.6%	13.4%	-2.3%	9.3%

Finally, table 175: Forest Service-Related Contributions to the Four-Forest Economy shows totals for all four southern California national forests for both jobs and labor income by industrial sector. Total Forest Service-related jobs and Forest Service-related labor income differ slightly from the tables referenced above as a result of rounding error but are the same jobs and income as accounted for in the various sectors of the economy where the impacts occur. The total four southern California national forests' regional employment and labor income is also shown for comparison purposes. As can be seen at the bottom of the table, Forest Service related employment and income accounts for barely more than 1/10th of 1percent of the regional totals. The total of 15,179 Forest Service-related jobs is a goodly number but barely a drop in the southern California economy.

Table 175. Forest Service-Related Contributions to the Four-Forest Economy

	Employment (jobs)		Labor Income ($ million)	
Industry	Area Totals	FS-related direct, indirect, and induced	Area Totals	FS-related direct, indirect, and induced
Agriculture	395,889	272	$7,100	$5.6
Mining	23,597	129	$1,811	$9.9
Construction	850,176	199	$38,678	$10.0
Manufacturing	1,450,168	718	$74,796	$32.8
Transportation, Communication, & Utilities	567,387	514	$32,797	$27.9
Wholesale Trade	665,256	713	$33,992	$37.2
Retail trade	2,128,347	5,507	$51,385	$124.3
Finance, Insurance, & Real Estate	1,036,685	484	$46,961	$22.2
Services	4,558,569	5,300	$172,173	$154.4
Government (Federal, State, & Local)	1,751,194	1,286	$84,983	$86.0
Miscellaneous	178,568	57	$2,133	$0.7
Total	13,605,837	15,179	$546,809	$511.0
Percent of Total	100.0%	0.11%	100%	0.09%

Not only is the southern California economy quite large in proportion to the labor income and employment attributable to the presence of the Forest Service, it is quite diverse. The IMPLAN analysis calculates a Shannon-Weaver diversity coefficient based on the number and complexity of interactions between industries in the economy. These coefficients range from 0.72 for the Angeles National Forest, to 0.71 for the Cleveland National Forest, to 0.71 for the San Bernardino National Forest, to 0.69 for the Los Padres National Forest; they directly reflect the relative size of each economy while inversely reflecting the rural character of each national forest. However, all of these coefficients are quite high, and the conclusion is that not only is the economic impact of the Forest Service minor relative to the total economy, but there is no disproportionate effect on any one industrial sector because of the high diversity.

Three major conclusions can be drawn from examination of the above tables. First, the total Forest Service-related contributions are not inconsequential. A total of 15,179 jobs in the ten counties covered by the four models are supported by Forest Service-related expenditures. Annual personal labor income amounts to $585 million per year. These figures are the result of the direct, indirect and induced effects of economic activity related to the Forest Service in a diversified regional economy.

Second, in spite of the magnitude of the totals for number of jobs and annual labor income, they are still minor compared to the immensity of the economy of southern California. Total jobs supported by the Forest Service amount to a mere 0.13 percent of the regional total, and annual labor income is only 0.11 percent of the regional total. In no case do the percentages exceed 0.4 percent, which occurs on the San Bernardino National Forest. This result should be put into perspective. The Forest Service figures prominently in southern California as a source of undeveloped land, plant and animal species habitat and a place for people to enjoy the outdoors. Some 15,179 people hold jobs because of the presence of the Forest Service. However, the regional economy is not dependent on the Forest Service. The Forest Service therefore does not have to be commodity-oriented to support the economy and has the option to make decisions that favor intangibles such as preservation of the landscape. Resource decisions can favor landscape preservation as a goal, which has an intangible dollar value but which has an ever-increasing social or esthetic value in the face of large scale urbanization. Further, the social value of landscape preservation is a factor which must be considered as communities and counties turn to the national forests as a possible site for travel and utility corridors and other infrastructure needs when space becomes limited.

The emphasis on strategic impacts befits a strategic document, but at a micro level there are potential local impacts that can be quite significant. The community of Big Bear on the San Bernardino National Forest is quite dependent on national forest management of the surrounding landscape to maintain the ambience that supports a predominantly recreation-destination economy. The aquifers of the area around Arrowhead (also on the San Bernardino National Forest) are a source of commercially valuable bottled spring water and the continued supply of that water could depend on Forest Service management decisions. Quantification of the impact of Forest Service activities is not possible with available data at a micro, or community scale. The analysis in this document has tried to localize the results within the limitations of available data but is limited to the larger county area. It must be understood that decisions affecting the conifer stands around Big Bear and other local areas will be made with the welfare of local communities in mind. This document does not make project decisions and there are too many communities in the planning area to dwell on possible management actions that might have a local impact. Decisions made at the project level must consider potential economic and social impacts to local communities.

Third, on all four southern California national forests, Alternatives 4 and 5 result in the highest number of jobs and labor income. Recreation is a major output of the national forests of southern California and contributes value to the area economy in the form of both primary (direct fees paid for the experience) and secondary (related expenses such as food) expenditures. It is now possible to see a point of saturation in terms of the national forests' abilities to accommodate all the people, and there will always be excess demand and increasing economic value from recreation use. The relative emphasis of Alternatives 4 and 5 on recreation capitalizes on the economic value of recreation. This of course is from a commodity viewpoint. The esthetic values of undisturbed landscapes must also be considered. There is also a matter of budget implication. The promise of additional recreation facilities to meet demand supposes the availability of funding that has not been available for a number of years. Hence, the theme of Alternative 4a is adjusted toward adaptive maintenance of existing facilities to accommodate wildlife species and changing user preferences. It is more achievable in a budget-wise but the decreased emphasis on accommodating numbers of users comes at a lower contribution of jobs and income to the regional economy. Alternative 4a ranks lower and is comparable to Alternative 3 in an economic impact context.

While income and employment considerations favor commodity-oriented activities such as recreation, a balanced alternative for management of the national forests would also consider social and demographic factors. It was seen in the affected environment discussion that Hispanics and Latinos are a major ethnic component of the population and are an increasing component of the population in proportionate terms. Use statistics from NVUM show that Hispanics have tended to participate at developed recreation sites and have not been as likely to hike and backpack in dispersed areas and wilderness. Similar to overall national forest visitor use, but more so, national visitor use monitoring data show that wilderness area visitors are mostly white. On the Los Padres National Forest, which is predominantly wilderness, fully 93 percent of the wilderness visitors are white. The degrees to which Alternatives 3 and 6 emphasize more non-motorized backcountry and wilderness while de-emphasizing vehicular access could eventually have the effect of reducing opportunities for Hispanic and ethnic minority uses of the national forests given their preferences for developed recreation opportunities. In this planning cycle that is not yet true, since access has been maintained to developed sites in spite of additional wilderness so developed recreation use does not decrease. But limitations are being approached on the Los Padres National Forest. The Angeles, San Bernardino and Cleveland National Forests are not as oriented toward wilderness and backcountry as the Los Padres National Forest and have more latitude to create more wilderness while maintaining a balance of uses.

Economic Efficiency

Economic efficiency measures the cost effectiveness of the alternatives via the computation of net present worth. Data inputs include projected costs as represented by the projected national forest budgets for each alternative. The budgets vary by alternative relative to program emphasis as related to the alternative theme. The relative mixes of land allocations in each alternative call for more or less fire protection, road and trail maintenance, wildlife protection and recreation facility operations funds. Each national forest was constrained to a moderate budget level marginally higher than the current budget level but allowing for accomplishment of the most important legally minimum standards. The programs and budget line items within each budget were based from an extensive analysis of actual expenditures in fiscal year 2002 and presented in a business plan that was developed for each of the four southern California national forests. These moderate budgets derived from the business plan information meet the planning criterion of basing outputs on reasonably foreseeable funding levels.

Outputs were estimated for the more traditional commodities for which there are also national values, from the internal publication "Resource Pricing and Valuation Procedures for the Recommended 1990 RPA Program." In most cases, the values are presented for the years 1989 and 2040, and are expressed in 1989 dollars. Also, in most cases the values were further derived by region so that the Region 5 values from the RPA guide apply for the state of California. Values are expressed as market-clearing price (MCP) and MCP plus consumer surplus (CS). MCP (as its name suggests) is an equilibrium price where demand equals supply and prices just cover the cost of production including a fair rate of return. MCP plus CS is the amount above the market price a consumer might be willing to pay rather than go without it and has been referred to as the "willingness to pay" value. MCP plus CS has been advocated in economic circles as being appropriate to social decisions as applied to natural resources. The MCP plus CS values were adjusted by computing the rate of change, or price inflator, between 1989 and 2040 and then calculating the 2002 value. As the resulting value is still expressed in 1989 dollars, the gross domestic product deflator was used to express the value in 2002 dollars. The resultant 2002 values for the respective projected outputs are shown in table 176: Commodity Output Values Used for the Efficiency Analysis

Table 176. Commodity Output Values Used for the Efficiency Analysis

Output	2002 Value	Unit
Range	$6.75	Animal Unit Month
Leasable Minerals		
Oil	$33.70	Barrels
Natural Gas	$9.48	M(thousand) Cubic Feet
Saleable Minerals		
Sand, Gravel, Rock	$0.93	Ton
Recreation		
Camping, Picnicking, Swimming	$11.23	Forest Visit
Mechanical Travel, Viewing	$6.71	Forest Visit
Hiking, Riding, Water Travel	$13.21	Forest Visit
Winter Sports	$45.70	Forest Visit
Wilderness	$39.27	Forest Visit
Hunting	$48.96	Forest Visit
Fishing	$57.96	Forest Visit
Wildlife Watching	$49.53	Forest Visit

Estimates of animal unit months are the potential production from National Forest System land and come only from identified suitable acreage, which varies by alternative. Suitable acres for grazing are divided by four to obtain animal unit months and further divided by 1.32 to obtain head months. These are standard conversions specified in Forest Service regulations. Leaseable and saleable minerals are based on current production and are constant across alternatives. These outputs are special uses, and it is assumed that all special uses will continue as they are now until the permits are renewed, at which time their compatibility will be reviewed as a project level decision. Recreation outputs are based on national visitor use monitoring data available for the Angeles, Cleveland, and Los Padres National Forests as year 2000 data and for the San Bernardino National Forest as year 2002 data.

Table 177: Present Values of Costs and Benefits by Alternative in $ X 1,000 (page 472) presents the results of the efficiency analysis. Budget costs and output values were expressed as decadal mid-point values and discounted over five decades at 4 percent to obtain present values of costs and benefits. Emphasizing that this analysis is couched in terms of commodities with tangible value, it does not consider the esthetic value or other intangible values of each alternative. Further, the results must be considered relative because the calculated net present value is not exhaustive (i.e., the analysis includes major components of cost and value but is not comprehensive).

Not all costs and benefits have been accounted for. For example, water outputs from the national forests are not accounted for, yet the water yield from public lands is essential and extremely valuable to the surrounding communities. However, water yield would not vary significantly by alternative. While the net present value would become impressively large with the inclusion of the present value benefit of water, it would be a constant across alternatives and the rankings would not change. Another example is the intangible dollar value of the background viewscape of the mountains, which might have an incredibly high value to the urban populations, but it might overwhelm every other measure if it were possible to put a value on it. Yet another example is the value of resources and property lost or saved as a function of alternative access for fire protection. This value is much more tangible but difficult to calculate on a large scale and predict with any degree of certainty. As interesting as they are, these are social costs and values which need to be considered but in a forum other than economic efficiency.

The "zero" values for timber result from the absence of suitable lands for scheduled commercial harvests on the four southern California national forests. Salvage cutting does occur but is incidental to forest health issues such as rehabilitation of burned areas or removal of drought and disease mortality. It is not a scheduled output but is rather an exception which cannot be predicted. For that reason, the value of salvage cutting is also not accounted for here.

Special uses are accounted for in the economic impact analysis but not in the efficiency analysis. The value of special uses on National Forest System lands in southern California is considerable, but not reflected in the amounts collected for the permits. Furthermore, surrogate values that can be placed on the many kinds of special-use permits are not readily available. A working assumption for this analysis is that existing special uses are not affected by any alternative until project-specific analysis is done to renew the permit, at which time the consistency of the permit with the selected alternative will be reviewed. Thus, special uses are considered a constant in this analysis and the exclusion of their value does not affect the rankings.

Finally, localized market studies might derive more realistic values than the regional RPA values that were used, but effects of using localized values would again be constant across alternatives leaving the rankings unchanged. That is, the efficiency analysis is entirely comparative and is not intended to provide a complete, or literal, net present value of national forest outputs.

Having noted the limitations and characteristics of table 177: Present Values of Costs and Benefits by Alternative in $ X 1,000, it can be seen that the total present net value of Alternative 4 is clearly highest, followed closely by Alternative 5, with a larger gap among the rest of the alternatives.

Table 177. Present Values of Costs and Benefits by Alternative in $ X 1,000

Costs and Benefits Discounted Over a 50 Year Period - Four Forests Combined

	Current	Alt 1	Alt 2	Alt 3	Alt 4	Alt 4a	Alt 5	Alt 6
Total Present Net Value	$4,796,988	$4,340,163	$4,584,776	$4,379,860	$5,966,229	$5,008,491	$5,311,356	$3,723,239
Present Value benefits by Program								
Range	$22,123	$21,510	$16,534	$15,145	$16,490	$16,493	$19,943	$3,208
Timber	$0	$0	$0	$0	$0	$0	$0	$0
Minerals	$379,783	$379,783	$379,783	$379,783	$379,783	$379,783	$379,783	$379,783
Recreation	$2,943,850	$2,943,834	$3,091,025	$2,796,642	$3,532,600	$3,091,025	$3,238,217	$2,649,362
Wildlife	$3,059,346	$3,059,346	$3,212,313	$3,269,057	$4,129,335	$3,613,169	$3,785,223	$2,753,411
PV of Benefits	$6,405,102	$6,404,473	$6,699,656	$6,460,627	$8,058,208	$7,100,470	$7,423,166	$5,785,764
Present Value costs by Program								
Range	$4,463	$4,049	$3,091	$2,308	$3,461	$3,461	$9,252	$2,308
Timber	$0	$0	$0	$0	$0	$0	$0	$0
Roads/Engineering	$445,268	$198,753	$280,714	$225,486	$333,461	$333,461	$271,593	$231,712
Minerals	$11,712	$11,755	$8,642	$6,465	$9,709	$9,709	$25,862	$6,465
Recreation	$167,797	$252,850	$271,070	$336,269	$340,754	$340,754	$166,622	$288,660
Wildlife	$30,782	$60,214	$65,895	$77,041	$57,754	$57,754	$52,856	$115,790
Soil, Water, Air	$40,926	$77,912	$85,139	$99,464	$74,625	$74,625	$68,900	$149,489
Protection/Forest Health	$845,234	$1,380,561	$1,307,960	$1,260,242	$1,198,983	$1,198,983	$1,404,811	$1,177,541
Lands	$40,665	$55,011	$50,766	$50,287	$50,026	$50,026	$88,710	$67,354
Planning, Inv., Monitoring	$21,269	$23,206	$41,601	$23,206	$23,206	$23,206	$23,206	$23,206
Present Value of Costs	$1,608,114	$2,064,310	$2,114,880	$2,080,768	$2,091,979	$2,091,979	$2,111,811	$2,062,525

Looking at Alternative 4 in more detail, it can be seen that the present value cost is similar to the other alternatives because the total national forest budget constraints are applicable to all alternatives. The present value costs of the various line items within the total present value cost reflect the emphasis of each alternative and consequent budget needs by line item. For example, Alternative 4 contains the highest present value cost for recreation as a reflection of its relative emphasis. What vaults Alternative 4 into the highest net present value is the present value benefit of recreation and wildlife. Both values are significantly higher than the other alternatives. Third in the rankings is Alternative 4a. In response to public comment about the budget implications and implementability of Alternative 4 and with the addition of a third zone with limited access, the recreation use expectations for Alternative 4a were reduced. Further, the emphasis on conservation measures and resolution of conflicts with threatened and endangered species suggested that recreation use will expand only moderately. Thus, Alternative 4a is not economically the most valuable alternative as it makes tradeoffs for conservation needs.

We have seen that Alternative 4 has greater economic benefits to the local economies in terms of personal income and jobs supported by the four national forests of southern California. Alternative 4 is also most efficient in terms of the value of its commodities relative to its costs. However, the need for habitat conservation and protection of wildlife and plant species requires a more moderate approach to recreation expansion with consequently lower present value benefit such that Alternative 4a is ranked lower in terms of present net value. The correct economic optimum in this case could be determined only if a fair market value could be placed on acres of habitat protected. In lieu of such a measure, the Forest Service can only recognize that a tradeoff has been made in terms of a lower present net value as the result of emphasis placed on protection of species and their habitats.

Effects on Social Environment

Direct and Indirect Effects

As stated by the U.S. Environmental Protection Agency at the Agency Web site environmental justice page, environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the execution of agency programs and policies. Fair treatment means that no group, ethnic or socioeconomic, will bear disproportionate consequences from the execution of an agency program or policy. Meaningful involvement means that potentially affected residents will have an opportunity to participate in agency decisions, be able to influence those decisions, have their concerns considered, and be sought out to express their concerns. References to USDA, Departmental Regulation number 5600-2, and Executive Order 12898 Federal actions to Address Environmental Justice in Minority Populations and Low-income Populations are included in Part 3, Design Criteria, and in Part 3, Appendix A of the forest plans.

The forest plans and the supporting FEIS are programmatic, or strategic, in nature. They are the highest level of planning and provide strategic direction in setting priorities, limitations, and standards for subsequent second level project implementation and program management. As such, the forest plans make broad-based decisions as discussed in Purpose and Need of the Forest Plan and Adaptive Management Framework in the Introduction to each forest plan. The environmental justice consequences of these broad-based decisions are addressable in the program emphasis and management direction, and in the land allocation emphasis as reflected by the zoning.

Population growth and demographic trends are developed and presented in the FEIS in the Economic Conditions section of the Affected Environment. It is clear that the Hispanic/Latino segment of the population continues to grow to major proportions, reaching 40% in the area defined as the Southern California Association of Governments. In this area, composed of Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura counties, the number of Hispanics exceeded the number of whites in the 2000 Census. While there are no barriers to visitation by Hispanics and minorities to the national forests, there is much to do to facilitate and enhance the available recreation experiences on national forests for Hispanics and other ethnic groups. The National Visitor Use Monitoring (NVUM) results available for the Angeles, Cleveland, San Bernardino and Los Padres National Forests show that the great majority of national forest visitors are white. National Forest visitation is therefore not representative of the ethnic mix of the larger surrounding population but it is expected that the disparity will decrease. Program emphasis in each of the forest plans recognizes the important and increasing presence of non-white ethnic groups, which calls for proactive management to implement bilingual and conservation education measures, to consider ethnic needs in making the national forest more attractive and hospitable, and to consider ethnic needs in the configuration and design of facilities. Further, there is an identified need for outreach to communities to create higher awareness of the opportunities to participate in national forest activities and participative discussions concerning national forest management.

Land zoning decisions in the forest plans revolve around degree of access: motorized (automobile, high-clearance vehicle, and trail), and non-motorized (mountain bike, equestrian, and hiking). Each of the land use zones carries a different emphasis for access as detailed in table 2.3.2, Suitable Uses Public Use and Enjoyment, of each forest plan. The level of access ranges from general motorized access for a variety of activities including developed recreation sites to very restricted non-motorized access as exemplified by wilderness. Visitation data from NVUM show that participation in wilderness hiking has a low rate of participation by non-whites and is not reflective of the demographic mix of the surrounding populations. Rather, the NVUM data suggest that non-whites are more inclined to utilize the developed recreation facilities. It might be supposed that alternatives with greatest emphasis on wilderness (such as Alternatives 3 and 6) are therefore discriminatory against non-whites. However, in those alternatives where additional wilderness is proposed there is no corresponding decrease or substitution for developed sites. The zoning has been constructed to allow continued access to existing developed recreation facilities even as wilderness increases. Dispersed recreation does decrease as formerly accessible land is replaced by wilderness and as general purpose roads are closed or designated for administrative use only. However, roads are equally accessible (or inaccessible) by everyone and any increase or decrease in roads has a proportionate effect on all groups. Thus, developed recreation activities favored by non-whites are not displaced by wilderness and impacts on dispersed recreation are proportionate to all groups.

The national forests are freely accessible, limited only by the means of transportation. It has been suggested that low income groups are denied access to the national forests for lack of transportation. That may be true, but it is the result of economic forces beyond the jurisdiction or control of the Forest Service. The Forest Service does maintain road and trail access to the national forests and these roads and trails are open to anyone. It has also been suggested that scenic roads should be provided much as scenic trails are provided for those who are unable to hike or backpack into remote areas. It is precisely the desired balance of available experiences (driving, hiking, etc.) that is the purpose of this planning exercise which has been open to all public interests from the beginning.

As explained in Chapter 1, Public Involvement, the public involvement process for this planning effort has been extensive, resulting in a mail list of some 8,500 names including citizens, special interest groups, and government agencies who are participating in this planning effort. It was the result of a public involvement plan that was developed by Public Affairs Officers from all four southern California national forests and a core team Public Involvement Specialist. There have been four rounds of public involvement at strategically important points in the planning process. These communities were also geographically distributed to be representative of local interests and to create accessibility for the greatest number of people interested in national forest management. Some of these meetings were held in relatively remote locations such as the Big Sur coast to be sure that most groups were allowed to participate. Twenty-nine open houses were held for the draft forest plan review alone. Most open houses had bilingual employee(s) available to facilitate comment and there was also an outreach effort to involve inner-city Hispanic groups. These efforts resulted in 10,900 identified comments, all of which were examined and answered in some fashion by the specialists on the interdisciplinary team. The comments resulted in adjustments to the forest plans and to the FEIS. Significant efforts were made to create the meaningful involvement that environmental justice calls for.

Other social issues have arisen which are not within the scope of this document. Examples are local community impacts and small business impacts, as well as availability of recreation residences to minorities. Local community impacts can and should be addressed at a project level. Small and minority-owned businesses are an identified target group for contracted services. The sale and exchange of recreation residences is a private party transaction governed by state and county non-discrimination requirements. These kinds of issues are administrative and beyond the scope of this land management planning document. The relevant laws and regulations that apply to these administrative procedures are referenced in Part 3, Appendix A, of the forest plans.

Effects on Heritage Resources

Direct and Indirect Effects

Applicable law, policy and direction provide the basis for the protection of heritage resources. In all alternatives, management activities proposed could directly, indirectly or cumulatively affect heritage resources. Activities are subject to the regulations outlined in Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and as promulgated by 36 CFR 800, to address effects to the heritage resources. In addition, heritage resource management activities such as inventory, analysis, stabilization and restoration, and public interpretation are present in all alternatives.

Each national forest (as part of the Region 5 Section 106 Programmatic Agreement with the State Historic Preservation Officer and the Advisory Council on Historic Preservation) has developed a Section 110 Plan. This plan is designed to allow the national forests to meet their responsibilities outlined in Section 110 of the NHPA, and includes procedures to inventory, protect, enhance and monitor the heritage resources on the national forest.

As part of the Forest Service infrastructure database process, heritage resource sites are visited to determine management and funding needs for protecting those sites; the focus is on priority heritage resource assets (formally recognized significant sites). Fiscal needs are entered into the database as deferred maintenance needs.

The following assumptions apply in the assessment of the environmental consequences of the activities allowed under the alternatives:

- Heritage resources would be managed according to existing laws, regulations and programmatic agreements to protect these resources according to societal expectations.
- Active management, encompassing the greatest acreage, would provide the best opportunities for identifying, protecting and interpreting heritage resources.
- Ground-disturbing management activities could have direct adverse effects on heritage resources.
- Public interest and support for heritage resource management will increase, including that of American Indian tribes, groups and individuals.

Unlike most other resource values, heritage resources are basically non-renewable resources. Damage or destruction to heritage resource sites is generally permanent. Effects on some heritage resources (such as the upgrading of windows in an historical building with non-compatible materials [wooden windows to aluminum]) can be reversed; however, until that happens, the effect is ongoing and potentially adverse. Overall, non-beneficial effects usually result in compromising the nature of the heritage resource and may affect its eligibility for inclusion in the National Register of Historic Places.

The significance of heritage resources, particularly historical and traditional cultural properties (areas of special religious or spiritual significance where traditional practices are performed), often depends on their context in the larger landscape as much as their immediate physical features. Activities that occur beyond the physical boundaries of the heritage resource can affect the heritage resources if they affect the larger, landscape-level context. In addition, the architectural and landscape features of buildings, compounds, roads, bridges, dams and other structures can be adversely affected by alterations.

As a rule, any activity that causes ground disturbance (disturbance to the soil matrix that contains the heritage resource) has the potential to adversely affect heritage resources, both directly and indirectly. This results in changes to the physical attributes of the resources that, in turn, compromise the integrity of the heritage resource and its context. Its context (the spatial relationship between the various artifacts, features and components of the heritage resource) is what is scientifically studied and interpreted and is the basis for the site significance determination. This effect is irreparable and considered adverse. Even a scientific archaeological excavation has an adverse effect because it is destroying the integrity and context of the heritage resource by removing its artifacts, features and components.

Direct effects that can damage heritage resources or their setting can result both from natural events or processes and human activities. Indirect effects can result from changed visitor use patterns and improved access that brings more visitors, resulting in the deterioration or loss of the site. Studies have shown that effects on sites have three basic characteristics: (1) impacts tend to be multiple (that is, several different impacts to the same site); (2) impacts are cumulative; and (3) many impacts are the result of land use activities rather than deliberate vandalism (Marshall and Walt 1984, US Army Corps of Engineers 1988). There is also the potential for previously unknown heritage resource sites to be discovered through exposure and/or damaged by land use activities that involve surface disturbance. Effects from project-specific activities are easier to identify and manage for through appropriate mitigation measures. Non-project-specific activities (such as unauthorized off-road vehicle use or wildland fires) have the greatest potential to adversely affect heritage resources, as these activities do not lend themselves to identification, anticipation or mitigation.

The intensity of impacts on heritage resources can be described as negligible, minor, moderate or major. Negligible impacts are those that result in barely perceptible changes in the important properties of a heritage resource or cultural landscape. Minor impacts are perceptible and noticeable. Moderate impacts are sufficient to cause a noticeable but not substantial change in the important characteristics of heritage resources. Major impacts result in substantial and highly noticeable changes in the important characteristics of heritage resources. Duration plays a key role in the overall effect; impacts of minor intensity over a long duration may have the same effect on the characteristics of heritage resources as would impacts of moderate intensity over a short duration.

Measures that reduce the intensity of the impact are appropriate under the requirements of NEPA; however, under NHPA, as defined by the implementing regulations for Section 106, the effects remain adverse. Therefore, measures to address impacts under NEPA may not be sufficient to address the effects under NHPA. The Secretary of the Interior has published regulations designed for the preservation, restoration and rehabilitation of heritage resources. The Region 5 Section 106 Programmatic Agreement provides a list of standard protection measures that can be used within the context of fast-track coordination with 36 CFR 800. Ultimately, the universal mitigation measure will always be in compliance with the vast array of historic preservation legislation and mandates.

Mitigation measures for effects include pre-planning survey of all proposed activities and sites; survey of all existing structures not previously surveyed for heritage resources; and use of standard protection measures such as project redesign, relocation and monitoring to protect the affected heritage resources. Education of project workers and the national forest user in regards to site damage or vandalism would also be an effective mitigation measure.

In all alternatives, management activities proposed could directly, indirectly or cumulatively affect heritage resources, and will be subjected to the regulations outlined in Section 106 of the National Historic Preservation Act of 1966, as amended, and as promulgated by 36 CFR 800, to address those effects to the heritage resources. In addition, heritage resource management activities such as inventory, analysis, stabilization/restoration, and public interpretation are present in all alternatives. To some degree, all alternatives will have irreversible commitments of heritage resources; the magnitude and degree of that commitment varies by the difference in acreage for those land use zones for which activities that result in ground disturbance are suitable.

Table 249. Acres of Back Country Land use Zone by Alternative

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Angeles	270,255	308,914	181,047	321,671	469,459	123,063	161,392
Cleveland	203,839	191,066	119,903	192,307	301,481	57,578	77,064
Los Padres	720,079	723,119	301,139	733,086	881,723	138,153	332,050
San Bernardino	328,029	313,580	213,978	346,604	472,471	135,445	169,786

The land use zones that allow the activities that have the potential to cause ground disturbance are Developed Area Interface (DAI) and Back Country zones. By the nature of its zoning, Developed Area Interface consists of higher levels of human use and infrastructure. The acreage for this zone remains fairly consistent throughout Alternatives 2 through 6, with Alternative 1 having approximately 1/3 more DAI acres than Alternatives 2 through 6. Alternative 4a has higher acreage than all the other alternatives except for Alternative 1. Back Country is the zone that changes most throughout the alternatives and will be used for the alternative comparison. The Heritage Program support for the activities allowed under the Back Country zone as required under Section 106 of the NHPA will increase the acres inventoried for heritage resources as well as heritage resource sites recorded, evaluated and protected.

It is apparent that Alternatives 6 and 3 would have the least direct effect to heritage resources as the Back Country acres are the lowest, while Alternative 5 would have the potential to have the greatest direct effect on heritage resources (table 249: Acres of Back Country Land Use Zone by Alternative). The differences between Alternatives 1, 2 and 4 are negligible (under 5 percent except for the Angeles National Forest, where there was less than a 8 percent difference in acreage when compared to the total national forest acreage). Alternative 4a actually has fewer Back Country acres than Alternative 3. There are indirect effects associated with these alternatives. Though Alternatives 3 and 6 provide the most protection from possibly damaging land use activities, they also restrict access and may prohibit management options that would enhance and protect heritage resources. Alternative 4 and 4a would provide opportunities for heritage resource interpretation and public enhancement. Under Alternative 5, even though it has the highest number of Back Country acres, by following the legal process designed to provide for the consideration and protection of heritage resources within any environmental analysis for those activities allowed, one could expect that more heritage resources would be protected. Finally, in Alternatives 2, 3, 4, 4a, and 6, there would be an increase of special interest areas focusing on heritage resources, which would increase the opportunities for the protection, enhancement, and public enjoyment of heritage resources.

Table 250. Back Country Land Use Zone Acres in High Sensitivity Zone for Heritage Resources by Alternative

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Angeles	8,551	11,075	8,300	11,417	15,534	6,739	9,108
Cleveland	29,518	30,236	23,059	29,798	41,064	13,314	15,524
Los Padres	57,077	57,483	35,360	57,071	60,793	23,166	42,104
San Bernardino	55,580	56,416	44,493	58,714	66,094	29,862	40,756

GIS analysis of the locations of known heritage resources indicates that the land area that would be the highest sensitivity for the occurrence of heritage resources is land that has slopes of 15 percent or lower.

The acreage for the high sensitivity zone for heritage resources show a drastic decrease in acres within Back Country (see table 250: Back Country Land use Zone Acres in High Sensitivity Zone for Heritage Resources by Alternative).

Alternatives 6 and 3 would have the least direct effect to heritage resources as the Back Country acres in the high heritage sensitivity are the least while Alternative 5 would have the potential to have the greatest direct effect on heritage resources. The differences between Alternatives 1, 2 and 4 are again basically negligible. Overall, Alternative 4a has slightly less acreage than Alternative 3 so the amount of direct effect to heritage resources would be between Alternatives 3 and 6 (but closer to 3).

The program to manage heritage resources in and of itself will vary among the alternatives. The Heritage Resource Program would focus on restoration and enhancement under Alternatives 3 and 6, focus on actively maintaining and management in Alternatives 2 and 4, and having a basic maintenance level program at Alternative 1. One would expect Alternative 4a to reflect a transition from actively maintaining and managing heritage resources to include the restoration and enhancement of heritage resources. In Alternative 4a, it is expected that there would be an integrated approach for using conservation education and interpretation to enhance the heritage resources for public benefit while building a support base for the advocacy for historic preservation and interpretation. In Alternative 5, the Heritage Resource Program will be focusing on management strategies that in effect will restrict other land-use activities. Special Interest Areas with a heritage resource emphasis are a good indicator on how the Heritage Resource Program will change by alternative (see table 251: Comparison of Heritage Resource Special Interest Area Acreage by Alternative). The activities associated with the management of those special interest areas are basically the "Section 110" component of the Heritage Resource Program. These special interest areas are designed to protect and promote heritage resources of archaeological, historical, and cultural values. Again, Alternatives 3 and 6 would have the most beneficial consequence for heritage resources while Alternatives 1 and 5 would basically have no change or consequence. The acreage for Alternative 4a shows a slight increase over Alternatives 2 and 4 but not as much as Alternatives 3 and 6.

Table 251. Comparison of Heritage Resource Special Interest Area Acreage by Alternative

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Angeles	0	6,639	7,850	6,639	0	16,907	7,850
Cleveland	0	0	0	0	0	0	0
Los Padres	5,592	15,524	15,524	15,524	5,592	15,524	15,524
San Bernardino	0	7,167	17,371	7,167	0	17,371	10,322

Almost all national forest project activities have the potential to result in ground disturbance, and the effects are described above and will not be repeated in the specific activity effect analysis. The discussion of national forest project activity effects on heritage will focus on non-ground disturbing actions and those ground disturbing activities that are of special note.

Effects of Land Ownership Adjustment on Heritage Resources

Under the NHPA, the transfer of heritage resources as a result of a land exchange is considered a potential adverse effect or consequence. An indirect effect is the loss of protection of undiscovered heritage resources if the land is transferred out of federal ownership. The acquisition of heritage resources through land exchange is a beneficial effect, because the resource is afforded protection under the heritage preservation legislation. Since the total acres adjusted are not expected to vary much by alternative, the adverse effect of transferring heritage resources out of federal ownership is similar for all alternatives. In all alternatives, overall National Forest System land increases, chiefly through consolidation, which has the potential to be a beneficial effect. The only variation by alternative would be the emphasis for the land management program.

Effects of Vegetation Management on Heritage Resources

The Vegetation Management Program in all alternatives focuses on mortality (dead trees), creating defensible space, the maintenance and construction of fuelbreaks, tree thinning and prescribed burning. Removal of dead trees (tree mortality) or timber can affect heritage resources because there can be ground disturbance caused by machinery and vehicles, felling of trees on certain types of heritage resources, skidding of logs and trees, theft and vandalism by workers or erosion caused by vegetation removal or damage. Construction or reconstruction of permanent or temporary roads for anticipated use would also affect heritage resources.

Prescribed burning may directly damage or destroy heritage resources. Historic sites and structures are at a greater risk from destruction due to fire. Vegetation removal can also have an indirect effect because the increase in visibility of heritage sites may result in an increase in vandalism.

Effects of Biodiversity Management on Heritage Resources

Most activities associated with wildlife and fisheries center on the project-specific level, such as prescribed burns, revegetation and terrestrial and aquatic structures. Also, the concentration of wildlife can trample and compact heritage resource sites. It is expected that these effects would increase in Alternatives 3 and 6; fewer increases are expected for Alternatives 5, 1, 4 and 2. Alternative 4a emphasizes threatened, endangered, proposed, candidate and sensitive species management in all land use zones with all activities designed to be neutral or beneficial to species of concern. The focus of any protection or restoration activity for biodiversity benefit in Alternative 4a will be on prioritized recreation uses where many heritage resource sites are known to exist. It is expected that the effects of Alternative 4a would fall between the effects associated with Alternatives 2 and 3.

Some of the strategies proposed to protect threatened, endangered, proposed, candidate and sensitive species apply to activities that need to be subjected to the provisions of the NHPA, because they could adversely affect heritage resources.

Effects of Watershed Management on Heritage Resources

Stable watersheds are beneficial to the long-term preservation of heritage resource sites. Measures designed to improve watersheds (including Burned Area Emergency Rehabilitation treatments) could have direct effects on heritage resources.

Effects on heritage resources would be greatest in those alternatives that emphasize land use zones and management activities that increase (or potentially increase) acreage for development or vehicle access, such as Alternative 5, followed by Alternative 4. Those alternatives that allow for more special designation areas (such as recommended wilderness), such as Alternatives 6 and 3, would result in a level of watershed program activities that would have minimum effect on heritage resources. In Alternative 4a, the focus would be on water quality and quantity, and the protection/restoration of watershed health. Restoration activities would be focused on prioritized recreation uses, which may have heritage sites present. However, in Alternative 4a motorized access is reduced, which may limit the number of watershed management projects.

Effects of Soils Management on Heritage Resources

Those activities that maintain soil stability on heritage resource sites through the maintenance or improvement of vegetation coverage would have a beneficial effect by preserving the soil matrix in which most heritage resources are found. Conversely, effects on heritage resources will be greatest in those alternatives that promote management activities that purposely remove the vegetation and the upper soil layer, resulting in the need for soil stabilization activities. Alternative 5 (followed by Alternatives 4, 2, and 1) would have the greatest potential for affecting the soil and heritage resources. Alternative 4a has a reduced effect from the present level but not as reduced as what is seen in Alternatives 3 and 6.

Effects of Geology and Hazards on Heritage Resources

Besides those activities associated with ground disturbance (such as trenching for subsurface strata examination, stabilizing or removal of hazards), the closing or restriction of access to historic mines will have a direct negative effect on heritage resources.

An indirect effect of a closure of an area as part of hazard management would be the restriction of public access to any heritage resource in the closure (benefit), but if the hazard results in ground movement, heritage resources could be damaged or destroyed (adverse).

The effects from activities associated with the mitigation of the risks posed by geologic hazards would be greatest in those alternatives which have a higher degree of surface disturbance or access and public use, such as Alternatives 4 and 5. Alternative 4a would have a reduced effect from the current level of activities but not as reduced as what is seen in Alternatives 3 and 6.

Mitigation measures for the above effects include a Heritage Resource Preservation Program that provides for resources to be preserved for future scientific studies, as well as the requirement that current studies retrieve and curate soil matrixes from the sites studied for future research.

Effects of Recreation on Heritage Resources

Population growth in southern California in the next 20 years is expected to result in an increase of visitation by 15 to 20 percent. Accordingly, use is expected to be more intense at existing sites and areas already heavily used, to increase at those sites and areas currently being lightly used, and to shift to those times of the year that have traditionally been low use (such as spring and fall). Frequency of vandalism is expected to rise in association with greater visitation to areas, especially in those areas with little law enforcement (U.S. Army Corps of Engineers 1989b). Opportunities for edification and education may result in public support and advocacy for historic preservation and interpretation, a positive effect.

The anticipated effects on heritage resources would be greatest in those alternatives that have the broadest range of recreation opportunities (such as Alternatives 4 and 5, and to a lesser degree, Alternative 2). Since the range of recreation opportunities is less in Alternatives 3 and 6, the effects of the Recreation Program on heritage resources would be less. Alternative 4a is focused on sustainable recreation uses with a theme of low-level growth of recreation activities and the facilities to support the increased use. Recreation use is managed to offset the effects of the uses on other resources including heritage resources. As such, it is anticipated that the effects on heritage resources from Alternative 4a would be less than Alternatives 2 and 4.

Effects of Developed Recreation on Heritage Resources

Construction, reconstruction or maintenance of campgrounds and other developed facilities resulting in ground disturbance will affect heritage resources. Many of the developed facilities have not been inventoried for heritage resources, so the true effect of the impacts is not known. These facilities are often situated on older historical camps or prehistoric sites and often are of the age to qualify as historic. Cultural deposits may occur at such sites that still contain valuable information even though the surface has been modified for many years. Many developed sites have reduced vegetation or ground cover that exposes artifacts that can contribute to illegal collecting and excavation.

Campground maintenance and public camping activities can cause impacts to archaeological deposits. Ongoing camping activities can mix and disperse archaeological remains; fragment botanical remains (seeds) beyond recognition; and introduce modern material (such as charcoal, tin foil, beer bottle glass and fishing swivels) into the archaeological deposits, resulting in the compromising of the scientific information. There is also some degree of additional impact as developed recreation facilities (camp fire rings, parking areas and tables) are removed from heritage resource site deposits.

Developed recreation has an indirect effect by introducing people and vehicles into an area that results in the trampling of heritage resources, increased vandalism and access to areas outside the developed areas that may contain (but have not been surveyed for) heritage resources.

Beneficial effects result from increased opportunities to provide heritage interpretation at sites located within developed recreation areas. Alternative 4a emphasizes the use and improvement of current recreation facilities to a resource sensitive, sustainable level. The incorporation and implementation of Appendix D (Adaptive Mitigation of Recreation Uses) of Part 3 of the forest plan would result in the ability for recreation use to occur while protection for the heritage resource is provided.

Effects of Dispersed Recreation on Heritage Resources

Dispersed recreation is often unregulated and occurs in a wide area. Direct impacts include hunters and other people making camps on top of heritage resources, leveling the land for tent pads, and creating surface disturbance. Recreationists also modify historic cabins for their own use; they remove wood from historic structures and sites for firewood, resulting in permanent site damage. Other impacts include surface disturbance (construction of campfire rings that use stones from prehistoric cache features) and introduction of modern charcoal onto site deposits. The increased use of the national forests results in an increase in pot hunting and vandalism opportunities, including artifact collection. An associated impact is the unauthorized development of roads and trails that damage or destroy heritage sites. The total number of acres available for dispersed vehicle camping varies little between alternatives. The zoning where these acres are available varies by alternative (see further discussion in Effects on Recreation , Effects of LMP Decisions on Dispersed Camping).

Effects of Law Enforcement on Heritage Resources

Impacts from unauthorized off-road vehicle use occur throughout the national forests with no consideration of land closures or restrictions, so the effects are similar in all alternatives. Unauthorized vehicle use occurs primarily in areas that have not been inventoried for heritage resources, so it is difficult to determine the effects of this use. Uncontrolled trail proliferation and unauthorized open use affect both the known and unknown heritage resources because of the inability to protect heritage sites from uncontrolled use. The direct impact is that soil is disrupted, the subsurface is compacted and deformed, and soil stabilizers such as vegetation, natural ground clutter and surface crusts are damaged or destroyed (U.S. Army Corps of Engineers 1992). Soil compaction reduces water infiltration, which increases run-off and erosion and decreases the amount of water available for vegetation (resulting in die-off) that would help camouflage any heritage resource present. It becomes harder for natural soil regeneration to occur, and it results in concave lenses that disrupt the subsurface soil profile of the heritage resource that is so important to an understanding of the heritage resource.

The degradation of the surface of sites due to use of "social trails" is compounded by running vehicles across sites during winter when the soil has more moisture, causing deep rutting and increased soil matrix damage.

Indirect impacts are associated with increased access into areas where there may be unknown heritage resources or where properly managed heritage resources exist; this access increases the possibility of vandalism and pot hunting. As part of the strategy to discourage unauthorized off-road vehicle use, repair or decommissioning of unauthorized off-road vehicle trails that run across many sites can cause direct impact on heritage resources. Treatments such as "chunking" (where the small dozer blade corner or edge makes divots staggered along an unauthorized trail to make riding difficult) cause damage or destruction to heritage sites located within the trail.

Mitigation measures include setting aside areas for authorized use that are inventoried for heritage resources and avoiding or excluding archaeological and historical resources through programmatic agreement standard protection measures (such as fencing and project redesign).

Effects of Scenery Management on Heritage Resources

The Native American community feels a close association with cultural and historic landscapes. Any activity that promotes scenery management and aims to maintain the feeling of the natural-appearing landscape would have a beneficial effect. Any alteration or permitted degradation of scenic integrity from the more natural settings, or the settings associated with the heritage resource may affect potential cultural or historic landscapes or traditional cultural properties. Alternative 1 provides for the most alteration of scenic integrity, while Alternatives 3 and 6 provide for the least. Alternatives 2 and 4 allow for a slight increase in alteration from Alternatives 3 and 6. Alternative 5 increases the alteration but not to the level of Alternative 1. Alternative 4a maintains the natural appearing landscape, and its focus lies between Alternatives 2 and 4, and 3 and 6.

Mitigation options include ensuring that the potential and current existence of historic and cultural landscapes and traditional cultural properties are documented during pre-project planning.

Effects of Socioeconomics on Heritage Resources

An indirect impact of the increasing visitation by the public, and the changing cultural demographics of the public, is that the new national forest user (especially people from different parts of the world) may not have the same values or connection to the heritage resources that other national forest users may have. This difference in values could result in indifference or lack of concern for protecting or preserving the heritage resources. Their emphasis may be associated with the purpose to which they are using the national forest, such as recreation.

This indirect effect will be greater in those alternatives that promote greater utilization, such as Alternatives 4 and 5, and will be seen to a lesser degree in those alternatives (such as 3 and 6) that may restrict access or, through special designation, manage large portions of the national forest for single purposes. Alternative 4a provides for a low level increase in the utilization of the national forest, and the facilities to support the increased use. It is expected that the indirect effect would be closer to that of Alternative 3.

An appropriate mitigation measure is an increase in education for the various national forest user groups about the value of the national forest heritage resources and about the legal protection afforded those resources.

Effects of Special Designation Areas on Heritage Resources

The most obvious direct effect of these designations is that they reduce the potential range of activities that can affect heritage resources. Forest plan standard S-33 provides that direction for those SIAs that are designated because of their heritage values. An indirect effect is that some designations could possibly limit the type of historic preservation activities to be used as part of the sound heritage management program (for example, no excavation of the sites for scientific study). Also, management emphasis of some areas (like wilderness) may result in the removal of non-compatible items such as evidence of human presence (historical buildings), which would be considered an adverse effect. Since the knowledge of the national forests' heritage resource base is based primarily on the past program support of other activities, the restriction of those activities limits the ability to increase the knowledge of the heritage resources in these areas.

Those alternatives that increase the acreage of special designations could affect heritage resources more than those alternatives that do not increase or actually reduce the acres of special designations. The acres with high sensitivity for heritage resources for special designations remains fairly constant through Alternatives 1, 2, 4, 4a, and 5, with some increase in Alternatives 3 and 6. Therefore, the overall effect of special designations on heritage resources may not be as great when examined across alternatives (see table 252: High Sensitivity Heritage Acres in Wilderness (Existing and Recommended) by Alternative).

Table 252. High Sensitivity Heritage Acres in Wilderness (Existing and Recommended) by Alternative

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Angeles	250	728	973	272	250	1,105	286
Cleveland	8,885	10,568	14,590	8,973	8,885	15,625	10,464
Los Padres	26,983	28,535	31,279	28,334	26,983	41,502	28,086
San Bernardino	6,916	7,517	18,500	7,703	6,916	10,627	7,868

Effects of Heritage Resources Management on Heritage Resources

Scientific archaeological excavation has a direct effect on heritage resources because it permanently destroys the physical context of the archaeological deposits that cannot be replaced or replicated. Even though the archaeological deposit and its internal contextual relationship are preserved somewhat in the data recording associated with an excavation, there is the potential of scientific information being permanently lost because of limitations of the current state-of-the-art data retrieval techniques.

An increase in scientific archaeological excavations in support of Section 106 of the NHPA would be expected under Alternatives 4 and 5 because of the anticipated increase in ground-disturbing activities (such as recreation development). Alternatives 3 and 6 would provide an increase in scientific archaeological excavation in support of heritage resource enhancing activities; however, this increase would not approach the level expected in Alternatives 4 and 5. The increase in scientific archaeological excavations for Alternative 4a will be between Alternatives 4 and 5, and 3 and 6. The increase will reflect a mix between excavations in support of Section 106 of NHPA and in support of heritage resource enhancing activities.

Effects of Tribal Relations on Heritage Resources

Agreements with tribes and local Native American groups regarding the preservation of archaeological sites (including the prohibition of excavation of certain site types) has the direct effect of preservation of the heritage resource, but it has the indirect effect of the lack of availability of those sites for scientific study, which may affect how knowledge about past cultures and ways of life is increased.

Effects of restricting research on heritage sites will be minimized by close collaboration between local tribes and Native American groups to develop research programs that address the need for information knowledge about past cultures and ways of life, support resource management decisions and address and honor the concerns of the tribes and Native American groups.

Alternative 6 facilitates the highest degree of active Native American participation in the Heritage Resource Program. Alternatives 3, 4,and 4a also facilitate a degree of collaboration. As a result of this collaboration, certain heritage resource site types may not be available for scientific investigation, resulting in a reduction in opportunities to learn about past cultures and lifeways. Alternatives 1, 2 and 5 will offer basically no change.

Effects of Buildings and Grounds Management on Heritage Resources

Approximately 30 percent of the facilities on the national forests are over 50 years of age and can be considered heritage resources. In five years, that number will rise to over 50 percent. The maintenance, reconstruction, remodeling and removal of these facilities are considered to be a direct effect on the characteristics that deem these facilities to be a significant heritage resource.

Indirect effects include the lack of maintenance and any resultant deterioration and destruction of historical buildings. The management of buildings for historical character results in higher maintenance and repair costs to use and fabricate materials in keeping with the character of the historical building. The lack of cohesive facility management for historical buildings, which have no administrative use but figure prominently in the Heritage Resource Management Program, can result in adverse effects on the structures because the lumber and other materials from historical buildings are sometimes scavenged for other buildings, uses or personal use. A beneficial effect on historical buildings is the incorporation of the Built Environment Image Guide into any comprehensive facility master plan. This activity is highly dependent on funding levels. It is anticipated that there will be an increase in buildings and ground maintenance in Alternative 4, where the focus is on improving high-use recreation facilities (including key visitor-related facilities), and in Alternative 5, where excess administrative structures may be offered to the private sector, through appropriate authorization for their use (which may result in changes or alterations to the structure to fit the needs of the permit holder). It is expected that the increase of new construction will be minimal for Alternative 4a with the focus on the maintenance or expansion of existing facilities, many of which are historic.

Mitigation measures in all alternatives include requirements that the above activities would be conducted in compliance with legal mandates and national and agency direction. The development of national forest facility master plans that recognize and incorporate the management of the historical fabric of the buildings helps minimize the impacts of facility maintenance.

Effects of Road Use and Management on Heritage Resources

Given the predominant reliance on the automobile for access to national forests today, public use of an area usually is intense in a zone immediately surrounding developed sites and roads, creating a heavy-use zone for recreation activities (Absher pers. comm.). A study of the location of heritage sites on the Angeles National Forest indicated that 40 percent of known heritage resource sites are located within 100 meters of a road. Yet, when the distance from a road is doubled, the number of known sites increased only an additional 10 percent. This indicates that the majority of the known sites are located within areas easily accessible by travel by current national forest users (Kosakowski 2003). As outlined by Gucinski and others (2000), many of the roads within the national forests are of an age or have associations to qualify as historic heritage resources or part of historic cultural landscapes, such as the landscapes associated with homesteading, ranching or logging.

Maintaining the road, improving road facilities (replacing historical rock retaining walls with cement and metal retaining walls) and upgrading the road can affect the historical character or association from which the road may derive its potential significance. Many roads have rock walls associated with the Civilian Conservation Corps era or architecturally significant bridges, and the retrofitting of the bridges or replacement of the walls and other features has a direct impact on the historical significance of the roads.

Road construction, reconstruction and maintenance of existing roads can directly affect heritage resources because of the associated ground disturbance. Roads can alter the water and sediment runoff to flow onto heritage resources, resulting in erosion that damages the soil matrix. Many Forest Service roads are unsurfaced (dirt) so the continual grading of the roads as part of maintenance continues to affect any heritage resource that the road crosses. Proper maintenance has a beneficial effect on heritage resources by reducing the risk of soil erosion that impacts soil matrices containing heritage sites.

Decommissioning roads has an adverse effect on heritage resources when it eliminates roads that are themselves heritage resources and have important historical associations. The ground disturbance associated with the decommissioning (such as installation of dirt barriers, gates, or ripping of the roadway) will disturb archaeological deposits within and adjacent to the road prism.

Indirect effects stem from increased access. Roads give access to areas previously not easily accessed, resulting in increased vandalism and artifact collecting and in damage to unknown heritage resources. Even upgrading a road will facilitate and increase access to areas with heritage resources. New road construction or improving existing roads can affect areas considered to be sacred or of importance to local communities, may diminish those qualities held to be sacred or important, and has the potential to introduce traffic into an area used for ceremonies, possibly limiting the ability to conduct those ceremonies (see table 253: Alternative Comparison of Road Miles Not Available for Public Motorized Access, page 352).

Based on the land use zones, Alternatives 1 through 5 reduce the opportunity for public access by relatively the same minor amount, while Alternative 6 has the largest amount of access reduction. Due to their themes, Alternatives 4 and 5 could potentially increase access through the incorporation of non-system roads. The larger the reduction of access, the larger the potential to reduce vandalism and heritage resource site damage while increasing access increases that potential for heritage resource site damage. Alternative 4a reduces public access more than the amount reduced in Alternatives 1 through 5. Most of the public access reduction is due to roads designated as Back Country Motorized Use Restricted (BCMUR). Use of BCMUR roads may be administrative or under authorization. This reduction of public access would lessen the potential for vandalism to occur in those areas that were accessed off the previously opened roads. The public that may be given authorization for access (such as tribal members accessing ceremonial areas) could be more sensitive to protecting heritage resources which would be a benefit. Alternative 4a also has fewer acres managed for motorized uses (as defined by land use zones) than Alternatives 1 through 5 (see table 359: Acres Managed for Motorized Uses as Defined by Land Use Zone, page 284).

Effects of Trails, Non-Motorized and Motorized Use and Management on Heritage Resources

Many of the trails within the national forests are of an age or have associations to qualify as historic heritage resources or part of a historic cultural landscape. Construction and maintenance of existing trails can directly affect heritage resources because of the associated ground disturbance. Trail maintenance, reconstruction (for example, replacing historical rock retaining walls with cement and metal retaining walls) and upgrading (for example, upgrading a narrow dirt trail to a wide-tread hardened trail) can affect the historic character or association from which the trail may derive its potential significance. Water run-off and erosion caused by trails can negatively affect the soil matrix containing heritage resources. Heritage resources can also be affected by lack of the appropriate level of trail maintenance through the degradation of the trail, resulting in damage to the trail's historic character or association.

Trails increase access into areas where there might be unknown heritage resources or properly managed known heritage resources, which increases the possibility of vandalism and pot hunting. Use of the trails by foot, hoof and vehicle traffic can further damage heritage resources crossed by trails, through compaction of soils, disturbance of the soil matrix, and damage to artifacts.

These effects are expected to increase in proportion to trail mileage. Non-motorized trail mileage will increase the most in Alternatives 3 and 6, followed by Alternative 4 and Alternative 5. A small increase in National Forest System trails overall rather than maintaining the status quo is expected to occur in Alternative 4a. Alternatives 3 and 6 show a decrease in motorized trail mileage. Motorized trail mileage is expected to increase in Alternatives 2, 4, and 5. In general, effects on heritage resources by motorized trail use are expected to be less in Alternatives 3 and 6, and more in Alternatives 2, 4, and 5 than under current management. Alternative 4a brings forth protection, through zoning modifications associated with Alternative 3 and the process to slowly develop recreation opportunities to reach the Desired Condition associated with Alternative 4. As such the effects are expected to be somewhere between the effects expected for Alternatives 3 and 4.

Effects of Special Forest Products on Heritage Resources

Some types of special forest products management can have an impact on heritage resources. The gathering of plant material from site locations increases the visibility of the heritage resources, resulting in an increased potential for vandalism and site damage. The unregulated management of special forest products allows the public to visit areas not previously inventoried for heritage resources, thus increasing the potential for site vandalism and damage. These effects are greater in those alternatives that promote higher utilization, such as Alternative 5, and are seen to a lesser degree in those alternatives (such as

Alternatives 3, 4a, and 6) that would manage large portions of the national forest under more restrictive land use zoning.

Mitigation measures include use of programmatic agreement standard protection measures as applicable; prior survey of all areas where requests for special forest product collection occur; and, whenever possible, restriction of special forest product collection to areas previously inventoried for heritage resources and found none.

Effects of Non-Recreation Special Uses on Heritage Resources

A broad variety of special uses are authorized including utility corridors, roads or dams and associated facilities. A special use authorization involves a permit, term permit, lease or easement that allows occupancy, use, rights or privileges on National Forest System lands. The increased access or presence of people in association with or attracted to the special uses and associated features has the potential to result in vandalism, site damage, or even artifact theft.

Some special uses (such as communication sites or utility corridors on mountaintops) occur in areas that frequently are the locations of traditional cultural values that may extend over vast areas. Mitigation of adverse effects on these type of properties is particularly difficult and involves extensive consultation with tribal and Native American groups.

Alternate 5 provides for an increase of suitable acreage over the present plan levels, and would have the greatest effect on heritage resources. Alternatives 2 and 4 will provide for a very slight decrease in suitable acreage. Alternative 4a provides for a decrease while Alternatives 3 and 6 provide for a substantial decrease. The management emphasis under Alternative 4a is to expand within existing facilities before developing new facilities when possible.

Effects of Minerals and Energy on Heritage Resources

Modern mining activity often occurs on or within historical mining claims that still have remnants in the form of historical adits, glory holes, mill sites, structures, roads, etc. This results in conflicts between modern mining activities and historical mining features, through adaptive reuse or destruction of the historical mining features. There is a direct effect on surface and subsurface heritage resources from mineral development (for example, mines, processing sites, heavy equipment use, waste piles, holding pits, buildings and roads). Suction dredging affects soil banks that may contain heritage resources as well as evidences of historical dredging.

Programs that identify and reclaim mines and evidence of mining activity (including safety hazard reduction, hazardous material cleanup or protection) require treatments (i.e., closing or collapsing mine shafts, removal of features such as tailing piles, etc.) that can indirectly affect heritage resources by compromising the integrity of the resource. Infrastructure development and use can alter water flow patterns, resulting in erosion of heritage resource sites. Sometimes off-site mitigation (for example, biological) is used for mineral and energy development, and this could indirectly affect heritage resources because these types of locations preferred for mitigation tend to occur within the high sensitivity zone for heritage resources.

Mining (that is, public gold panning or sluicing) sometimes is conducted without permit or regulation oversight and can disturb sensitive areas that may have unknown heritage resources. This results in the uncovering of buried cultural deposits that, once noticed, promotes vandalism and looting.

The public removes rocks from National Forest System land for personal and commercial use. If this activity occurs on a prehistoric heritage resource, there is the possibility of the removal of lithic artifacts, resulting in the loss of contextual information and site damage.

The effects are greatest in Alternative 5, where an increase in mineral and energy development (including oil and gas) can be expected, and in Alternative 1. Because of minerals withdrawals and special designations, Alternatives 3 and 6 will result in an overall decrease in effects on heritage resources by this activity. Alternatives 4 and 4a will have a decrease in effects potentially followed by Alternative 2. The effects associated with these three alternatives will reflect a slight decrease from the current level of effects.

Mitigation measures such as a program of in-depth research of the mining location and public interpretation opportunities focusing on historical mining may result in a beneficial effect to heritage resources.

Effects of Livestock Grazing on Heritage Resources

Effects of livestock grazing can be documented on two levels: impact on the soil matrices in which heritage resources occur, and impacts and damages to artifacts and other cultural remains (Horne and McFarland 1993).

Direct impacts are from fence construction, spring developments, wells, water holes, salt licks, stock tanks, pumps, pipelines, water storage, use of heavy equipment or fire for vegetation type conversions, cattle guards and non-structural projects such as noxious weed treatments, forage improvement and livestock grazing. The actions of the livestock themselves result in chiseling in damp soils; compaction of soil and artifacts by concentration in small areas, such as around water tanks; collapse of stream banks and other soil features that may contain heritage resources; displacement of artifacts (affecting site significance); and the introduction of dung down to a depth of 20 cm, which compromises site integrity and research. Dried dung accumulations can ignite and affect artifacts, which results in the loss of important contextual information (U.S. Army Corps of Engineers 1990).

Indirect impacts include the removal of vegetation and biomass so that visibility and erosion are increased, which can result in vandalism and site damage, respectively (Horne and McFarland 1993, U.S. Army Corps of Engineers 1990). Range improvements such as water and range vegetation improvements provide an environment that promotes the increase of wild herbivores and small mammals that may live in heritage sites and churn up the deposits by their activities. The removal of livestock from areas may constitute an indirect effect, because grazing itself may be an integral part of the historical landscape for a given area.

All alternatives have a reduction in the number of grazing areas and suitable acreage from what is presently available. The reduction is primarily due to the amount of currently vacant acres available by alternative. However, with that said, the effects will be greatest in Alternatives 1 and 5, and least under Alternatives 3, 4 and 6. The effects associated with Alternative 4a would approximate those under Alternative 4.

Effects of Wildland Fire Management on Heritage Resources

Any fire can affect surface and shallow sites depending on the duration and intensity of heat. Fire can burn historical structures, damage artifacts and features, and thermally alter surface and buried artifacts. Wildfires and prescribed fires can cause detrimental effects ranging from dramatic alteration of artifact composition, form and color to the loss of scientific information through destruction of both relative and absolute dating information. Wildland fire also causes the introduction of modern charcoal, carbon and ash into archaeological contexts, which affect the dating of the site.

Perishable artifacts (those that have carbon in their makeup) have virtually no tolerance for fire and will usually receive adverse impacts. Non-perishable artifacts (depending on the artifact type) will tolerate only low- or moderate-intensity fire. Cultural landscapes can tolerate fire intensity that will not cause the introduction of non-compatible elements (such as bulldozed fire lines) or a change in vegetation community (chaparral to grasslands).

Wildfire effects on rock art (a significant heritage resource) include discoloration, soot smudging, rock face spalling and heat penetration, which changes the organic binder materials for painted elements (Kelly and McCarthy 2000). This effect can result from direct heat if fuels are in close proximity or by convention when an advancing fire preheats the rock surfaces.

Fires with cool combustion temperatures generated by sparse understories and light fuels have minimal effect on diagnostic artifact characteristics. Thus, if designed for cool combustion temperatures, controlled burns can avoid major impacts on archaeological sites and artifacts. Prescribed burns can be effectively used to control vegetation on archaeological sites without damage to cultural resources (U.S. Army Corps of Engineers 1989a).

Any type of fire that removes vegetation has an indirect effect because the loss of vegetative protective cover allows for increased visibility of heritage resources, which can result in increased unlawful collecting and excavation. The lack of vegetation can also contribute to an increase in erosion that can damage or destroy the site matrix where heritage resources are located. Fire on any level can result in the loss of ethnographic resources and the disturbance and degradation of traditional plant gathering areas, heritage sites and sacred/spiritual places.

Activities associated with wildfire suppression that cause ground disturbance (such as fire lines, helicopter bases and heliports, base/spike camps and drop points) will directly affect heritage resources. Foam or water applied to hot rock surfaces causes spalling, "potliding" or fracturing that damages archaeological features. Water and retardant drops can damage or destroy historical structures or hasten their deterioration.

Fuelbreaks and other ground disturbances associated with fire protection often provide access into areas that were previously inaccessible, resulting in increased potential for site damage and vandalism. Erosion runoff from these sites can affect heritage resource sites located both within or adjacent to these features.

Due to the present situation with vegetation (substantial tree and shrub mortality caused by the drought conditions over the last six years), an increase in acres burned due to wildfires can be expected even though the number of fire occurrences would be reduced in several of the alternatives. The difference of fire occurrences by alternative is not expected to be significant though in the beginning, Alternatives 4a and 6 would have the smallest number of fires due to substantial gating of roads that are currently open to the public. The focus of Alternative 6 is community protection with 90 percent of the acres to be treated (either through prescribed fire, mechanical means, or herbicides) located next to the communities, within the Developed Area Interface (DAI) zone, which has been identified as usually showing a higher level of human use and infrastructure present. Any fuelbreak work in Alternative 6 would occur in the DAI. For Alternatives 1 through 5, including Alternative 4a, approximately 75 percent of acres treated will occur for community protection, but the other 25 percent as well as fuelbreak work will occur away from the communities. Therefore, Alternative 6 would have the least effect on heritage resources as the potential for ground disturbance in areas that have not already been disturbed or highly sensitive for heritage resources is the lowest. The other alternatives are similar in effects in terms of similar numbers of acres subject to wildland fire and to other vegetative management tools such as prescribed burning, fuelbreak maintenance, and construction and thinning.

Mitigation measures include a program of pre-incident survey of all potential fuelbreaks and other fire suppression-related activity locations. Where heritage resources are found, use programmatic agreement standard protection measures such as project redesign, relocation and monitoring to protect the affected heritage resources. Inventories should also occur on those incident activities not previously inventoried prior to the completion of the incident. Effective treatment measures should be used to rehabilitate fire suppression-related ground disturbance.

Cumulative Effects

Heritage resources (including ethnographic resources and their traditional cultural associations and landscape resources) have been lost or damaged in the national forests through past land management activities (including development of facilities and infrastructure), visitor use and natural events. Many of the activities that are affecting heritage resources are activities that were initiated prior to the implementation of the National Historic Preservation Act of 1966, as amended. Some trails have been in use since the turn of the twentieth century, so the long-term effect of their use on any heritage resource continues, resulting in the gradual destruction of those resources.

The destruction or damage of heritage resources on the national forests means the loss of information important to the understanding of the past (including information lost before the development of better research techniques), loss of interpretive opportunities and the incremental loss of the heritage resource base.

Because of the rapid rate of urbanization, the loss of heritage resources, often unmitigated, is putting greater significance on the heritage resources located in the national forests. The heritage resources on National Forest System lands are afforded a higher level of protection than those resources on private lands; thus, the public looks to the national forest heritage resources as a valued resource. At the same time, given the changing cultural demographics, some national forest users may not see the relevance of national forest heritage resource protection to their cultural norms and values, which impedes the effort to protect heritage resource sites.

Continual vandalism leads to the destruction of sites and irretrievable loss of information. Vandalism removes the most recognizable artifacts (such as projectile points and grinding stones), which causes misidentification of sites and can result in the proposal of management options that are ineffective. The removal of time-sensitive artifacts like projectile points hinders the research potential and the documentation of past cultural groups and lifeways.

With implementation of the protection and mitigation measures provided by legislation, policy and the land management plan, the differences in cumulative effects on heritage resources by authorized activities under the different alternatives should be low. The difference in cumulative effects would be through unlawful activities such as vandalism and unmanaged vehicle use.

Alternatives that result in more acres of planned management activities could reduce cumulative effects, as more acreage would be inventoried for heritage resources resulting in more sites documented and managed.

Adverse cumulative affects result from the advances of time, inadequate or inappropriate maintenance, outright destruction and the steady loss of heritage resources through repeated mitigation of adverse effects rather than intact preservation. This could result in the reduction of heritage resources of a particular type (such as village sites), which diminishes the overall research value of heritage resources on the national forests.

Effects on Tribal and Native American Interests

Direct and Indirect Effects

Applicable laws, policy and direction provide the basis for the direction for tribal relations and issues.

Forest Service activities and special use authorizations will comply with the land management plan. All special-use applications are subjected to environmental review before an authorization is issued. Tribal concerns are typically addressed during project design.

The following assumptions apply in the assessment of the environmental consequences of the activities allowed under the alternatives:

- National Forest planners view the national forests for planned land uses emphasizing resource values, while Native Americans view the national forests as a portion of their spiritual values, lifeways and beliefs.
- Native people have a deep connectedness with the natural environment of the national forests.

- With open space around the national forests disappearing at a rapid rate because of urbanization, the Native American community will look to the national forests to meet their needs.

In all alternatives, management activities proposed could directly, indirectly or cumulatively affect the values that tribes and Native American groups and individuals may have for the land within the boundaries of the national forests.

Developed Area Interface (DAI) and Back Country are the land use zones that allow activities with the potential to most directly or indirectly affect values held to be of importance to the Native American community. Those activities include camping, road maintenance, motorized and non-motorized trails, special-uses, facility infrastructure, livestock grazing, community protection areas and fuelbreak construction. By the nature of its zoning, DAI consists of higher levels of human use and infrastructure present. The acreage for this land use zone remains fairly consistent throughout Alternatives 2 through 6, with Alternative 1 having approximately 1/3 more DAI acres than Alternatives 2 through 6. In contrast, the Back Country zone changes across the alternatives, and will be used for the alternative comparison (see table 305: Back Country Land use Zone Acres by Alternative).

Table 305. Back Country Land use Zone Acres by Alternative

Forest	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Angeles	270,255	308,914	181,047	321,671	469,459	123,063	161,392
Cleveland	203,839	191,066	119,903	192,307	301,481	57,578	77,063
Los Padres	720,079	723,119	301,139	733,086	881,723	138,153	332,050
San Bernardino	328,029	313,580	213,978	346,604	472,471	135,445	169,785

It is apparent that Alternatives 6, 4a, and 3 would have the potential for the least direct effect on Native American values because they have the fewest Back Country acres, while Alternative 5 would potentially have the greatest direct effect. The differences between Alternatives 1, 2 and 4 are negligible (under 5 percent except for the Angeles National Forest where there is less than a 8 percent difference in acreage when compared to the total national forest acreage). In Alternatives 2, 3, 4, 4a, and 6, there will be an increase of special interest areas focusing on heritage resources values, which would increase opportunities for the protection, enhancement and public enjoyment of values of concern to the American Indian community.

All alternatives accommodate traditional and contemporary uses of the national forests; however, Alternatives 1 and 2 would be more reactive compared to other alternatives that would focus on the conservation, protection and restoration of resources of concern. Alternative 5 focuses on resolving conflicts between other national forest users and those practicing traditional uses. Opportunities for contribution of traditional knowledge to sustainable national forest management would increase under Alternative 6. Government-to-government relations increase in Alternatives 2 through 6, with Alternative 6 having more focus on Native American participation in the national forest management process.

The current lack of information is the limiting factor in the assessment of environmental consequences of national forest activities on those items of concern to local tribes, Native American groups and individuals. The desired information centers on the type of resources used (plants, stone, etc.), resource locations, and the relationship of the natural environment to native people. Fundamental baseline inventory data are limited, usually available on a project-specific basis and not on a landscape level. This is further accentuated by the hesitancy of the American Indian population to share information with the national forests out of concern that the information will not remain confidential and the resources of concern will be damaged or destroyed.

Native Americans view their space within the national forests as a participant, not as a manipulator or manager, which is the view of non-indigenous cultures. Any alteration, such as ground disturbance, that is permanent and not in harmony with the environment would be an adverse effect in the Native American view.

They are also concerned about impacts on heritage resources that are associated with their ancestors and other indigenous people who lived in the area of the national forests. The discussion of environmental consequences and effects under the Effects on Heritage Resources section that is applicable to Native American heritage resources applies here and will not be repeated. Growing emphasis on Native American input to the management of the national forests has the possibility of broadening the understanding and awareness of historical ecosystem management.

Refer to the discussion under heritage resources for issues of concern to Native Americans as they relates to archaeological heritage resources. Any activity that results in alteration or the introduction of non-natural elements into the natural environment could be an issue of concern to the tribes and to Native American groups and individuals. Any activity that will promote, improve, preserve or restore the natural environment and natural features, or promote the fabric of harmonious environment interactions, would probably not be viewed as an issue of concern. Any activity that promotes the ability to access the natural open space of the national forests would be more acceptable to tribes and Native American groups and individuals, compared to those activities or management directions that restrict access to the natural open space of the national forests.

Effects of Vegetation Management, Insect Pests and Disease on Tribal and Native American Interests

Healthy and diverse vegetation has the potential to provide for a range of plants that Native Americans use for a variety of cultural reasons. Although invasive species pose a threat to a healthy vegetation community, certain treatment activities pose environmental consequences that may be considered adverse by the Native American community. The use of pesticides (including herbicides) along with the off-site movement of chemicals can result in the contamination of basket plants or other plants of traditional or cultural concern, and potential exposure to basketweavers. Studies show that herbicide residues are detectable in plants of interest to Native Americans located not only within areas treated with herbicides but also outside those same areas (Segawa and others 1997). The plants that are eliminated by herbicide spraying are often the same plants that provide Native people with traditional foods and teas and are used in baskets and for healing, ceremonial and other traditional purposes (California Indian Basketweavers Association 1994). The issue of concern to the Native Americans is one of poisons being present, regardless of levels, within the environment with which they interact and rely on for materials and practices important to their concept of being.

The use of pesticides on private and public lands is of utmost concern to California Indian basketweavers because of the harmful effects their use may have on the health of Native American plant gatherers and communities, as well as on the health and vitality of the environment. The use of pesticides may result in areas of the national forests being avoided or material not collected by Native American plant gatherers and communities. This could have the effect of restricting or altering traditional lifeways or practices that are associated with the national forests and indigenous cultures. All of the alternatives provide for the use of pesticides (Carbaryl, Sporax, Trichlopyr, Glyphosate), with their use and application designed to be-site specific with the appropriate level of environmental analysis. The risk assessment in Appendix O. Pesticide Risk Assessment identifies the risks associated with pesticide use as well as the Best Management Practices (BMPs) to minimize the risks to the natural environment.

Prescribed burning may directly damage or destroy heritage resources and other values held to be of significance by contemporary cultures, and it may alter landscapes important to traditional cultural beliefs or practices.

Mitigation measures suggested by the Native American community include focusing on land management activities to hinder the spread and establishment of invasive species. To be effective, eradication should include the correction of the chronic human-related land disturbance activity responsible for the conditions that facilitate the establishment of invasive species, and it should restore the native vegetation and natural disturbance regime (including fire). The use of alternative methods of plant control such as hand weeding or hand-removal (though potentially costlier) reduces the concerns about the use of herbicides as a vegetation management tool. If herbicides are chosen as a treatment option, then, during the site-specific analysis, consultation with tribes and Native Americans would emphasize identifying areas of concern for avoidance, identifying alternative methods of eradication to minimize any effects to areas of concerns, and focusing herbicide use in areas of lower sensitivity for items of concern for the tribal and Native American community.

Effects of Biodiversity Management on Tribal and Native American Interests

Wildlife is an important part of Native American lifeways as a food source, and certain animals figure prominently in their traditional worldviews and cosmologies. Agency policies (both federal and state) on National Forest System lands (such as the taking of bears identified as public threats) may conflict with their values and in their view are not appropriate management practices and do not incorporate the proper respect.

Protection programs (including species strategies) for wildlife and botanical species (including threatened, endangered, proposed, candidate and sensitive species) may affect the ability for Native Americans to practice traditional lifeways that today may not be reserved in treaty rights, by restricting access or use of the wildlife. Habitat protection measures including closures may deny Native Americans access to ceremonial areas or other areas of cultural concern.

Mitigation measures include pre-planning collaboration with the local Native American community to identify issues and effects associated with proposed activities.

Effects of Land Ownership and Adjustment on Tribal and Native American Interests

The acquisition of land through land exchange is a beneficial effect. It may provide access for Native Americans to national forest resources of importance. It may open natural areas that had previously been under private ownership or public lands to which access was hindered by other land ownership. The loss of natural-appearing land through land exchange may reduce the opportunities for Native Americans to practice traditional and contemporary lifeways.

In all alternatives, overall National Forest System land would increase, chiefly through consolidation, which has the potential to be a beneficial effect. The only variation by alternative would be the emphasis for the land management program. In Alternative 4a, the focus will be primarily toward consolidation of land within the national forest boundary, which should promote access as well as the protection of species habitat and the preservation of wildlife corridors, all of which is held as important by the Native American community.

Construction, reconstruction or maintenance of authorized land uses, easements, utility corridors and associated facilities may result in increased access. The increased access can (in association with the easements and utility corridors) affect the condition of national forest resources important to the Native American community, as well the ability to practice ceremonies and other traditional lifeways. These authorizations may also restrict access to certain areas, which may reduce the opportunities for Native Americans to practice traditional and contemporary lifeways.

Mitigation measures include collaboration with the local Native American community to identify issues and effects associated with proposed activities, both authorized and unauthorized, and to develop partnerships to provide resolution of any conflicts.

Effects of Recreation Management on Tribal and Native American Interests

Substantial population growth in southern California is expected in the next 20 years, resulting in an increase of visitation by 15 percent to 20 percent. Accordingly, use is expected to be more intense at existing sites and areas already heavily used, to increase at those sites and areas currently being lightly used, and to shift to those times of the year that have traditionally been low use (such as spring and fall). This will result in competition for currently used areas while increasing the presence of people into new areas on a level not presently seen, which could impact the ability of Native Americans to gather traditional and contemporary valued resources and practice ceremonies where privacy and solitude is essential.

Developed recreation has an indirect effect by introducing people and vehicles into an area that may result in a park-like setting rather than a natural setting. Sometimes the use of areas for dispersed recreation is in conflict with areas held to be of spiritual and cultural importance to the Native American community, such as Mt. Pinos and its associated winter snowplay opportunities on the Los Padres National Forest. Native Americans see the large influx of people using the area for winter snowplay as contributing to the degradation of the spirituality of the mountain; however, proposals by the national forest to manage the use in terms of capacity limits and support facilities are also seen by Native Americans as contributing to the degradation of the spirituality of the mountain, because such management will inevitably attract more people to the area (McCarthy 1995).

Some trail features follow the routes of earlier American Indian trails. Trails provide access into areas, possibly creating conflicts between national forest users desiring open space and Native Americans desiring areas to use for ceremonies that rely on privacy and solitude.

Alternative 4a emphasis is for a low level increase of recreation use and the facilities to support that use. In areas of resource conflict, Appendix D of the forest plans (Adaptive Mitigation for Recreation Uses) will be implemented. The focus is on using and improving areas that are currently being utilized to provide for sustainable use before constructing new facilities when possible. The effect of Alternative 4a would be less than Alternatives 1, 2, 4, and 5 while not low as Alternatives 3 or 6.

Mitigation measures include collaboration with the local Native American community to identify issues and effects associated with proposed activities (both authorized and unauthorized) and development of partnerships to provide resolution of any conflicts.

Effects of Law Enforcement on Tribal and Native American Interests

Unauthorized/unrestricted vehicle use increases the loss of open space that provides solitude. Uncontrolled trail proliferation and unauthorized open use affect both the condition of national forest resources important to the Native American community (ground disturbance-caused damage) and the ability to practice ceremonies and other traditional lifeways. This unauthorized use also permits the introduction of noise, which can affect ceremonies and other activities.

Effects of Scenery Management on Tribal and Native American Interests

The Native American community feels a close association with cultural and historical landscapes. Any activity that promotes scenery management and aims to maintain the feeling of the natural landscape would have a beneficial effect. Any alteration or permitted degradation of scenic integrity from more natural settings may affect potential cultural or historical landscapes or traditional cultural properties. Other than Alternative 1, the alternatives generally maintain a high degree of natural-appearing landscape (defined by the percentage of acres in the very high/unaltered and high/appears unaltered scenic integrity objectives). Alternative 5 (which has the largest variation of natural-appearing acres among national forests) would allow more reduction in those acres that are natural-appearing. Alternative 4a maintains the natural appearing landscape, and the degree of that maintenance of natural appearing landscapes resides between Alternatives 2 and 4, and Alternatives 3 and 6.

Mitigation measures include maintenance of the existence and potential of historical and cultural landscapes and traditional cultural properties, through documentation during pre-project planning, and consultation with appropriate tribes, Native American groups and individuals.

Effects of Special Designation Areas on Tribal and Native American Interests

Alternatives that increase the acreage of special designations and increase the natural appearance of the landscape are of greater value for spiritual, ceremonial and other uses by Native Americans. On a whole, those areas that are not zoned for special designations are usually assigned to a land use zone that may allow a range of activities that could affect values held to be of importance by the local Native American community (such as Back Country). Using wilderness special designation as an example, table 304: Wilderness Acres (Existing and Recommended) by Alternative (page 423) shows that even though the acreages for the designation vary by alternative, the acres remain constant in Alternatives 1 and 5, with some increase for the national forests in Alternatives 2, 4a, and 4, and the largest increase in Alternatives 3 and 6. However, some special designations may actually reduce or limit the type of access into areas, which may affect the ability of the Native American community to access areas for the practice of traditional and contemporary lifeways.

Effects of Heritage Resources Management on Tribal and Native American Interests

Archaeological excavation (whether scientific or vandalism-motivated) has adverse effects on values held by tribes and Native American groups and individuals. There is concern about the destruction of evidence of previous generations, including the removal of burials. Some tribes and Native American groups and individuals are opposed to any form of excavation. There is also conflict between the information disclosure nature of the Heritage Resource Management Program and the confidential nature of the information that the tribes and other Native Americans see as essential to the maintenance of their way of life. There is expected to be an increase in scientific archaeological excavation for Alternative 4a from the current level. The increase will be between the increases expected for Alternatives 4 and 5, and Alternatives 3 and 6.

Mitigation measures include the development of collaborative strategies and memoranda of agreement with tribes and local Native American groups and individuals on the appropriate level of investigation, the treatment of the resources and protection of sensitive information.

Effects of Socioeconomics on Tribal and Native American Interests

Documentation presented elsewhere indicates that the national forests can expect the following trends:

- Decreasing number of whites and American Indians in conjunction with an increasing number of Hispanics and Asians, which will bring different traditions (including characteristics of open settings); and
- Decreasing population of American Indians in conjunction with an increasing population of Hispanic and Asian peoples will result in the use of different botanical products for medicinal and other purposes.

Any management activity that will promote different traditions or use of different botanical products may result in an indirect effect of precluding or restricting opportunities for Native Americans to practice traditional lifeways. This could affect their current lifestyles, environment and quality of life.

This indirect effect will be greater than those alternatives that promote greater utilization, such as Alternatives 4 and 5, and will be seen to a lesser degree in those alternatives (such as Alternatives 3 and 6) that may restrict access or, through special designation, manage large portions of the national forests for single purposes. Alternative 4a provides for a low level of increase in the utilization of the national forests and the facilities to support the increased use. It is expected that the indirect effect would be closer to that of Alternative 3.

Mitigation measures include developing ongoing collaboration and planning with the Native American community to identify resources and opportunities to promote the preservation and enhancement of those resources. Also, the development of education programs geared to the different national forest user groups will help develop respect for the use of national forests by other cultural groups.

Effects of Roads on Tribal and Native American Interests

Many ceremonial locations, cemeteries, traditional gathering areas and heritage resource sites located in the national forests contribute to the American Indian community's way of life, identity, traditional practices and cohesiveness. Roads sometimes provide essential access to many of these areas. Reduction of roads limits access by contemporary cultures to areas of cultural concern and importance; however, the Back Country Motorized Use Restricted zone is designed to allow tribal access to areas of cultural concern and importance while still restricting access to other publics. Less tangibly, but no less important, roads often affect areas that American Indians or other groups consider sacred, because roads may limit people's ability to conduct ceremonies that require privacy and may even diminish the sacred qualities of such places (Gucinski and others 2000). Based on their land use zones, all alternatives reduce road miles available to the public for access with Alternative 4a reducing the road mileage more than the amount reduced in Alternatives 1 through 5 (see table 253: Alternative Comparison of Road Mileage Not Available for Public Motorized Access, page 352). Due to their themes, Alternatives 4 and 5 could potentially increase public motorized access through the incorporation of non-system roads.

Mitigation measures include the identification of areas of concern, including the roads themselves, to local groups and individuals. Obtaining information about sacred places and other places of concern from some American Indian groups is difficult because Forest Service styles of communication and negotiation are often incompatible with these cultures, and revealing sacred values and identifying sacred places to outsiders may be thought to imperil the values in need of protection. The use of Native Americans as part of Forest Service information requests might help facilitate the collaboration between groups and sharing of information critical to help determine sound management decisions.

Effects of Buildings and Grounds on Tribal and Native American Interests

In many cases, buildings and grounds are found in the same locations that have been utilized by other cultures in the past. Ongoing administrative activities have the potential to effect values in those areas that are held by Native Americans by disturbing heritage sites or altering visual connections to a location. Facilities also have the potential to restrict access by Native Americans to other locations of the national forests.

Mitigation measures include collaboration with the local Native American community to identify issues and effects associated with facility management, and the development of measures to resolve any conflicts.

The use of herbicides in and around facilities and administrative compounds would trigger the same issues as the use of herbicides for vegetation management. Native Americans currently gather plant material from some of the administrative sites within the four southern California national forests.

The mitigation measures highlighted in the vegetation management activity section would apply here and perhaps could result in more labor-intensive practices to manage weeds.

Effects of Special Forest Products Management on Tribal and Native American Interests

The inconsistency of management for the collection of special forest products results in confusion and often barriers to the collection of forest products that have social or cultural importance to the Native American community. An increasing Hispanic and Asian population using the national forests brings different traditional values regarding national forest use that may conflict with other current and historical cultural uses. The increasing population diversity is resulting in an increased use of different botanical products for medicinal and other purposes and, sometimes, competition for the same forest product.

Mitigation measures include developing management practices consistent with the National Strategy for Special Forest Products (USDA Forest Service 2001), as well as consultation and collaboration with tribes and local Native American groups and individuals to identify areas and opportunities for protection and enhancement of special forest products considered of importance to the Native American community. Education messages that focus on the groups and populations who engage in the use of special forest products (regarding proper collection levels and the fact that other groups also have an interest in special forest products) are also mitigation measures.

Effects of Non-Recreation Special Use Authorizations on Tribal and Native American Interests

Some special use authorizations may restrict access to areas used by Native Americans for traditional and contemporary uses. The authorizations may also introduce foreign visuals such as communication sites that may occupy landscape features (such as peaks) that may be an integral part of the cultural landscape.

Alternate 5 provides for an increase of suitable acreage over the present plan levels, which means there is the potential for greater access restrictions, and would have the greatest effect on heritage resources. Alternatives 2 and 4 will provide for a very slight decrease in suitable acres. Alternatives 4a provides for a decrease while Alternatives 3 and 6 provide for a substantial decrease. The management emphasis under Alternative 4a is to expand within existing facilities before developing new facilities when possible. This will minimize the potential for Native American access to be restricted from additional areas beyond the present situation.

Mitigation measures include collaboration with the local Native American community to identify issues and effects associated with proposed activities (both authorized and unauthorized), and to develop partnerships to provide resolution of any conflicts.

Effects of Minerals and Energy on Tribal and Native American Interests

There are currently an estimated 1,650 mining claims on record with the Bureau of Land Management in the four southern California national forests. Most claims are small in size (about 20 acres) and are owned by individual prospectors who are not full-time miners. Large-scale mining occurs in sand and gravel operations and high-grade limestone deposits. These operations could affect the natural appearance of the landscape, introduce noise and people into areas and possibly contribute hazardous material into the environment.

Oil and gas leases (when developed) introduce foreign elements into the landscape in the form of derricks, roads, and pipelines. Geothermal potential has been identified for the four southern California national forests but to date there has been little interest. However, elsewhere in the state (such as Medicine Lake in northern California), development of geothermal sites has conflicted with Native American values and areas of sacredness and ceremonial importance (Pena 2003).

Mitigation measures include collaboration with the local Native American community to identify issues and effects associated with mineral and energy development and development of measures to resolve any conflicts.

Effects of Livestock Grazing on Tribal and Native American Interests

The grazing of livestock in areas that are considered to be of importance (such as traditional cultural properties) by the Native American community could constitute an introduction of a foreign element within the landscape context that defines why the area is special to Native Americans; however, grazing is recognized as an income-producing economy and Native Americans hold some of the current livestock grazing allotments on the Los Padres National Forest (Montgomery pers. comm.). Grazing does have the potential to have indirect impacts on significant cultural sites (Horne and McFarland 1993).

All alternatives have a reduction in the number of grazing areas and grazing areas and suitable acreage from what is presently available. The effects would be greatest in Alternatives 1 and 5, and least under Alternatives 2, 3, and 4. Alternative 6 would have the least effect as it has the greatest reduction in suitable acres available for grazing. The effects associated with Alternative 4a would approximate those under Alternative 4.

Mitigation measures include collaboration with the local Native American community to identify issues and effects associated with grazing, and development of measures to resolve any conflicts.

Effects of Wildland Fire on Tribal and Native American Interests

Due to the present situation with vegetation (substantial tree and shrub mortality caused by the drought conditions over the last six years), an increase in acres burned due to wildland fires can be expected even though the number of fire occurrences are expected to be reduced in several of the alternatives. The difference of fire occurrences by alternative is not expected to be significant, though. Initially Alternatives 4a and 6 would have the smallest number of fires due to substantial gating of roads that are currently open to the public.

Wildland fire can cause the disturbance and degradation of traditional plant gathering areas, heritage sites and sacred/spiritual places, as well as the loss of ethnographic resources. If not properly managed, prescribed fire can have the same results; however, with proper management prescribed fire can be used to help promote the propagation of selected species of plants (basketry plants) important to the Native Americans.

Fire of any nature may alter landscapes important to traditional cultural beliefs or practices. An indirect effect of wildland fire is an increase in access created by the removal of vegetation. This access could bring an increase in use to areas essential to Native Americans as places for solitude or privacy.

Mitigation measures include working with the Native American community to identify issues and concerns to be incorporated into the pre-project planning for suppression and hazard fuels projects. The development of an on-call cadre of fire-line-qualified Native American resource advisors would help lessen the potential effects of wildfire and suppression activities on landscape values and on specific sites and areas of concerns.

Effects of Wildland Fire Protection on Tribal and Native American Interests

The focus of Alternative 6 is community protection, with 90 percent of the acres to be treated (either through prescribed fire, mechanical means, or herbicides) located next to the communities within the Developed Area Interface (DAI) land use zone, which is described in Chapter 2 (Land Use Zones) as usually showing a higher level of human use and infrastructure present. Any fuelbreak work in Alternative 6 would occur in the DAI. For Alternatives 1 through 5, including Alternative 4a, approximately 75 percent of acres treated will occur for community protection, but the other 25 percent as well as fuelbreak work will occur away from the communities. Therefore, Alternative 6 would have the least effect on tribal resources, as the potential for ground disturbance in areas that have not already been disturbed is the lowest, and most of the visual impacts would occur in areas already impacted by development. The other alternatives are similar in effects in terms of other vegetative management tools such as prescribed burning, fuelbreak maintenance, and construction and thinning, and the location of some of those activities in areas outside the DAI.

Wildland fire suppression and fire protection programs (community defense zones) have the potential to introduce foreign visuals (fire lines, etc.) into a traditional landscape that may be integral to traditional or contemporary ceremonies and practices.

Fuelbreaks and other ground disturbances associated with fire protection often provide access into areas that were not previously accessible by vehicles, resulting in increased potential for loss of privacy and solitude or for the unauthorized collection or destruction of important resources.

Mitigation measures include working with the Native American community to identify issues and concerns to be incorporated into the pre-project planning for suppression and hazard fuels projects. The development of an on-call cadre of fire-line-qualified Native American resource advisors would help lessen the potential effects of wildland fire and suppression activities on landscape values and on specific sites and areas of concerns.

Cumulative Effects

Due to the rapid rate of urbanization, the loss of natural open space outside the national forests' boundaries is putting greater importance on the natural open space located inside the national forests. The natural open space within the national forests is afforded a higher level of protection than those resources on private lands, and thus the Native American community looks to the national forests' natural open space as a valued resource. The continuing reduction of the natural open space within the national forests results in the loss of opportunities for Native American communities to continue to practice traditional and contemporary lifeways and to connect to values held in importance.

Cultural landscapes are the result of human adaptation and the use of natural resources. Ethnographic resources are features of a landscape that are linked by members of a contemporary community. Any use or activity that results in alteration of the landscape affects the viability of the cultural or ethnographic landscape to promote the values held to be of importance to a community. Over time, this could result in a loss of landscape and values, affecting the long-term viability of traditional cultures and lifeways.

As the cultural demographics of the national forest user continue to change, the cultural relativity of Native American traditional practices to the new national forest user (based on their own cultural norms and values) may result in unmitigated impacts to the areas and resources held to be critical to the Native American community. If these impacts increase over time because of lack of management, then the long-term viability of traditional cultures and lifeways will be in question.

Effects on Recreation

Direct and Indirect Effects

Recreation will be managed in accordance with recreation opportunity spectrum (ROS), land use zones, strategies and standards.

Visitor use will inevitably grow over time in the southern California national forests. We estimate a visitor growth of approximately 15 percent to 20 percent to occur over the next 15 years. More intense use will occur at existing sites and areas, and new and additional use will occur at those sites and areas that are now only lightly being used or not used at all. As the popular sites and areas fill to their capacity levels, more use will shift from the heavier summer season to spring, fall and, to some degree, winter.

Also of importance is how the demographics of the population and the national forest visitor will change over time. Visitors will be more diverse and will have changing expectations of recreation opportunities; there will be increasing differences in visitor perceptions arising from their differing world-views, leading to greater challenges for agency managers to provide quality recreation opportunities. More Hispanic visitors are expected, especially in those hot-spot forests and places near urban centers. It is expected that currently popular southern California short-term day-use recreation activities, including driving for pleasure, picnicking, hiking, nature viewing and water play, will continue to increase more than traditional backcountry extended-duration activities such as dispersed camping and hunting. Demand is expected to outstrip supply for these popular recreation activities in some areas at certain times of the year. Agency managers will face ever-increasingly difficult decisions about recreation management and resource protection conflicts.

Because more people now live in urban areas, wildland recreation skills of visitors will continue to erode, leading to more safety and liability concerns and search-and-rescue operations. Also, emerging technologies will continue to create new uses with as yet unknown impacts; however, it is clear that conservation education and partnerships will play vital roles in the health and stewardship of the national forests.

In summary, recreation visitation and use will increase in all alternatives; however, the location, type, rate and intensity will vary in complex, interconnected ways.

Recreation visitation and use has different effects on the natural environment. These effects depend on timing of the use, sensitivity of the location, use intensity and specific behaviors of recreationists. Furthermore, recreation is just part of the equation when considering impacts on ecosystems; natural events, including the current drought in some of the national forests, and other human-caused events, including urbanization, play a large role as well. These factors in turn influence recreation. For example, increasing numbers of people may desire to visit the national forests to recreate, but their decisions may be negatively affected if the character of the national forest changes over time (more dead trees because of drought and/or wildfire) or if there are seasonal restrictions on use of fire and access.

Conflicts among users may increase as available space becomes more crowded, where incompatible uses are not separated, or where desired opportunities are not available. Because of the diverse desires for outdoor recreation activities, experiences may be affected by behavior or mode of travel by other recreational users in the same area. Examples of these effects are horseback riding, mountain biking, and hiking; off-highway vehicles and nature watching; and alpine skiing and snowboarding. Non-motorized recreationists seeking solitude from the noise of motorized activities or people desiring group or family associations may conflict with individuals seeking solitude or testing their independence and backwoods skills.

However, new technology such as quieter, cleaner-running motors in off-highway vehicles might be used in the future to actually reduce conflicts between users. Also, user behavior could be modified through conservation education to reduce some types of conflicts and resource impacts. And facilities and trails may be designed, built and maintained to better protect sensitive resources and enhance recreation opportunities. Because desired uses vary considerably, each alternative has general advantages for certain groups of users while being less desirable for other groups. Conflicts between uses and natural resources protected by existing legislation (such as the Endangered Species Act) will occur. Alternatives vary in the potential for these conflicts depending on which activities are allowed, where and when.

Effects of LMP Decisions on Recreation Setting

Decisions in the land management plan revision to allocate areas of the Angeles, Cleveland, Los Padres, and San Bernardino National Forests to different land use zones will affect recreation visitation and use to some extent in each alternative. The quantity, quality and distribution of recreation opportunities depend on the mix of recreation opportunity spectrum (ROS) classes available. In this broad-scale, general analysis, land use zones and their mapping rules model for ROS classification for alternative comparison as follows:

Land Use Zone	ROS
Existing and recommended wilderness (EW/RW)	Primitive
Back Country Non-Motorized (BCNM)	Semi-primitive non-motorized
Back Country Motorized Use Restricted (BCMUR)	Semi-primitive non-motorized with some Roaded Natural and Semi-primitive motorized
Back Country (BC)	Semi-primitive motorized, Roaded Natural, with some Rural
Developed Area Intermix (DAI)	Rural and Roaded Natural
Critical Biological (CB)	Varies
Experimental Forest (EF)	Semi-primitive non-motorized and Semi-primitive motorized

The ROS classifications reflect the overall theme and character expressed by the land use zones, as such the character of recreation varies by alternative and the setting maintained for recreation activities and facilities varies. Alternative 1 continues the current mix of settings; Alternative 2 has only minor adjustments to reflect the wilderness additions; Alternatives 3 and 6 settings reflect more natural, open space preservation; Alternative 4 reflects a mix of settings but more developed in nature; Alternative 4a provides more natural, open space setting preservation and a recreation character that maintains the niche of the national forest landscapes in providing the recreation activities; and Alternative 5 provides a mix of settings but the least natural, open space area.

Recreation may substantially affect the natural setting (depending on facilities), site mitigations, user behaviors, user densities, site capability, design and many other factors, some of which vary by alternative. Alternative 1 continues existing management; Alternative 2 reflects minor modifications to the land use zones and the addition of recommended wilderness (RW); Alternatives 3 and 6 propose substantially more RW and Back Country Non-Motorized (BCNM); Alternative 4 proposes less RW and more BCNM and Back Country (BC); Alternative 4a proposes less BC, more BCNM, RW similar to Alternative 4, with a Back Country Motorized Use Restricted zone (BCMUR) that is managed primarily as a BCNM zone; and Alternative 5 proposes no RW but the most BCM. Some places would have more land use zone changes by alternative than others. For details, see table 333: Comparison of Alternative Acres by Land Use Zone, page 26. In light of the population growth projections, visitor use is expected to continue to increase, causing some peak season visitors to be displaced or unable to find their desired recreation setting or opportunity, especially in the popular places.

In the original land management plans, roadless areas were analyzed and recommended for wilderness designation or for further evaluation. In this land management plan revision, inventoried roadless areas are analyzed and recommended for new wilderness or additions to existing wilderness designation, Back Country Non-Motorized zones (equivalent to semi-primitive non-motorized ROS), or Back Country zones (usually equivalent to semi-primitive motorized ROS). Recommendations for these inventoried roadless areas vary according to alternative themes. Designation of a Back Country zone in some alternatives was usually made to address specific connectivity issues associated with national forest off-highway vehicle trail systems. Designating some of the inventoried roadless areas as semi-primitive motorized could facilitate the development of long-distance motorized trail riding opportunities by allowing linkage of existing isolated or unconnected trails for vehicles measuring 50 inches or less in width.

Effects of Forest Plan Decisions on Visitor Use, Participation and Satisfaction

Barring unforeseen circumstances, a substantial population growth in southern California of 20 percent is forecast during the next 15 years. A general, parallel trend is estimated for this analysis. Recreation demand of the southern California national forests will increase approximately 15 percent to 20 percent during this time period.

Visitor use, participation and satisfaction levels will vary by alternative but are difficult to quantitatively describe and predict because of their inherent complexity and unpredictability. This analysis will describe how the Forest Service would, in different ways, plan, provide and manage opportunities for up to a 20 percent projected increase in visitor demand for all alternatives unless otherwise stated below. Most visitors at this time are white, male and middle-aged. This is expected to change over time for all alternatives to reflect with greater accuracy the changing, diverse demographics of southern California (see the Social and Economic Environment section for more information).

Visitor participation is expected to vary by alternative. Most visitors now participate in recreation activities that involve driving for pleasure, viewing natural features and wildlife, walking and general relaxation. That mix of opportunities would generally remain the same for Alternative 1; there would be a greater emphasis on motorized recreation in Alternative 5 and a greater emphasis on non-motorized recreation in Alternatives 3 and 6. Alternative 4 would provide the most emphasis on all types of recreation as would Alternative 4a, although Alternative 4a would not accommodate as much of the projected demand. Alternative 2 would emphasize a mixture of recreation opportunities. Some motorized and developed recreation opportunities would be lost or foregone in Alternatives 3 and 6 if road systems were reduced and/or if campgrounds and picnic areas were closed to reduce resource impacts.

Satisfaction throughout all alternatives would be mixed, mostly depending on which activities would be available to which user groups and how well the national forests accommodate increased visitation growth. Under all alternatives, as the diversity of recreation visitors increases, satisfaction of users becomes more contingent upon a successful environmental and conservation education program including specifics such as where to go, what to do, and information to create a sense of welcome. As management focus remains on the sustainability of the recreation setting and the national forest niche of nature based activities, cooperation and partnerships with local communities and other recreation providers will be required to provide a full range of recreation opportunities.

Effects of Forest Plan Decisions on Developed Recreation

The combined design capacity of all major developed sites within the southern California national forests (excluding downhill ski areas) is currently 46,462 persons-at-one-time (PAOTs). The Angeles, Cleveland and San Bernardino National Forests have considerably increased their developed recreation capacity since the original land management plans were approved, leading to a province-wide average increase of 27 percent. The Los Padres National Forest slightly decreased its developed recreation capacity.

The national forests have identified the following recreation areas or complexes (multiple facilities where recreation is a management focus), which will remain in all alternatives:

- Angeles National Forest - Big Pines, Chilao, Crystal Lake, Little Rock, Pyramid;
- Cleveland National Forest - Mt. Laguna;
- Los Padres National Forest - Mt. Pinos, Rose Valley, Lower Santa Ynez, Figueroa, Arroyo Seco; and
- San Bernardino National Forest - Barton Flats, North Shore.

Operational capacities are being reached and exceeded at some popular facilities now (see table 104: Major Developed Recreation Sites Capacity, page 248). Given a projected 15 percent to 20 percent growth estimate during this land management plan revision for developed recreation use, many more facilities (especially large, urban-proximate, more developed sites during the summer season, weekends and holidays in the popular forests and places) would reach and exceed this limit in the next 15 years, especially in Alternatives 1, 2, 3, 4a and 6. It is estimated that each alternative will vary in providing for developed recreation (including actual or estimated capacities in PAOTs) during the life of the plan as follows:

Alternative 1 - Existing situation. Continue intensive control strategies at a few key locations, including closure and/or removal of sites and reconstruction of others, to protect sensitive environmental resources. 46,462 PAOTs.

Alternative 2 - Reconstruction of existing degraded facilities and construction of new facilities to accommodate a partial amount of the projected recreation demand in an environmentally sustainable way. Favors more intensive use controls to minimize conflicts among users and with sensitive environmental resources. Invests in proactive mitigation to allow use levels to continue. Estimate 5 percent increase of capacity. 48,785 PAOTs.

Alternative 3 - Modification of existing facilities (no new construction) to better protect sensitive resources coupled with decommissioning of recreation facilities and individual sites that negatively affect sensitive resources. Maximum visitor capacity controls and proactive environmental design to minimize impacts are implemented. Estimate 5 percent decrease of capacity. 44,139 PAOTs.

Alternative 4 - Reconstruction of existing degraded facilities and construction of new facilities to fully accommodate all projected recreation demand in an environmentally sustainable way. Favors more intensive use controls to minimize conflicts among users and with sensitive environmental resources. Invests in proactive mitigation to allow use levels to remain high. Estimate 20 percent increase of capacity contingent upon new public-private partnerships and other funding sources, because this capacity increase cannot be funded by the Capital Improvement Program (CIP) alone. This is the only alternative that is projected to meet future recreation demand and is also the most costly alternative. 55,754 PAOTs.

Alternative 4a - Reconstruction of existing degraded facilities and construction of new facilities to accommodate a partial amount of the projected recreation demand in an environmentally sustainable way. Favors more intensive use controls and expansion within existing sites to minimize conflicts among users and with sensitive environmental resources. Invests in proactive mitigation to allow use levels to continue. Reconstruction and improvements to meet demand will be incremental and remain ongoing with an estimated 5 percent increase of capacity. 48,785 PAOTs.

Alternative 5 - Reconstruction of existing degraded campgrounds and picnic areas and construction of new campgrounds and picnic areas to fully accommodate projected demand focused specifically for motorized recreation users. There are minimal use controls designed to reduce conflicts among users and with sensitive environmental resources. Investments in mitigation are few, made reactively to allow recreation use to continue as fully as possible with few restrictions. Estimate 10 percent increase in capacity contingent upon new public-private partnerships and other funding sources because this capacity increase cannot be funded by CIP alone. 51,108 PAOTs.

Alternative 6 - Modification of existing facilities (no new construction) to better protect sensitive resources coupled with decommissioning of some recreation facilities and individual sites that negatively affect sensitive resources (including those within CB zones) and where some facilities can no longer be accessed because of the closure of all of the level 2 road system to public vehicle use. Maximum visitor capacity controls and proactive environmental design to minimize impacts are implemented. Estimate 10 percent decrease in opportunities. 41,816 PAOTs.

Both the means of funding the deferred recreation facility maintenance backlog and the national forest CIP (which is the primary funding mechanism to rehabilitate and construct developed recreation facilities and sites) are outside the direct scope of the land management plan. However, the varied developed recreation emphases of the alternatives would be carried out by varying the type of projects prioritized for funding, as described in more detail in Appendix L - Visitor Use and Participation (NVUM).

The limitations of developed recreation infrastructure will affect recreation use in all alternatives, particularly over time. With the current high use levels at some sites, further deterioration of infrastructure is likely, especially in Alternatives 1, 3 and 6. The most popular sites are already at design capacity and exceed operational capacity on weekends and holidays, while vacancies remain during other times. Development of new sites, especially in Alternatives 2, 4, 4a and 5 could help meet demand from the growing population but may not reduce the over-use of popular sites. Without an increase in developed sites, visitors may be displaced during peak use periods. Typically these displaced visitors seek their preferred experience in an undeveloped site in the immediate vicinity of the developed site or find alternatives in nearby areas. This increases the potential for resource damage in the surrounding area and impacts on other visitors. Because of the need to maintain existing heavily used recreation facilities and the potential impacts on less disturbed areas of the national forests, developed recreation capital investments are now and in the near future far more likely to be applied to the reconstruction and sustainability of existing facilities rather than construction of new recreation sites.

There will be a gradual trend in which the national forests shift toward construction and conversion to more day-use facilities rather than overnight campgrounds. This would happen the most in Alternatives 3, 4a and 6. To protect the rustic experience, it is anticipated that campground site density will not increase in any alternative. The need for site-specific environmental planning and the lack of room to build out at many locations will hinder overall developed recreation facility capacity growth, even in Alternatives 2, 4, 4a and 5. Also, there is an opportunity to develop some public-private funding sources to supplement appropriated funds to build new and improve existing developed recreation sites. A major challenge agency managers face is the expected growth in the popular national forests and places, where much of the recreation infrastructure is already built out. Those more remote locations where new developed recreation facilities might be constructed in the future are not those areas where most visitors have the time, inclination and access to (because these areas are usually on more primitive roads). Concessionaires (through special use authorizations) currently manage 22 percent of the developed recreation sites and contribute to rehabilitation and improvements through a fee-offset program. The percentage of concessionaire-managed facilities is expected to remain similar in all alternatives.

Effects of Forest Plan Decisions on Dispersed Camping

Decisions in the land management plan revision to allocate areas of the Angeles, Cleveland, Los Padres and San Bernardino National Forests to different land use zones will affect dispersed camping to some extent in each alternative. The quantity, quality and distribution of dispersed camping opportunities depend on the mix of land use zones available and local decisions made by each national forest based upon public safety, resource protection and fire danger. A broad-scale, general analysis was conducted to describe and estimate the availability of potential dispersed vehicle camping opportunities by national forest land use zone in each alternative.

This analysis shows that approximately 2 percent of the total National Forest System land base in southern California is available for potential dispersed vehicle camping. The analysis illustrates that the total acreage of potential dispersed vehicle camping does not vary much by alternative or by national forest. What does vary is where those acres are located in land use zones. Fewer acres were available for dispersed vehicle camping in the motorized zones in Alternatives 3 and 6 and more in the other alternatives; Alternatives 3 and 6 had more acres available in non-motorized land use zones. Opportunities listed in the existing wilderness, recommended wilderness, Back Country Motorized Use Restricted and Back Country Non-Motorized zones are those within ¼-mile of a public use road and do not mean that vehicles are allowed to drive there. Also, although the model displayed Critical Biological zones as one of the land use zones in which potential dispersed vehicle camping could occur, it would not be encouraged by the Forest Service and would be subject to site-specific restrictions. Although acres are included from the wilderness, recommended wilderness and Critical Biological zones, it is reasonable to conclude that these locations are less likely to receive dispersed vehicle camping use.

The Los Padres National Forest has, by far, the largest potential dispersed vehicle camping opportunity with almost 31,000 acres, followed by the San Bernardino National Forest at almost 22,000 acres. The Cleveland National Forest at 3,000 acres and the Angeles National Forest at 2,000 acres trail far behind in this opportunity. For the most part, this is a reflection of the sheer size of the Los Padres National Forest, along with its rural backcountry. The Angeles National Forest (although extensively roaded) has the steepest terrain, the most urban influences and the fewest opportunities. As might be expected, most opportunities are offered in the Back Country zone in each alternative for every national forest (except the Angeles National Forest in Alternative 1).

It is anticipated that the current trend of mostly light use and fewer visitors participating over time in this activity will continue; all alternatives should provide sufficient dispersed vehicle camping capacity for the life of the forest plan. Therefore, the alternatives were differentiated on the basis of potential land use zone changes, not by increasing or decreasing the number of campers or acres of opportunity. However, some site-specific areas will continue to receive more intensive use and impacts than many others, especially as overflow to developed sites during summer, weekends, holidays and hunting season.

Alternative 1. Existing situation. Most national forests are open to some level of dispersed vehicle camping in many locations. Approximately 74 percent of the opportunities exist in the Back Country zone.

Alternative 2. The general theme would be to offer a partial accommodation of dispersed vehicle camping to meet some projected recreation demand in an environmentally balanced way. Most opportunities are still in the Back Country zone, but a very small amount of new acreage is now shown in the recommended wilderness and Critical Biological zones, and somewhat fewer acres are offered in the Developed Area Interface.

Alternative 3. The general theme would be to implement more environmental protections for dispersed camping. The major change in this alternative is the shift in acres between Back Country Non-Motorized (more) and Back Country (less).

Alternative 4. The general theme would be to offer a full accommodation of all dispersed camping to meet all projected recreation demand. Fewer acres are shown for the Developed Area Interface zone. There would be fewer dispersed camping restrictions, with more site-specific mitigation of resource impacts.

Alternative 4a. The general theme would be to offer a managed partial accommodation of dispersed vehicle camping to meet a low level of projected recreation demand increase in an environmentally balanced way. Most opportunities are still in the Back Country zone, but a very small amount of new acreage is now shown in the recommended wilderness and Critical Biological zones, and somewhat fewer acres are offered in the Developed Area Interface

Alternative 5. The general theme would be to offer a full accommodation of dispersed camping to meet all projected motorized recreation demand. No Back Country Non-Motorized, recommended wilderness or Critical Biological zone acres are shown, and most acres are now in Back Country. There would be the fewest dispersed camping restrictions of any alternative and the most unclassified road system available, allowing more use and access.

Alternative 6. The general theme would be to implement more environmental protections and monitoring for dispersed camping. Also, some dispersed vehicle camping sites and areas would no longer be accessible because of decommissioning part of the of level 2 transportation system. Most acres are now shown in the Back Country Non-Motorized, recommended wilderness and Critical Biological zones, and fewer acres in the Back Country zone.

Dispersed camping offers a unique recreation opportunity in a mostly urban southern California, one in which visitors may more closely enjoy nature and have solitude and privacy. However, there are also resource impacts associated with this activity. Most of these resource impacts result not from dispersed camping itself but rather from unauthorized off-road driving and road creation to the campsite. This is a major threat to the viability of a number of plant and wildlife species, riparian areas and water quality. Other concerns include littering, sanitation, the potential for wildland fire starts from unattended/abandoned campfires and vehicle exhaust systems, the difficulty in making fire prevention contacts when the campsite is well-hidden from the road, the spread of undesirable plants, and soil compaction and erosion. These concerns would be greatest in Alternatives 4 and 5, and least in Alternatives 3 and 6.

As visitor numbers continue to increase, and without concurrent increases in traditional developed campground capacity, the need for site designation and some minor level of development to protect resources in heavily used dispersed camping and play areas is clear. Some increased use from dispersed camping is due to overflow from developed campsites, but most is because dispersed car campers prefer the solitude along more primitive roads. As other users competing for the same space displace visitors, they may move to undisturbed areas, expanding impacts to vegetation, watershed and wildlife resources. Conflicts with resources result when dispersed camping affects sensitive plants, animals, or watersheds. Site development could include such actions as hardening and designating existing undeveloped campsites to reduce impacts to soil and vegetation resources, installation of fire-safe campfire rings or installing portable toilets to address sanitation issues. More of this type of action is expected in the future with all alternatives except Alternatives 1 and 5. These actions are site-specific in nature and may further displace some visitors who prefer little or no evidence of management. The dispersed camping program in the southern California national forests is more expensive to operate than other national forests because these sites are actually more like highly-used low-level developed facilities than they are to true seldom-used, more remote dispersed sites elsewhere. They require frequent cleaning, repair and trash/ash removal. Some sites are so popular that they can be reserved in advance, which is another cost of operation not normally associated with this program. The need for dispersed vehicle camping sites depends, to some degree, on the location, amount and development scale range of existing developed recreation facilities. Fewer dispersed vehicle camping sites are needed if there are plentiful low-level development scale recreation facilities.

Effects of Forest Plan Decisions on Driving for Pleasure

Visitors will continue to enjoy driving for pleasure under all alternatives. They will seek out opportunities to explore and understand the national forests. Scenic byways will remain the premier opportunity for visitors to experience the most scenic areas of the national forests on high-speed state routes. No new scenic byways are proposed for any alternative; however, corridor management plans may be prepared and implemented for existing scenic byways.

Alternative 1. The existing scenic roadways will remain; however, interpretation and development of the stories along these routes will be slow and will occur when opportunities come up. Rural routes will remain and be used as visitors discover them. Visitor demand and quality expectations would not be met.

Alternative 2. There will be similar results as in Alternative 1; however, there would be some improvement in the quality of opportunities because of increased road maintenance and interpretation along existing designated scenic routes.

Alternative 3. The focus of interpretation efforts under this alternative would be on the ecosystems along the routes; however, the availability of driving for pleasure will not be altered. There would be no development of the rural routes under this alternative.

Alternative 4. This alternative would establish a proactive management approach to this activity. Scenic byway corridor management plans would be established, with partnerships and stewardship expanding as a result. A formal system of rural routes would be developed with the possibility that networks of travel ways being promoted as opportunities for driving for pleasure would increase. Visitor demand and the quality of the experience would be met.

Alternative 4a. This alternative would establish a proactive management approach to this activity. Scenic byway corridor management plans would be established, with partnerships and stewardship expanding as a result. A network of driving for pleasure opportunities would be utilized to educate visitors about the unique ecosystems of southern California, from Big Sur to Baja. A formal system of rural routes would be developed with the possibility that networks of travel ways being promoted as opportunities for driving for pleasure would increase.

Alternative 5. The consequences under this alternative are similar to Alternative 4; however, the setting would change somewhat as the focus is placed on commodities in addition to motorized recreation activities.

Alternative 6. The consequences are similar to Alternative 3, except that some of the level one, Back Country, less traveled roads used for driving for pleasure may be closed or converted to trails. Some developed sites may become more difficult to reach.

Effects of Forest Plan Decisions on Wildlife and Nature Viewing, Snowplay, Water Play, Hang-Gliding, Rock Climbing

No specific locations were identified by the four southern California national forests for emphasis or new development of water play, hang-gliding or rock climbing. The San Bernardino National Forest identified a need for new dispersed snowplay sites in Alternatives 2, 4, 4a and 5, although none were specifically named or located; other national forests did not. Capacity is difficult to quantify, however; all these activities are expected to receive somewhat greater agency attention and focus in Alternatives 4, 4a and 5, and to some degree, Alternative 2. Opportunities would be somewhat less in Alternatives 3 and 6, especially if roads and/or developed recreation sites were to be restricted or closed. These uses will be allowed in all alternatives in all land use zones, except hang-gliding as described below: motorized access to hang-gliding take-off spots in Back Country Non-Motorized (BCNM) and motorized access to hang-gliding take-off spots and hang-gliding itself in existing and recommended wilderness (RW). Of the hang-gliding take-offs listed in table 261: Hang Gliding Take-offs in southern California National Forests, page 255, the specific sites that would be affected in this way within the Los Padres National Forest are Wild Cattle (BCNM in Alternative 6); Pine Mountain South (BCNM in Alternative 2 and RW in Alternative 6); and Nordoff Ridge (Nordoff Peak and Chief's Peak, BCNM in Alternative 6). Within the San Bernardino National Forest, Black Hawk is zoned within BCNM in Alternative 6. In all recreation activities, access methods would vary by land use zone.

These dispersed recreation opportunities offer vibrant outdoor experiences in a mostly urban southern California in which visitors may relax, enjoy nature and participate in personal challenge and sport; however, there are also impacts associated with these activities. These include littering, sanitation, soil compaction and erosion, trampling of vegetation, wildfire starts, and disturbance of riparian, stream, and lake ecosystems. Other impacts are social in nature, such as the perception of overcrowding or parking and trail conflicts with other visitors or residents.

As wildlife and nature viewing are widespread and mostly unrestricted, each alternative is expected to provide sufficient capacity for this activity. Alternative 5 would provide the greatest motorized access for visitors, but this might cause greater disturbance and crowding in some locations at some times of the year. Alternatives 3 and 6 provide the greatest non-motorized access and wilderness designation; fewer visitors might be able to view more wildlife and ecosystems that are less disturbed by humans. Conservation education opportunities for wildlife and nature viewing are greatest in Alternatives 2, 3, 4, 4a and 6. Conservation education and development of NatureWatch opportunities would be a critical element of Alternative 4 and 4a in its attempt to increase recreation use in a sustainable manner while protecting resources. There are numerous opportunities for development and identification of NatureWatch opportunities on all national forests. The San Bernardino National Forest has identified 19 specific locations where existing recreation use areas could be improved to take advantage of the NatureWatch opportunities. These areas could be improved under all alternatives depending on the funding and alternative emphasis.

Snowplay and water play are also widespread and mostly unrestricted. Each alternative is expected to provide sufficient capacity for these activities. Exceptions to this would occur in Alternatives 3 and 6, when access and use might be restricted or closed in some locations to reduce resource impacts.

Rock climbing is very localized and would not change by alternative.

Effects of Forest Plan Decisions on Recreational Target Shooting

Given the urban setting, recreational target shooting areas in the southern California national forests are often near areas, roads and trails occupied by residents and visitors. It also means that a heavier volume of shooting activity occurs than is the case in other national forests far from large urban populations. Therefore, concerns have become apparent and are expected to continue in southern California that would require an increasing level of shooting activities management in all alternatives based upon the criteria of safety of participants and the general public.

Environmental protection is another issue. It encompasses a broad variety of concerns, including trash left behind from targets, spent shells, trash dumping, direct damage to live trees and vegetation from being used as a target, ignition of wildland fires from either legal or illegal ammunition, lead from spent bullets or shot, general destruction of riparian and/or threatened and endangered species habitat, and shooting or disturbance of wildlife. Disturbance of nearby residents, national forest visitors and wildlife by the sound of gunfire is also a concern.

The following tables display scenarios of recreational target shooting opportunities that were developed for each national forest by alternative for the purpose of this analysis:

Table 273. Angeles National Forest Recreational Target Shooting by Alternative

Target Shooting	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Gun Clubs	2	2	2	2	2	2	2
Concessionaire	2	2	2	2	2	2	2
Designated Areas	0	0	0	0	0	0	0
Rest of Forest	closed	closed	closed	closed	closed	closed	closed

Table 274. Cleveland National Forest Recreational Target Shooting by Alternative

Target Shooting	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Gun Clubs	0	0	0	0	0	0	0
Concessionaire	0	0	0	0	0	0	0
Designated Areas	2	0	0	1	1	0	1
Rest of Forest	closed	closed	closed	closed	closed	closed	closed

Table 275. Los Padres National Forest Recreational Target Shooting by Alternative

Target Shooting	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Gun Clubs	2	2	2	2	2	2	2
Concessionaire	0	0	0	0	0	0	0
Designated Areas	3	1	1	4	4	1	3
Rest of Forest	most	closed	closed	closed	closed	closed	closed

Table 276. San Bernardino National Forest Recreational Target Shooting by Alternative

Target Shooting	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Gun Clubs	2	2	2	2	2	2	2
Concessionaire	1	1	1	1	1	1	1
Designated Areas	5	5	0	5	5	0	5
Rest of Forest	most of San Jacinto District	most of San Jacinto District	closed	most of San Jacinto District	most of San Jacinto District	closed	most of San Jacinto District

Table 277. Totals - Recreational Target Shooting by Alternative

Target Shooting	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 4a
Gun Clubs	6	6	6	6	6	6	6
Concessionaire	3	3	3	3	3	3	3
Designated Areas	10	6	1	10	10	1	9
Rest of Forest	most of San Jacinto District and LPNF	most of San Jacinto District	closed	most of San Jacinto District	most of San Jacinto District	closed	most of San Jacinto District

The revised forest plans identify areas where recreational target shooting is allowed. Shooting opportunities would remain constant in Alternative 1, fewer shooting opportunities would be offered in Alternatives 3 and 6, and more shooting opportunities would be offered in Alternatives 2, 4, 4a and 5. For those alternatives where recreational target shooting opportunities remain constant or decrease over time, it is expected that shooting would be displaced onto other lands (both public and private) as an unauthorized activity with subsequent adverse social and resource effects. In addition, it is anticipated that recreational target shooting opportunities would be managed with more environmental restrictions in Alternatives 3, 4, 4a and 6 than in Alternatives 2 and 5; however, public safety concerns would not be compromised in any alternative.

The national forests have recognized the seriousness of public safety and resource protection concerns for years and have taken steps to more intensively manage recreational target shooting. As a result, many areas of the national forests have already been determined to be unsuitable for shooting. Existing shooting ranges (concession sites and gun clubs) under special-use authorization will not be displaced by land management plan direction.

Effects of Forest Plan Decisions on Hunting and Fishing

Hunting and fishing opportunities will continue in all alternatives. Because Alternatives 3 and 6 have more restrictions on motorized access, future hunting and fishing use is projected to increase at a lower rate than in Alternatives 2, 4, and 4a. Hunting and fishing are projected to increase the most in Alternative 4 because of an emphasis on meeting demand, while Alternative 4a will provide a balance of opportunities and higher quality because of the emphasis on sustainable recreation. Fishing and hunting quality will be higher in Alternatives 3 and 6 because of a decrease in crowding, overharvest, harassment and poaching resulting from less road access. Alternative 5 will provide increased access, but game populations may not be as abundant because of the possibility of overharvest, harassment and poaching. Quality of the experience and success will not be as great as in other alternatives. The increase in fuels management (resulting in a more open forest) should benefit most game species and improve hunting opportunities in all alternatives. The greatest improvement in habitat from fuels management and other habitat restoration will be in Alternative 3 and 6. Individual volunteers and hunting, fishing and conservation groups will continue to be a substantial influence in maintaining hunting and fishing opportunities and forest health in all alternatives.

Effects of Forest Plan Decisions on Recreation Residences

There is no difference among alternatives with regard to effects on the 1,709 currently authorized recreation residences in 62 tracts. Management of these areas under permit would be consistent with revised forest plan direction.

Effects of Forest Plan Decisions on Winter Sports

Winter sports opportunities of downhill skiing and snowboarding, Nordic skiing and snowplay do not vary by alternative and are the same as described in the affected environment section. No new winter sports areas or expansions of existing facilities are proposed in any alternative. The former Snow Forest Ski Area on the San Bernardino National Forest would remain closed and would be reverted back to general National Forest System lands.

Effects of Forest Plan Decisions on Conservation Education and Partnerships

Conservation education and partnership programs and projects would continue to be an emphasis in all alternatives. Partnerships with other agencies, groups and private support organizations will continue to be a method used to meet recreation demand. These programs and projects remain extraordinarily beneficial to the Forest Service, partners and the public, varying slightly by alternative theme.

Alternative 1 would continue the current minimal level of programs and projects. Alternative 2 would substantially increase conservation education and partnerships, and the national forests would enlist the support of local communities, partners and volunteers to strongly promote a stewardship ethic and enhance visitor services in a balanced manner. Alternative 3 would develop a maximum use of conservation education and partnerships, and the national forests would strongly promote a stewardship ethic focused on biodiversity. Alternative 4 would substantially increase the use of conservation education and partnerships, and national forests would enhance visitor services while also promoting a stewardship ethic. Alternative 4a would provide an integrated approach to the use of conservation education, promoting partnerships, community participation, visitor services and a strong stewardship ethic that would help manage use by providing the basis of understanding about the sustainability of the landscape and the human role within that landscape. Public communication would go beyond information and knowledge information in order to provide successful change in behaviors. Alternative 5 would have a minimal use of conservation education, with an emphasis on reaching visitors participating in motorized recreation. Alternative 6 would develop a maximum use of conservation education and partnerships, creating a substantive and wide-ranging program. This would include an expansion of partnerships, targeted youth programs and promotion of environmental literacy and international education, leading to a greater appreciation of the national forests as biodiversity reservoirs.

Effects of Biodiversity Management on Recreation

Wildlife management can directly affect recreation opportunities. Timing restrictions, seasonal closures during sensitive periods and prescribed burning to improve habitats can temporarily displace recreationists to other areas. Recreational benefits from wildlife management could include increased hunter, angler and wildlife viewer satisfaction.

Effects on recreation from threatened, endangered, proposed, candidate and sensitive species would be consistent in all alternatives because of the Endangered Species Act, Forest Service direction, and other policies that require threatened, endangered, proposed, candidate and sensitive species protection. Impacts from management of these species may include seasonal road restrictions, total closures, vegetation manipulations to improve habitat, or structural improvements. Recreation activities likely to be affected may include closure and/or relocation of developed facilities and dispersed areas to protect threatened, endangered, proposed, candidate and sensitive species. More of these impacts would occur in those places with major threatened, endangered, proposed, candidate and sensitive species populations. Alternatives 3 and 6 place the greatest emphasis on wildlife and plants and threatened, endangered, proposed, candidate and sensitive species programs, while Alternative 5 places the least emphasis.

Effects of Vegetation Management on Recreation

major ecological change is occurring due to record drought, more than 100 years of wildfire suppression, and dense over-stocked, weakened stands of trees that are now susceptible to bark beetle mortality (see Vegetation Condition and Forest Health and Effects on Vegetation sections). Even lower-elevation hardwood and chaparral stands are affected. This situation is centered in the San Bernardino National Forest, especially in the Lake Arrowhead, Big Bear, Barton Flats, San Gorgonio Wilderness and Idyllwild areas. It is also seen in portions of the Angeles and Cleveland National Forests. Stand-replacement fires are predicted to occur within the next 15 years over vast areas of dead vegetation, resulting in intense fires that will be difficult to suppress. The affected area is the heart of the recreation program for the San Bernardino National Forest and has the potential to dramatically affect visitor perceptions of physical settings, personal safety and recreation opportunities. Settings are rapidly transitioning from dense stands of mature, large-diameter conifers to large numbers of dead and dying trees (many of which around communities are being treated by removal and/or burning) to more open landscapes of younger trees, hardwood and brush.

A great number of Forest Service developed recreation facilities lie within these affected areas and are at risk of structural damage or destruction from wildfires. Occurrences of wildfires are not predictable under any alternative. Visitor use frequency may change, and in the short term there would be fire restrictions and closures. Changes to various aspects of visitor satisfaction are unknown at this time.

Vegetation removal would have impacts on the perceptions of the scenic integrity that visitors expect. Many visitors are expected to express sorrow and dismay at the ecological changes now underway in the national forests, especially when their favorite places are affected by loss of large trees, shade and cool temperatures. Conversely, there is also a window of opportunity for the Forest Service and partners to develop and implement a major conservation education program that informs and educates residents and visitors about long-term wildland fire safety and forest health.

Vegetation management (in this case removal of dead trees and thinning) has the potential to affect recreation experiences and opportunities in several ways. Short-term effects may include increased noise, dust and smoke levels; landscapes altered by differing types of tree removal; the presence of slash piles, burned areas and roads constructed for mortality removal sales and service contracts; and conflicts with logging trucks on roads used by other drivers or by bicyclists. Displacements of wildlife viewing opportunities and area restrictions or closures during operations are other possible effects. Hunting opportunities may be affected in the short term because of closures, but they may benefit in the long term from stand and habitat improvement treatments. Users may be temporarily displaced to other locations because of log truck traffic and the noise from chainsaws.

All alternatives propose the same high emphasis on community defense treatments. Tree removal and road building can create long-term changes to the landscape, resulting in changes to physical settings. Partial cutting could lessen the impacts on recreationists. Recreational benefits from vegetation management can include new roads and trails and the opportunity to gather firewood. In some cases, recreationists then use roads built for mortality removal operations, although these roads typically are closed and/or obliterated after completion of the sale or contract. Road development for timber management purposes in undeveloped areas has the potential to attract more visitors to the interior of the national forests where access previously has been limited. As use increases, visitors would experience less solitude and remoteness. Primitive and semi-primitive non-motorized settings could change to semi-primitive motorized and roaded modified settings.

Effects of Special Designation Areas on Recreation

Recreation would be affected by the proposed designation of new wilderness, wild and scenic rivers (WSR), research natural areas (RNA) and special interest areas (SIA). In general, recreation opportunities become more restrictive as National Forest System land receives special designation. For example, motorized and mechanized opportunities are lost when an area is designated as wilderness. More special designations are proposed for Alternatives 3 and 6, fewer in Alternatives 2, 4 and 4a, and few to none in Alternatives 1 and 5.

Opportunities for primitive non-motorized recreation will increase in roadless areas recommended for wilderness designation. These areas offer the best opportunities for solitude, the absence of motorized or mechanized vehicles and lack of human developments. Areas that are recommended for wilderness would be managed in a similar manner as those lands currently designated as wilderness. Visitation to new wildernesses may increase somewhat as more people seek out the values for which they were established. Visitation in most existing wilderness is expected to increase regardless of alternative. Corresponding increases in recreation-associated impacts to wilderness resources can be expected.

In all alternatives that recommend wilderness, there would be a decrease of the primitive and semi-primitive recreation opportunities outside of wilderness. Roadless areas that are assigned other land use zones will be managed for the recreation opportunities appropriate to the assigned land use zone. The settings are usually semi-primitive non-motorized in character; development would tend to shift the settings toward the semi-primitive motorized experience. Alternative 5 has the most opportunities for additional motorized activities. Some of the proposed areas have the potential to develop important new recreation opportunities, such as trails and campsites. Trail construction, reconstruction and maintenance within new wilderness would be more costly because of reliance on primitive tools. Finally, it is recognized that additions to the National Forest Wilderness System carry significant intangible values that are difficult to quantify, including values for an appreciation of open spaces and natural beauty; for nature's healing to the human imagination and spirit; for solitude, serenity, and spiritual renewal; and simply for the knowledge that wild places are wild and will remain that way forever.

Existing use of new wild, scenic and recreational rivers is continued, but new uses and developments may be restricted according to classification and corresponding management requirements of that river segment. On the Angeles, Cleveland, and San Bernardino National Forests, all rivers found eligible for wild and scenic river designation would be protected pending suitability study; therefore, the effects are constant in Alternatives 2 through 6.

On the Los Padres National Forest, recommended WSR mileage varies by alternative. The alternatives with the most recommended WSR mileage (especially wild or scenic class rivers) most protect natural resources from the effects of recreation development and use. Congressional designation of all or part of recommended suitable rivers could lead to an increase in river-related recreation, because designation would likely make the rivers more attractive day-use destinations and provide positive social effects for those people who enjoy river-based recreation such as native trout fishing.

The Forest Service does not specifically market research natural areas (RNAs) for recreation use; however, existing low levels of motorized and non-motorized recreation use would be allowed as long as the use does not become a threat to the values for which the RNA was proposed. No developed recreation facilities are allowed.

In contrast, special interest areas (SIAs) are designated and marketed for public use and enjoyment. Existing levels of motorized and non-motorized recreation use would be allowed as long as the use does not become a threat to the values for which the SIA was proposed. Developed recreation facilities are allowed; conservation education efforts would be made a high priority; and current levels of hiking, hunting, camping and other related dispersed uses by the public would be allowed to continue. A management plan is developed after designation.

Effects of Lands (Real Estate) on Recreation

Recreation use in some areas is currently adversely affected by lack of rights-of-way to National Forest System lands through non-National Forest System lands. This can restrict recreationist access to their national forests and also restrict management activities such as roads or trails maintenance. Alternatives 4, 4a and 5 most strongly emphasize addressing this need and would have the most positive effect on acquiring access.

Effects of Socioeconomics on Recreation

Differences among alternatives may affect local and regional tourism and economies because of varying levels of recreation opportunities provided by alternative, although the anticipated effects are minor and not on a regional scale. Furthermore, differences are diminished because for some opportunities, such as developed ski areas, there is no difference among alternatives.

Effects of Roads and Trails on Recreation

Recreation would be affected by new roads and highways in all alternatives. Cutting of vegetation and road building can create long-term changes in the landscape, resulting in changes to the recreation habits of visitors. Semi-primitive settings could potentially be converted to more urban settings. Recreation uses may be permanently disrupted or discontinued. There may be major auditory impacts, resulting in lost opportunities for solitude.

Recreation is also affected by the quality and size of the transportation system. Visitors may be dissuaded from driving a backcountry road or hiking/biking a trail if they find the maintenance inadequate or if there are safety concerns. This is especially true in the spring, when roads and trails may be in rough shape from the effects of winter and downed trees. Alternative 5 proposes the largest transportation system, and Alternative 6 proposes the smallest transportation system. Road density is greatest in the Big Bear

Backcountry and other similar Places. Over time, the trend has been a gradual decrease in the mileage of system roads and a gradual increase in the mileage of unclassified roads and trails. This is indicative of the recreation pressures that accompany increased population growth and the development of new motorized and mechanized technologies. The San Bernardino National Forest has the most unclassified roads with 671 miles, and the Angeles National Forest has the least with 137 miles. Another impact is the growing commuter traffic and safety issues for visitors and sightseers along some of the state highways that are designated as Forest Service scenic byways, including the Rim of the World, Palms to Pines and Angeles Crest highways.

Effects of Non-Recreation Special Uses and Water Uses on Recreation

Recreation would be affected by utility corridors in all alternatives. The Angeles National Forest has the greatest number (742) of non-recreation special use authorizations covering the largest area (20,496 acres), and the Cleveland National Forest the smallest number (362) of non-recreation special use authorizations covering the smallest area (4,592 acres). Alternative 5 would have the highest level of non-recreation special uses and commodity production, and Alternatives 3 and 6 would have the least.

Recreation is similarly affected by dams, impoundments and water diversions in all alternatives. Facility construction could create long-term changes in the landscape. Semi-primitive settings could move toward the urban end of the spectrum. Water diversions can considerably reduce the quality of the recreation experience, especially in Front Country places associated with streams and water features. Recreation benefits from dams, impoundments and water diversions could include increased water-based recreation opportunities downstream if adequate flow levels are ensured, along with hunting, fishing and wildlife-viewing opportunities.

Effects of Minerals and Energy on Recreation

Recreation would be affected similarly by mineral exploration and extraction in all alternatives, with more activity expected in Alternative 5 than the other alternatives. The largest-scale mineral impacts are felt within the Desert Rim and Big Bear Backcountry Places of the San Bernardino National Forest for industrial limestone mining. Non-motorized settings could potentially change to motorized settings. Short-term effects may include noise and visual impacts from open-pit mining operations. In the long term, effects may include a change to roaded and developed from a more naturally appearing landscape; new permanent open pit mines and physical structures; and new roads and road corridors constructed for the drilling operation. These new roads may or may not be open for foot, equestrian, motorized and mechanized use, which sometimes creates confusion for the recreating public.

The degree to which oil and gas activities such as exploratory drilling, oil and gas field development and other activities involving the construction of roads, well sites and other facilities would affect national forest visitors depends on the type of opportunity and setting present. More activity is expected in Alternative 5 than the other alternatives. Most oil and gas impacts are felt within the Los Padres National Forest; there are 22 oil and gas leases on 15,000 acres that contain about 180 wells and associated facilities. The Sespe Oil Field and Ojai areas have 96 percent of the wells, and 4 percent are in the South Cuyama Oil Field.

The impacts associated with the drilling of a single exploratory well could adversely affect the setting associated with the Back Country and non-motorized opportunities. These impacts would be of relatively limited area and short duration, and once drilling and reclamation are completed the impacts would not be considerable; however, some evidence of human activities would be present for a long period. These impacts may be of relatively high intensity and long duration if they are associated with oil and gas field development and the subsequent production of oil and gas. The impacts associated with a producing oil and gas field could last 20 to 30 years or more.

In many cases, oil and gas activities can be shielded from areas popular for recreation use so that development is less evident to visitors. New or improved roads constructed for oil and gas activities could enhance motorized recreation activities, if after site-specific analysis they remain in place and open. In the case of a non-productive exploratory well, the road and well pad may be decommissioned and reclaimed or the road could be managed as open for new access. A producing oil and gas field would have a system of well-developed roads. In that case, visitors would experience some oil and gas-related traffic. Short-term noises of drilling and the potential long-term noise from pumping and odors of gas production could negatively affect users near an oil production site.

Effects of Livestock Grazing on Recreation

Decisions for livestock grazing made in land management planning will have little effect on recreation, given that changes to livestock grazing management that would affect recreation are implemented through allotment management planning and permit actions. There will be little difference in effects on recreation from grazing by alternative with the exception of Alternative 5, which emphasizes commodity production. The Los Padres National Forest (with the most rural backcountry) has the most active range management program of any of the four southern California national forests, with 102 allotments, 12 livestock areas, and 27 administrative pastures; the Angeles National Forest (the most urban-proximate national forest) has the least active range management program, with six allotments and one livestock area.

Effects on recreation from livestock grazing include visual impacts (removal of vegetation tops and remaining stubble, trampled vegetation and stream banks, manure, fences, and other range improvements), auditory impacts (sounds of domestic livestock, especially sheep), and olfactory impacts (smells of animals and animal wastes). Conflicts can occur between visitors and livestock or with the dogs used by permit holders to control herds. Recreationists who prefer a livestock-free experience yet choose to visit areas that are actively grazed most keenly hold these concerns, although visitor satisfaction surveys do not identify any areas where conflicts with grazing are currently an issue for recreationists. A positive effect of livestock grazing is the developed water resources that are available for equestrian recreation users. Site specific conflicts between livestock grazing and recreation use are resolved utilizing the Adaptive Mitigation for Recreation Uses protocol, (Appendix D in Part 3 of the forest plans).

Effects of Wildland Fire Management on Recreation

Fuels management effects on recreation are similar to the effects described under vegetation management. This may cause an increase in fire extent, creating a more visible and long-lasting change to the setting. The degree of these effects is difficult to determine. Prescribed fire has some level of predictability for time, location and intensity, which may decrease the short-term impacts on visitors.

Cumulative Effects

The Angeles, Cleveland, Los Padres and San Bernardino National Forests have experienced many changes in recreation since they were established, and even over the life of the original land management plans. Initially, recreation was light and concentrated in just several popular areas, with few campgrounds or other sites developed until the Civilian Conservation Corps era when many developed sites and trails were constructed. Another major boom in recreation occurred after World War II through the early to mid 1960s, as post-war populations started heading to the national forests, demanding more and better recreation facilities. Since the 1970s, interest in and appreciation of the environment has increased national forest recreation visitation and has shifted activities and expectations. Changing demographics have led to an increase in the popularity of lower elevation canyon and water play use close to urban areas. As temperatures increase during the summer, many people flock to the national forests for relief from the heat, traffic, smog and urban stress. They especially travel to those locations with shade, water and cool temperatures.

In addition to increasing local populations and changing values, evolving technology has also shifted the recreational modes and composition of visitors. The mushrooming popularity and refinement of off-highway all-terrain vehicles (ATVs), motorcycles, and four-wheel drive vehicles have added additional motorized use, allowing many people to travel in backcountry areas into which they never may have been able to travel previously. Similarly, the growth in the popularity of the mountain bike has added a major recreation use that barely existed at the writing of the original land management plan.

The main issues identified for recreation in this forest plan revision revolve around an ever-increasing southern California population, with correspondingly heavy national forest visitation and use and the effects of that visitation and use on other visitors, communities, facilities and the natural environment.

The cumulative effect area is within approximately two driving hours of the southern California national forests. The time frame is from the previous planning period through the next planning period, approximately 15 years. The environmental consequences section describes effects on recreation from various topic areas. Of these topic areas, the primary topics that could cumulatively affect recreation management are biodiversity; vegetation management; fire; insect pests and disease; roadless areas and special designations; and the conflicts among various recreation uses.

An astounding population growth in southern California in the past 50 years has led to more crowded national forest recreation experiences, especially during peak use times and seasons; this growth has greatly increased stress levels and ranges of demands on other visitors, communities, and natural resources. More conflicts among the visitors themselves have evolved, primarily between motorized and non-motorized recreation users.

Population growth within and surrounding the national forests will probably be the single largest impact on national forest recreation management over the next 15 years. Population growth rates of the local counties are projected to be higher than are most of the projected growth rates for other counties throughout the United States; many are also predicted to be more ethnically diverse than the rest of the nation. The cumulative effect of increased population is an extraordinarily high demand for outdoor recreation opportunities offered in a mountain setting, which only the southern California national forests offer with relatively easy driving access from the major population centers (National Visitor Use Monitoring (NVUM); National Survey of Recreation and the Environment, Cordell and others 2004—see Appendix L. Visitor Use and Participation (NVUM)).

This growth has also pushed urban development closer to and within the national forests, in many cases directly adjacent to national forest boundaries. These public lands offer the growing population a place to recreate and enjoy a natural mountain setting. They also contribute to local tourism economies, especially in resort communities like Big Sur and Big Bear. This continued expansion necessitates that communities plan for the future by identifying access points and trails systems that will provide recreation opportunities for nearby residents. Because National Forest System lands are or will be the boundary for this development, the cumulative effect will be ever-increasing recreation pressure on these adjacent lands.

Changes and improvements in technology and equipment used for recreation purposes on the national forests will also have impacts as new or existing uses change the ease with which visitors can access areas to recreate and further change the recreation experience in some areas. This may be especially disconcerting to those who pursue more traditional recreation opportunities, including hiking in remote locations. There will be an expanded role needed for social and technical recreation research from both the public and private sectors to better understand and resolve conflicts and to develop new ways to help manage recreation opportunities in environmentally sustainable ways.

Technology is continually making improvements to off-highway vehicles and mountain bikes, which changes their ability to traverse National Forest System lands. Off-highway vehicles are more powerful and have better suspensions and traction than ever before. They allow a wide range of users a relatively comfortable and affordable mode of transportation that can traverse rugged roads, trails and open areas of the national forests with a minimum of effort. This has created a trend toward increased numbers of user-created trails and off-highway vehicle operations on roads with mixed traffic. With lighter frames and better gearing and suspensions, mountain bikers are continually pushing the limits of where people can ride. In addition, new types of recreation technology such as mountain skateboards and others continue to change how the national forests are used. There has been an increase in the use of these technology-driven recreational pastimes. Multiple-uses on some trails have created a number of conflicts among riders, equestrians, and hikers as each competes for the same trail. Similar conflicts exist between motorized and non-motorized users during both summer and winter as they recreate in similar areas and trails.

The popularity of these recreation activities has increased dramatically in the past ten years and is projected to continue to increase at a similar rate (National Survey of Recreation and the Environment—see Appendix L. Visitor Use and Participation (NVUM)). The cumulative effect of the increased numbers of motorized recreation vehicles is the desire to have more opportunities for discovery and testing of skills on limited travel ways and land mass, which push user densities towards undesirable levels for many recreationists and have the potential to cause more user, resource and water conflicts.

In addition to an increase in mechanical forms of recreation, as the population grows there will be additional increases in more traditional forms of recreation, especially day-use activities such as picnicking, hiking, viewing wildlife and water/snow play. Changes will also occur within each of these categories as the population ages and more ethnically diverse visitors use the national forests (Carr and Chavez 1993, Chavez 2001).

Demand for activities such as driving for pleasure, walking, day-use recreation and developed recreation site camping will continue to increase, primarily during summer, weekends and holidays. Peak-use periods on other activities will vary, but more use is expected not only during the summer, but also during the other three seasons. Water and riparian areas will remain a magnet for visitors, with these sensitive areas receiving more use leading to potential resource impacts and management restrictions.

The growth in population and recreation demand coupled with greater access from new technologies is having a profound effect on the surrounding national forests. The niches that the national forests offer are being increasingly burdened, and the greatest challenge becomes providing quality, environmentally sustainable outdoor recreation opportunities in a natural setting. Sensitive habitats for wildlife, plants and riparian-dependent resources are threatened by heavy recreation use and unauthorized activities. Unauthorized roads and trails on public lands reflect the increased demand for more motorized and mechanized opportunities, but they result in decreased opportunities for primitive and semi-primitive non-motorized recreation and increased impacts. The need and opportunity for diverse, urban-based conservation education, stewardship, partnerships, and volunteers is high and expected to increase dramatically. Increased cooperation and coordination with local governments and other recreation providers is also anticipated.

Carrying capacities (where determined) will be reached faster and more often than would be expected around the rest of the state and nation. This will lead managers to consider developing new and/or more restrictive limits to ensure quality recreation opportunities and adequate, sustainable environmental protection in the more popular sites and areas. These management techniques would vary by area, issue/concern, and time/season.

Some of the alternatives propose to increase recreation facilities and capacity. In all alternatives, this increase is not intended to accommodate all the projected increases in recreation use throughout the entire southern California region, but only a partial amount of the southern California National Forests' reasonable proportion of the anticipated increase. Conflict among users may also escalate, increasing the need for management actions to manage the problems.

Increased visitation and use has required the Forest Service to reconstruct and harden a considerable number of developed recreation sites, in addition to making them more accessible to all members of the public. These modifications (in addition to many other factors) have helped to change the opportunity for many recreationists. More large-family facilities, flush toilets, and hot showers are being added. These facilities may meet many people's basic recreation needs but do not always fulfill the desired rustic mountain recreation experience.

Drought in the southern California national forests (along with overstocked stands and insect epidemics) is expected to change physical settings and recreation use, especially within the San Bernardino National Forest and parts of the Angeles and Cleveland National Forests. There would be seasonal restrictions and closures due to fire danger and vegetation changes. Visitors may change their use frequency and types of recreation they practice in response to these restrictions and also in response to the appearance of the national forests themselves, as more large trees die. There may be short- to medium-term disturbance from tree mortality removal operations and prescribed and wildland fires.

The range and distribution of recreation settings across the national forests are unique; no other land management agency in southern California administers vast landscapes of foothills, mountains and canyons. Some alternatives do not change these recreation settings. Other alternatives add major blocks of additional wilderness or other special designations that would change existing or potential land and management use patterns, restricting some motorized recreation use. Roadless areas have traditionally provided opportunities for semi-primitive non-motorized recreation and motorized trail recreation, converting more roadless areas into wilderness would increase primitive recreation and solitude while decreasing motorized trail opportunities. An alternative that limits motorized recreation would potentially displace current users and move them to other areas open to that use on nearby public lands or within the national forests. Conversely, opportunities for non-motorized recreation and solitude would rise, and many current and potential commodity uses would be restricted or not allowed.

Designation of additional wild and scenic rivers would add diversity and improve representation of outstandingly remarkable rivers in southern California as part of the National Wild and Scenic River System. It may also increase river-related recreation as designated rivers would likely be more attractive as day-use destinations; however, regionally, it would not substantially increase the overall amount of recreation use on the four southern California national forests. Stream values would be perpetuated and protected from long-term resource impacts (such as impoundment). Conversely, there is a narrowed range of opportunities for various resource and recreation activities.

Designation of new special interest areas (SIAs) would mean more acreage with unique features available for public enjoyment and interpretation. Cumulative effects resulting from designation of SIAs would largely depend on the management plan written and implemented for each SIA after the land management plan is approved.

Designation of research natural areas (RNAs) could affect recreational pursuits in the future because of some of the limitations prescribed by RNA direction on the types of recreation allowed and on accessibility.

No other national forests are close enough to greatly influence use and management of recreation in southern California, with the exception of winter sports at the Mammoth Resort on the Inyo National Forest.

In addition to the Angeles, Cleveland, Los Padres and San Bernardino National Forests, other comparable public and private outdoor recreation providers in southern California include:

- Bureau of Land Management lands;
- Anza-Borrego Desert State Park, Silverwood Lake State Recreation Area, Mt. San Jacinto State Park, Montana del Oro State Park, Cuyamaca Rancho State Park, Castaic Lake State Recreation Area, Hungry Valley State Vehicular Recreation Area, Pismo State Beach, Carpenteria, Oceano Dune, Maleoa, Julia Pfeiffer Burns, Pfeiffer Big Sur, San Simeon and Limekiln State Parks, Emma Ward State Beach, Chino Hills State Park;
- Joshua Tree National Park and Santa Monica Mountains National Recreation Area;

- San Bernardino, San Diego, Los Angeles, Santa Barbara, San Luis Obispo, Ventura and Riverside counties parks and recreation areas;
- Numerous local municipalities – parks; and
- Private recreation facilities and conservation group preserves.

These agencies and private entrepreneurs offer developed and dispersed recreation opportunities including camping, fishing, hunting, wildlife viewing, boating, hiking, bicycling, picnicking and four-wheeling. As recreation carrying capacities within the southern California national forests are determined, approached, and met, recreationists may be displaced to these areas, assuming that capacity is available.

The State of California faces many of the same challenges and opportunities as does the Forest Service in providing environmentally sustainable recreation opportunities for a rapidly growing and demographically changing population. The Forest Service and the state coordinate and cooperate regularly, both at the local level and the state and regional levels. The Forest Service is a member of the California Roundtable on Recreation, Parks and Tourism (CRRPT), which focuses on emerging trends, present and proposed programs and opportunities, and conservation education.

As tourism grows and the country's population ages, there may be added demand to increase recreation opportunities on the developed end of the ROS scale (Dwyer 1994). The resultant change to the natural landscape would increase opportunities associated with developed recreation and road development and decrease opportunities for recreationists seeking a more natural, primitive setting. For southern California, the largest predicted gaps or shortages where projected demand exceeds supply in all alternatives are for day-use recreation, especially picnicking, water play and hiking in popular laces near cities (Cordell and others 2004).

All alternatives emphasize primitive and semi-primitive recreation opportunities, providing today's recreationists with reasonable assurances of future backcountry opportunities as well as development possibilities. Alternatives 4 and 5 offer more developed recreation and motorized recreation opportunities. Other values such as remoteness, solitude and non-motorized and wildlife-related recreation opportunities would be gained in Alternatives 3 and 6, primarily through gains in wilderness acreage. Alternative 2 offers a mixture of recreation opportunities.

In all alternatives, the Angeles, Cleveland, Los Padres, and San Bernardino National Forests will remain the largest provider of mountain and forest outdoor recreation opportunities in southern California.

Effects on Wilderness

Direct and Indirect Effects

An explanation of the evaluation process and how the evaluations were incorporated into each alternative is found in Appendix D. Although the basic characteristics of the southern California ecologies is well represented even in Alternatives 1 and 5, that include no new recommendations to the Wilderness system, each of the other alternatives recommend additions based upon the theme. Alternatives 6 and 3 recommend new wilderness areas as well as additions to existing wilderness. They move national forest management towards an emphasis on wilderness management over many other activities and emphasize the protection of species and habitat. Alternative 2 expands the wilderness system although not quite to the extent of Alternatives 3 and 6. Alternatives 4 and 4a recommend primarily additions to the existing wilderness areas to provide for protection of solitude and challenge opportunities as well as to protect wilderness values that may add to the system but usually already exist within the system in southern California.

Human use of designated wilderness is governed by the terms in the Wilderness Act and other specific legislation. This limits management activities within the wilderness, restricting human impacts and influences to desired levels. Programs and projects within these areas are evaluated for compliance with wilderness values. Commercial uses of wilderness are controlled by special-use authorizations and associated operation plans. Because direction for wilderness is detailed in law, regulation, agency policy and specific management plans, management for existing wilderness as described below will vary little by alternative. No alternative recommends elimination of any existing designated wilderness, either in part or whole.

Illegal marijuana plantations within the wilderness areas have a detrimental effect on natural resources and disturb natural processes, including adversely affecting vegetation and available water. Public safety is jeopardized as well.

Travel of undocumented immigrants through wilderness areas, (notably in those areas adjacent to the international border with Mexico) may affect natural processes because of the increased use of fire to cook and keep warm and use of other activities not allowed in wilderness. This type of use may result in lack of protection or preservation of the wilderness resources due to different cultural values, unfamiliarity with wilderness values and/or a focus on meeting basic human needs rather than on recreation use. In addition, the safety of more people could be placed in jeopardy because of bad weather or wildland fire incidents.

Wilderness values could be affected from some the following activities listed below. Differing effects on the listed values will depend on the values that are present in a particular area and the nature and duration of the activity.

Effects of Vegetation, Wildland Fire, Insect Pests and Disease Management on Wilderness Values

To address forest stand densification and high levels of mortality, help improve ecosystem health, and meet the intent of the Wilderness Act, the national forests will consider increasing the use of prescribed fire within designated wilderness in all alternatives. This action will help to return wilderness vegetation conditions to more natural conditions.

Wilderness characteristics—including solitude, primitive recreation experiences and natural landscapes (untrammeled by human activities)—may be affected by wildland fire suppression and prescribed fire. Risks to life and values are ascertained and choices for suppression techniques are made considering the effects on wilderness characteristics. Minimum impact suppression techniques (MIST) are used when possible. Potential direct effects could include a temporary loss of vegetation, a reduction in water quality due to sedimentation, a permanent loss of cultural resources, a temporary loss of grazing opportunities, increased smoke pollution and a short- to long-term perceived loss in scenic quality. Indirect effects of fire use may include a temporary loss of wildlife habitat for some species or additional habitat for others. Fires burning in wilderness could change visitor use patterns and cause inconvenience. Wilderness visitors could expect temporary access restrictions during periods of fire management activities. Recreation use of burned-over areas may drop for a period of years, until vegetative recovery achieves a more advanced stage. Intense fire in dense stands of trees could increase long-term trail maintenance needs from continued downfall of snags across trails.

Tree cutting and road building are not permitted within wilderness, but salvage logging activities near wilderness boundaries have the potential to create short-term disturbances that may change the user's perception of being in a remote area. Any vegetation management activities near the wilderness boundary will have the potential to affect wilderness use levels by creating potential motorized trespass entry points and increase the potential for adverse ecosystem effects, including noxious weed introductions. Additional access as a result of vegetation management activities may result in increased non-motorized recreation use.

See also the discussion of special designations in the Vegetation and Fire Management sections.

Effects of Watershed Management on Wilderness Values

The 1964 Wilderness Act states that water manipulation is an appropriate use. None of the southern California national forest wildernesses have any major dams, impoundments, reservoirs or wells that have effects of water capture, release, de-watering and stream channel alteration.

Effects of Air Quality on Wilderness Values

Air quality for many southern California national forest wildernesses is primarily affected by activities in the vast urbanized areas here that are outside the scope of Forest Service influence. Poor air quality (especially during summer and fall) affects wilderness visibility and resource values. Some local emissions, primarily smoke from wildland fires and controlled fires, also temporarily affect wilderness values (see Air Quality section).

Effects of Land Ownership and Adjustment Wilderness Values

Land ownership adjustments within designated wilderness are usually made to acquire private in-holdings for the protection or maintenance of wilderness values from the threat of development and to provide long-term benefits for wilderness resources. Land ownership adjustment strategies may vary by alternative, thus affecting wilderness resources.

Effects of Other Special Designations on Wilderness Values

Approximately 1,200 acres of the San Dimas inventoried roadless area (which is under consideration for designation as a wilderness) is within the boundary of the San Dimas Experimental Forest. Designation after the recommendation of wilderness designation in Alternatives 2 and 3 would have an impact on the operations of the experimental forest. Major conflicts with wilderness designation would include the presence of existing infrastructure and the manipulative research being performed in some areas of the experimental forest.

Effects of Recreation Use on Wilderness Values

Visitation in most existing wilderness is expected to increase regardless of alternative, mostly in the form of day hiking, backpacking and equestrian use. Corresponding increases in recreation-associated impacts on sensitive wilderness resources at trail and camping hotspots can be expected, especially in the more popular wildernesses near urban areas. Most of the wilderness backcountry will remain unvisited because of steep terrain and dense vegetation. Additional areas recommended as wilderness, if designated, could redistribute some of this use. In some cases, the use in existing relatively undisturbed areas could increase as a result of that wilderness designation. Alternatives 3 and 6 have the most opportunity for additional areas to provide wilderness experiences. Wilderness education will be emphasized in Alternatives 2, 3, 4, 4a and 6 in an effort to protect wilderness values. In all alternatives information, management and regulation enforcement are expected to also help protect wilderness values. Additional management could include strategies such as greater conservation education, field presence (including volunteers), quota and permit systems, group size limits, camping and fire restrictions and designated campsites.

Effects of Roads and Trails on Wilderness Values

Roads are not allowed within wilderness; however, construction and reconstruction of roads near wilderness boundaries can potentially affect wilderness resources by increasing access to the wilderness. Road-building activities near wilderness boundaries have the potential, in some types of terrain and vegetative cover, to increase inappropriate wilderness use by creating potential unauthorized motorized entry points. In the short term, increased noise levels would change the user's perception of being in a remote area. Improved access could also result in increased recreation use. Alternative 5 would allow the most roaded access. There are few buildings in existing wilderness and few effects are anticipated. It is anticipated that few, if any, new non-motorized trails will be constructed in any designated wilderness. Existing trails within wilderness are mostly in fair to poor condition; insufficient trail maintenance has the potential to allow soil movement and loss and to increase public safety concerns. More emphasis on reconstruction or maintenance of non-motorized trails would be placed in Alternatives 2, 4, 4a and 6.

Effects of Minerals/Oil/Gas on Wilderness Values

Designated wilderness is withdrawn from mineral entry and energy leasing, subject to existing rights. Minerals on private in-holdings within wilderness could be developed (for example, gold mining within Sheep Mountain Wilderness), although the likelihood of development appears low at this time. There would be no difference among any of the alternatives in effects from mineral or energy exploration or development on designated wilderness areas.

Effects of Livestock Grazing on Wilderness Values

Grazing would continue in wilderness in all alternatives in accordance with congressional guidelines and management direction in the forest plan. There are 66 grazing areas and 128,109 suitable acres of livestock grazing within existing wilderness in the southern California national forests, the majority (120,561 acres) of which are located on the Los Padres National Forest. The Angeles National Forest has no grazing areas or suitable acres; the Cleveland has five grazing areas and 4,164 suitable acres and the San Bernardino has four grazing areas and 3,384 suitable acres. Improvement of conditions identified as "not meeting objectives" varies by alternative and would affect wilderness as described in the section on effects on vegetation from livestock grazing. The Wilderness Act of 1964 permits grazing within wilderness, disposition of vacant allotments by alternative is based on range capability and other resource needs, not on wilderness considerations.

Cumulative Effects

The cumulative effects analysis for wilderness considers existing designated wilderness within the Angeles, Cleveland, Los Padres and San Bernardino National Forests over the life of the plan. National Forest wildernesses within southern California are the primary contributors to the National Wilderness Preservation System for this area. Past management actions emphasized minimal regulations and education of wilderness visitors to protect wilderness resources. Expected population growth in southern California and urban development near or adjacent to wilderness has a direct relationship with use and increased resource concerns within wilderness. Fragmentation and isolation of wilderness as ecological islands is a serious concern (Hendee and Dawson 2002), especially in southern California. The degree to which fire can be successfully returned to fire-dependent ecosystems within and adjacent to wilderness is a major factor in the long-term benefits of these areas as sources of intact, properly functioning ecosystems. This varies by wilderness because historical fire regimes vary with vegetation cover types. Management of wildlife and fish populations and control of noxious weed invasions both within wilderness and on adjacent lands are other important contributors to the broad functioning of wilderness ecosystems. Finally, management of livestock grazing and recreation use will affect the long-term role that wildernesses can play in contributing to biodiversity and sustainability of the larger systems of which they are a part.

These factors do not vary considerably by alternative specifically for areas already designated as wilderness; therefore, cumulative effects on wilderness would be similar for all alternatives. It is anticipated that additional regulations will be required over time to protect the wilderness resource and manage the increased use and associated impacts throughout the wilderness. As a result, these components of the National Wilderness Preservation System can continue to contribute to the purposes for which wilderness is designated.

The effects analysis for roadless areas and proposed wilderness is captured in the applicable section that is affected. The possible designation of additional wilderness may provide additional opportunities for primitive unconfined recreation experiences and broaden the ecological diversity within the National Wilderness System. Designation of new wildernesses may occur as a result of this forest plan revision and future legislation. For example, legislation that was introduced in 2003, by Senator Boxer and

Congresswoman Solis (S. 1555) includes a number of proposed wildernesses that are within the southern California national forests. Ultimately, with projected population growth, demand for high-quality wilderness recreation opportunities within the national forests will eventually be exceeded by visitor numbers in all alternatives, especially in smaller, more popular wildernesses adjacent to the "front range" population centers. Under Alternatives 3 and 6, it is expected that growth in demand for wilderness might be met for a longer period of time.

Effects on Landscape Management

Direct and Indirect Effects

Under 36 CFR 219(f), the scenic resource is to be evaluated for each alternative, addressing the landscape's attractiveness and the public's visual expectation. Scenic integrity objectives (SIOs) are assigned to land areas. Alternatives will be compared using changes in the assigned scenic integrity objectives, the projected changes in scenic attractiveness and the projected visibility of landscape alterations. Some key places will be examined in further detail to determine the effects that forest-health activities and utility infrastructure may have on landscape character.

The desired landscape character (DLC) is an expression of a desired condition to be sustained. This expression captures the landscape's attributes visitors have come to appreciate. These attributes help define visitors' sense of place, and are generally expected to occur over time. The DLC is place-specific and does not change by alternative.

Effects of LMP Decisions on Scenic Integrity Objectives

Scenic integrity objectives represent the minimum levels of scenic integrity to which landscapes are to be managed. These objectives are generally synonymous with the visual quality objectives (VQOs) in the original land management plans. Management activities, using best environmental design practices are to achieve these minimum levels (refer to Appendix A in Part 3 of the forest plans to see references of best environmental design practices). Generally speaking, in alternatives where biological values are emphasized, the minimum levels result in landscapes that are more natural-appearing; in alternatives where commodities are emphasized, the minimum levels result in landscapes that could have an altered appearance. Currently, most national forest landscapes look "natural," except for a few areas that have been noticeably altered.

Minor under-achievement of SIOs is allowed with Forest Supervisor approval at the project level. Temporary under-achievement of the SIOs (up to 3 years) is allowed for vegetation management projects that improve forest health or fire-safe conditions. The effect of this provision has not been assessed since it is temporary in nature. It is also recognized that well-designed vegetation treatment patterns (using best environmental design practices) will have a beneficial long-term landscape management effect.

Each alternative (if implemented) has the varying potential to maintain, alter or restore the scenic character of national forest landscapes. The Scenery Management System recognizes the interdependence of aesthetics and ecological systems; and promotes natural-appearing landscapes. Across the alternatives, opportunities for viewing scenery would vary depending on a number of factors: construction of roads, trails and new recreation facilities would create opportunities for viewing scenery, while some viewing opportunities may be decreased by road and trail closures.

Scenic integrity objectives (SIOs) have been developed for each alternative. In most alternatives, landscapes would be managed to maintain a natural-appearing character. It is projected that all alternatives will meet their assigned SIOs; however, landscape restoration to achieve desired landscape character will change depending upon the theme of the alternative.

Under Alternative 1, national forest management would maintain its present course except for implementation of the Scenery Management System. Translating the Visual Management System from the current plan to the Scenery Management System, approximately one-half of the national forest land base would be managed to maintain a natural appearance, with SIOs of high and very high (Angeles National Forest 54 percent, Cleveland National Forest 53 percent, Los Padres National Forest 62 percent, and San Bernardino National Forest 69 percent). The remainder of these landscapes could have an altered appearance, with SIOs of moderate and low. Most of these alterations would occur in scenic attractiveness class B (SAC-B) and SAC-C landscapes, although less than two percent of the SAC-A landscapes could have an altered appearance. Alterations would be most noticeable in middleground distance zones along the most popular travel routes (concern level 1). Up to 164 miles of unclassified roads will be restored to a natural appearing condition under this alternative.

Under Alternative 2, most of the national forest land base would be managed to maintain a natural appearance, with assigned SIOs of high and very high (Angeles National Forest 96 percent, Cleveland National Forest 95 percent, Los Padres National Forest 93 percent, and San Bernardino National Forest 98 percent). The remainder of these landscapes could have a modified appearance with assigned SIOs of moderate and low. Most of these alterations would occur in SAC-B and SAC-C landscapes, although approximately 10 percent of SAC-A landscapes could be modified, including some acreage to address tree mortality. Generally, landscapes would remain natural-appearing along the most popular travel routes (concern level 1). Up to 175 miles of unclassified roads will be restored under this alternative.

Under Alternative 3, virtually all of the national forest land base would be managed to maintain a natural appearance, with assigned SIOs of high and very high (Angeles National Forest 99 percent, Cleveland National Forest 99 percent, Los Padres National Forest 99 percent, and San Bernardino National Forest 99 percent). The remainder of these landscapes could have a modified appearance with assigned SIOs of moderate and low. Most of these alterations would occur in SAC-B and SAC-C landscapes, although some minor acreage of SAC-A landscapes could be modified to address tree mortality. Generally, landscapes would remain natural-appearing along the most popular travel routes (concern level 1). Up to 348 miles of unclassified roads will be restored under this alternative.

Under Alternative 4, most of the national forest land base would be managed to maintain a natural appearance, with assigned SIOs of high and very high (Angeles National Forest 96 percent, Cleveland National Forest 95 percent, Los Padres National Forest 93 percent, and San Bernardino National Forest 99 percent). The remainder of these landscapes could have a modified appearance, with assigned SIOs of moderate and low. Most of these alterations would occur in SAC-B and SAC-C landscapes, although some minor acreage of SAC-A landscapes could be modified to address tree mortality. Generally, landscapes would remain natural-appearing along the most popular travel routes (concern level 1). Up to 156 miles of unclassified roads will be restored under this alternative.

Under Alternative 4a, the national forest land base would be largely managed to maintain a natural undeveloped appearance, with assigned SIOs of high and very high (Angeles National Forest 92 percent, Cleveland National Forest 93 percent, Los Padres National Forest 90 percent, and San Bernardino National Forest 98 percent). About seven percent of the land base (292,305 acres) could have a modified appearance, with an assigned SIO of moderate. No landscapes would be managed with an assigned SIO of low under this alternative. Alterations would occur in SAC-B and SAC-C landscapes, although some minor acreage of SAC-A landscapes could be modified to address tree mortality. Landscapes would remain natural-appearing along the most popular travel routes (concern level 1). Up to 447 miles of unclassified roads will be restored under this alternative.

Under Alternative 5, a large portion of the national forest land base would be managed to maintain a natural appearance, with assigned SIOs of high and very high (Angeles National Forest 90 percent, Cleveland National Forest 83 percent, Los Padres National Forest 87 percent, and San Bernardino National Forest 71 percent). The remainder of these landscapes could have a modified appearance, with assigned SIOs of moderate and low. Most of these alterations would occur in SAC-B and SAC-C landscapes, although approximately 15 percent of the total SAC-A landscapes could be modified, including some acreage to address vegetation mortality. Alterations would be most noticeable in middleground distance zones along the most popular travel routes (concern level 1). Up to 51 miles of unclassified roads will be restored under this alternative.

The consequences of Alternative 6 are similar to those of Alternative 3; however, up to 539 miles of unclassified roads will be restored under this alternative.

The following activities can have the most effect upon scenic integrity. The effects will be broadly described and then further assessed in affected key places.

The most obvious general effects on scenic integrity are from unplanned wildland fire and wildland fire management activities, forest health activities, road construction, and utility infrastructure development. These activities can alter natural vegetation patterns, introduce non-characteristic line elements in the landscape or affect the natural silhouette of mountaintops and ridgelines. Best environmental design practices will be used at the project level to guide the environmentally sustainable integration of proposed management activities in the landscape, including vegetation management activities.

Effects of Unplanned Wildland Fire on Landscape Character

Unplanned wildland fires have long-term and short-term effects. Based on the historical size of wildland fires, burned areas can visually overwhelm visitors when viewed in the foreground and middleground distance zones, and can be prominent in background panoramas. The long-term scenery effects of unplanned wildland fire relate to the introduction of non-characteristic lines from mechanical-equipment use during suppression, and from high-intensity, stand-replacing wildland fires that typically reduce vegetation species composition and age-class diversity. Short-term effects relate to the size of the burned areas: large burns can visually dominate views in the foreground and middleground zones. Due to their unpredictability, the effects of unplanned wildland fires have not been assessed. In addition, these effects would be the same for all alternatives. The use of prescribed burning to lessen the occurrence of unplanned wildland fire is a preferred vegetation-management strategy.

Wildland fire management activities, specifically the construction of community defense zones, fuelbreaks, and prescribed burn units can affect scenic integrity. Community defense zones have the potential to overwhelm national forest visitors who view the landscape in foreground and middleground distance zones. Fuelbreaks can introduce non-characteristic line elements in the landscapes. Large-sized prescribed burn units can overwhelm visitors when viewed in foreground distance zones. Prescribed burn units (designed to mimic natural vegetation patterning) are viewed as having a restorative effect on scenic attractiveness and can contribute to achieving the place's desired landscape character. This effect will last for approximately 15 years. Prescribed burns can also be used to protect highly valued conifer stands. Most of the prescribed burn activity will occur in SAC-B and SAC-C landscapes. Visual changes may be noticeable immediately after the project, but will not be noticeable in three years. It is estimated that in chaparral, prescribed burn units can improve the vegetation's age-class mosaic. Due to its restorative effect upon the landscape, and through the implementation of best environmental design practices, wildland fire management activities to achieve fire-safe conditions are not further assessed.

Effects of Forest Health Activities on Landscape Character

In some high-elevation locations experiencing severe forest-health problems due to tree mortality, losses in scenic attractiveness will occur. Most of the changes in the landscape will occur in SAC-B or SAC-C landscapes, but some loss will occur in SAC-A landscapes. Because of the severity of tree mortality, the dense canopy of big conifer trees will be lost; the end result will be a more open, park-like, managed appearance. The public's visual expectations will be affected by the changes in the landscape that will occur, primarily in the immediate foreground and middleground distance zones. Some landscapes may look altered in the short-term but should improve as treated areas recover. The program designed to address tree mortality remains constant across alternatives; the effects on scenic integrity will be the same. The most severe effects on scenic integrity attributed to tree mortality will occur at high elevation places in the San Bernardino National Forest, and to a lesser extent, the Cleveland National Forest. This will be examined in greater detail in the cumulative effects section for the affected places.

Effects of Road Construction on Landscape Character

Little or no road permanent new road construction is planned among any of the alternatives. Temporary roads may be constructed to address forest health; however, the land affected by these temporary roads will be restored upon completion of forest health projects. Refer to the specific key places listed below where forest health projects will most likely occur.

Effects of Communication and Utility Infrastructure Development on Landscape Character

Communication and utility infrastructure development can have the effect of introducing non-characteristic line elements in the landscape. Communication sites are usually located in high-elevation areas of the national forests. Development at these sites has the potential to disrupt natural silhouette of ridgelines or mountaintops by introducing non-characteristic vertical line elements. The demand for additional communication sites proposed along ridgelines or visually prominent mountaintops is minor and may not have an additional effect on scenic integrity. Development of other utility infrastructure in suitable land use zones and corridors has the potential to introduce prominent non-characteristic linear patterns in forest vegetation that is difficult to visually integrate into the landscape. Single utility lines are less visually intrusive than multiple lines concentrated in corridors; typically, very large vegetation swaths may be required to accommodate the width of utility corridors in forested environments, while single utility lines require swaths of lesser width. Demand for two new unoccupied corridor segments are identified in the Western Utility Group planning map of July 2003: the Elsinore Mountain-to-San Mateo segment and the El Cajon Mountain segment at Cleveland National Forest. The Elsinore Mountain-to-San Mateo segment falls within a key place and will be examined in further detail in the cumulative effects section to discuss compliance with the assigned scenic integrity objectives.

Effects of Minerals and Energy Management on Landscape Character

Mineral, oil and gas activities (including exploratory drilling), oil and gas field development and other activities that involve the construction of roads, mines, well sites and other facilities would affect scenic integrity. These impacts would be of relatively limited area and of short- to long-term duration. Once drilling, mining and reclamation are completed, the impacts on scenery and desired landscape character would lessen; however, some evidence of human activities would be present for a moderate to long periods of time.

Cumulative Effects

Cumulative effects on national forest landscapes result from the introduction of a series of vegetation management activities or the addition of structural elements in a close geographic proximity or time frame. Landscape cumulative effects are more pronounced in foreground situations and less so in the background. The most sensitive landscapes are those that are visible from urban settings, along popular travel routes, or that provide high-elevation recreation settings. Only eight key places are projected to undergo moderate to major landscape-character alterations over time. Most of these alterations are a result of treating tree mortality; however, other alterations may result from utility infrastructure development and demand for utility-corridor additions as identified by the Western Regional Corridor Planning Partnership (Western Utility Group 2003).

The following seven places are examined for cumulative effects related to treating the vegetation mortality issue:

- Arrowhead, 36,663 acres. The desired landscape character for Arrowhead is natural-appearing, including the maintenance and recruitment of a big-tree conifer forest character. The dominant SIO across Alternatives 2 through 6 is high (ranging from 80 percent in Alternative 5 to 99 percent in Alternatives 4 and 4a). Sizeable patches of moderate and low occurs in Alternative 5

(7,083 acres and 12,227 acres, respectively). Most alterations in landscape character will result from treating tree mortality. Almost 51 percent of the area in Arrowhead will be treated for mortality. Although 88 percent of this treatment will occur in SAC-B landscapes, approximately 42 percent of the SAC-A landscapes will be treated (1,842 acres). Approximately one-half of the treated area will occur in the foreground or middleground distance zones, along popular travel routes.

- Big Bear, 39,078 acres. The desired landscape character for Big Bear is a natural-appearing landscape, including the maintenance and recruitment of a big-tree conifer forest character; and maintenance of quaking aspen groves. The SIO across Alternatives 2 through 6 is high. Most alterations in landscape character will result from treating tree mortality. Almost 61 percent of the area in Big Bear will be treated for mortality. Although 61 percent of this treatment will occur in SAC-B landscapes, approximately 38 percent of the treated area is in SAC-A landscapes (9,064 acres). All of the treated area will occur in the foreground or middleground distance zones, along popular travel routes.
- Garner Valley, 38,451 acres. The desired landscape character for Garner Valley is a natural-appearing landscape, including the preservation of montane meadows, Jeffrey pine forests, mixed conifer forests on Mount San Jacinto, and the pastoral landscape views from the scenic byway. The SIO across most alternatives is high, except for Alternative 5 where only 57 percent of the place is classified as high, with the remainder in moderate (6,180 acres). Most alterations in landscape character will result from treating tree mortality; however, only 15 percent of the acres in Garner Valley will be treated. Fifty-four percent of this treatment will occur in SAC-B landscapes. Only 17 percent of the treated area is in SAC-A landscapes (987 acres). All the treated areas will occur in the foreground or middleground distance zones, along popular travel routes.
- Idyllwild, 44,361 acres. The desired landscape character for Idyllwild is natural-appearing and pastoral, including the maintenance of conifers in higher elevations, the diversity of brush species in the foothills, and views from the scenic byway and the Pacific Crest National Scenic Trail. The SIO across most alternatives is high, except for Alternative 5 where only 81 percent of the place is classified as high, with the remainder as moderate (9,005 acres). Most alterations in landscape character will result from treating tree mortality. Only about seven percent of the acres in Idyllwild will be treated for tree mortality, with approximately 41 percent of those treated acres (1,268 acres) falling in SAC-A landscapes. Virtually all of the treated acres will occur in the foreground or middleground distance zones, along popular travel routes.
- Laguna, 30,183 acres. The desired landscape character for Laguna is a natural-appearing landscape, including the maintenance of mature overstory trees and grassy meadows. The SIO across most alternatives is high, except for Alternative 5 where only 80 percent of the place is classified as high, with the remainder as moderate (9,005 acres) and low (2,265 acres). Most alterations in landscape character will result from treating tree mortality. Almost 44 percent of the area in Laguna will be treated for mortality. Although 88 percent of this treatment will occur in SAC-B landscapes, approximately 10 percent of the treated area is in SAC-A landscapes (1,287 acres). Approximately one-third of the treated acres will occur in the foreground or middleground distance zones, along popular travel routes.
- Palomar, 23,940 acres. The desired landscape character for Palomar is a natural-appearing landscape, including the maintenance of mature overstory trees in and around developed recreation sites and scenic vista points along California State Highways S6 and S7. The SIO across most alternatives is high, except for Alternative 5 where 74 percent of the place is classified as high, with the remainder in moderate (9,615 acres) and low (2,855 acres). Most alterations in landscape character will result from treating tree mortality. Thirty-one percent of the area in Palomar will be treated for mortality. Approximately 47 percent of these treated acres

fall in SAC-A landscapes. Almost 80 percent of the treated acres will occur in the foreground or middleground distance zones, along popular travel routes.

- San Bernardino Front, 84,566 acres. The desired landscape character for San Bernardino Front is a natural-appearing landscape, including the preservation of craggy silhouettes of the mountain peaks, a well-defined age-class mosaic in chaparral and the presence of mature conifers in high elevations and canyons. The SIO across most alternatives is high, except for Alternative 5 where 89 percent of the place is classified as high, with the remainder as moderate (5,135 acres). Most alterations will result from treating tree mortality. Almost 22 percent of the area in the San Bernardino Front will be treated for mortality. Although approximately 39 percent of this treatment will occur in SAC-A landscapes (6,987 acres), approximately 33 percent of SAC-B landscapes will be treated. Most of the treated acres will occur in the foreground or middleground distance zones, along popular travel routes.

The desired landscape character for Arrowhead and Big Bear cannot be achieved in any alternative, in the near term. To a lesser extent, the same holds true for Laguna and San Bernardino Front. Sound environmental design practices will need to be undertaken at the project level to improve the layout, design and restoration of treated areas to provide short-term strategies for achieving the DLC in the long-term. The desired landscape character can be achieved in Garner Valley, Idyllwild and Palomar. The temporary SIO under-achievement provision will allow tree mortality projects to meet the scenic integrity objectives for these seven key places.

The following place is examined for the cumulative effects related to projected demand for new unoccupied utility corridor segments identified in the Western Regional Corridor Planning Partnership map dated July 2003. Elsinore is the primary key place affected by the proposed unoccupied corridors.

- Elsinore, 46,729 acres. The desired landscape character for Elsinore is a natural-appearing landscape, including the preservation of the undeveloped quality and character of the urban backdrop, including and especially the natural-appearing skyline silhouette of the Santa Ana Mountains and views from Ortega Highway and Interstate 15. The SIO across most alternatives is very high or high, except for Alternative 5 where 90 percent of the place is classified as high, with the remainder as moderate and low (4,748 acres). Most alterations could result from the possible introduction of a new utility corridor (Elsinore Mountain to San Mateo segment). Sound environmental design practices will need to be undertaken at the project level to improve the layout, design and restoration of treated areas to provide strategies for achieving the DLC in the long-term.
- Combined, the Valley Serrano Line and Elsinore Mountain to San Mateo segment affect 25 percent of the Elsinore place. Neither line will contribute to the achievement of the place's desired landscape character.

Effects on Law Enforcement

Direct and Indirect Effects

Effects Common to all Alternatives

Population growth in southern California is expected to increase by approximately 20 percent by the year 2020. This type of growth is anticipated to drive a continued increase in outdoor recreation demand, which is the largest use on the four southern California national forests (see Social and Economic Environment and Effects on Recreation sections). Under all alternatives, the anticipated increase in visitation is expected to affect the national forests' ability to provide effective law enforcement services over the planning period. Demand for access to National Forest System land is expected to increase as more development takes place adjacent to or within national forest boundaries from surrounding cities and communities; accordingly, encroachment and trespass issues adjacent to National Forest System land are expected to increase. It is also expected that this increase in development along national forest boundaries will result in a direct increase in all types of unlawful behaviors that are typically associated with any increase in urbanization such as trash dumping, graffiti, and the proliferation of unclassified roads and trails. Occupancy and use violations, such as failure to pay campground fees or discharging a firearm in a restricted area, and fire violations are expected to remain the predominate type of violation offenses that occur on the four southern California national forests (see affected environment and table 459: Predominate Categories of Offense Violations from FY 2001 through FY 2003). Vehicle related incidents and violations are expected to increase over time as vehicle traffic increases along with the anticipated rise in visitor use.

Table 459. Predominate Categories of Offense Violations from FY 2001 through FY 2003

Offense Category	2001	2002	2003	Total
Occupancy and Use	1,398	3,252	2,565	7,215
Fire	956	1,771	970	3,697
OHV	307	875	536	1,718
Forest Roads and Trails	269	515	462	1,246
Sanitation	70	175	114	359

OHV: Off Highway Vehicle
FY: Fiscal Year

National Forest System land is expected to remain an attractant for criminal activities that take advantage of remote locations and that are readily accessible from the urban population centers of southern California. Day-to-day support actions and investigative services by law enforcement staff are expected to be increasingly directed to activities that have high-value costs associated with them, such as wildland arson investigation, or to high-risk activities such as marijuana cultivation (personal observations, southern California law enforcement staff). Marijuana cultivation is expected to increase over the next 15 years, with national forest visitors and national forest personnel being exposed to an increasing level of risk. Increasing levels of resource damage caused by the by-products of the cultivation process (for example, large applications of fertilizer, pesticides, and other chemicals toxic to soil and biotic resources) are expected.

Travel patterns of undocumented immigrants are expected to continue to adversely affect the national forests as migration patterns become reestablished at random intervals and locations and as the amount of foot traffic that travels through a national forest fluctuates over time.

Effects of LMP Decisions on Law Enforcement

The prevention of resource violations and the reduction of unlawful actions that occur on the national forests can best be accomplished by an alternative that provides a wide diversity of public uses, facilitates conservation education, and achieves an acceptance of regulations from the public.

Alternative 1 continues existing management direction and would continue to provide a wide range of uses and opportunities. Conservation education efforts would be limited to the programs currently in place and are not expected to be able to meet the need for educational services with the anticipated increase in visitor use. This is expected to contribute to an incremental increase in the number of incidents and violations that occur each year. Compliance with regulations is expected to remain high overall as the majority of national forest users have accepted the general national forest management practices currently in place. This situation is not expected to materially change over time. The rise in violations is expected to be influenced more by the increase in visitation that is anticipated. The ability to meet the desired conditions for the service would be limited as resource conditions are expected to decline over the planning period.

Alternative 2 responds to changing conditions in a similar way as Alternative 1. A wide range of uses and opportunities are provided. The ability to disburse activities over the landscape for resolution of conflicts would be similar to Alternative 1 as small changes are made to land use zones. Future conservation education needs are not expected to be met. Compliance with regulations is expected to be similar to Alternative 1 with an incremental increase in law enforcement incidents and violations occurring over time. The ability to meet the desired condition for the service would be similar to Alternative 1.

Under Alternatives 3 and 6, a wide range of opportunities are provided although motorized activities are more limited due to the reduction in motorized land use zoning. Other types of activities, such as hiking or equestrian use, would also be affected as access constraints vary between the two Alternatives. Under Alternative 3, access into more remote locations of the national forests would be retained similar to Alternatives 1 and 2 as most of the ML 2 road system is retained for motorized use. Access to remote locations would be more limited under Alternative 6 as approximately 67 percent of the National Forest System roads would be managed for fire suppression or vegetation treatment activities and would not be open for general public use by vehicle travel. Visitor use in the more remote areas is expected to decrease over time with a corresponding reduction in law enforcement incidents and violations occurring in these areas. Visitor use would be concentrated along the road corridors. The ability to disburse various uses over the landscape for conflict resolution would more limited than in the other alternatives. Conservation education efforts would be focused on species and resource protection and how the changes in land use-zoning helps to accomplish the desired condition for resource protection. Compliance with regulations is expected to be initially mixed under these alternatives and include short-term spikes of increased levels of incidents and violations related to the changes in land use zoning, then taper off over time as the public becomes more aware of the reasons why these changes were implemented and as enforcement actions reinforce the need for the implementation.

Alternative 3 is expected to have a higher level of acceptance from the public than Alternative 6, as it retains the transportation system more or less in its existing configuration. Conflicts with new wilderness designations can be expected to increase the number of incidents and violations associated with wilderness (such as vehicle trespass) for the short term until the public becomes better educated and accepts the zoning changes, and as unclassified routes are decommissioned or managed for non-motorized uses. Conflicts with new wilderness designation are also expected under Alternative 6 although to a lesser degree than in Alternative 3. Fewer wilderness acres would be accessible to vehicle trespass in Alternative 6 than in Alternative 3 as more of the transportation system becomes unavailable for public use. Violations associated with the transportation system (such as traveling on roads that are closed to public use and an increase in vandalism to government property, e.g., damage to gates and signage) are expected to increase in Alternative 6, more so than in Alternative 3, as compliance with the access restrictions is expected to be initially low. The ability to meet the desired conditions for the service would be improved over time as implementation continues and as the public becomes more knowledgeable regarding the need for improved resource protection.

Alternative 4 continues to provide a wide range of uses and opportunities. The ability to disburse activities over a large landscape for conflict resolution is improved as the configuration of the motorized and non-motorized zoning shifts to meet demands for long distance motorized trail travel while basically retaining the same amount of motorized acreage as Alternative 1. Conservation education efforts are emphasized along with increased managerial controls that emphasize resource protection and visitor satisfaction. This is expected to reduce the number of law enforcement incidents and violations over time even as visitor use and vehicle traffic is anticipated to increase over the planning period. Compliance with regulations is expected to be high as opportunities to enjoy or utilize the national forests are similar to the existing condition. The ability to meet the desired conditions for the service is similar to Alternatives 3 and 6.

Alternative 4a responds to use levels in a manner that is in between Alternatives 3 and 6 as changes in land use zoning reflect the managerial intent for the national forests. This alternative continues to provide a wide range of uses and opportunities. Access to some locations would be more constrained as some National Forest System lands are zoned as Back Country Motorized Use Restricted and as some of the

ML 2 road mileage becomes unavailable for public vehicle travel. A short-term rise in incidents and violations associated with these changes are expected primarily with road trespass or with property damage similar to the effects described under Alternatives 3 and 6. The number of incidents and violations are expected to be more than Alternative 3 but less than Alternative 6 due to the variations in roaded access between the alternatives. Approximately 28 percent of the land base is zoned where motorized activities are a suitable use (see table 359: Acres Managed for Motorized Uses as Defined by Land Use Zone, page 284). This is slightly less than Alternative 3 (30 percent) but more than Alternative 6 (18 percent), would have a reduced ability to disperse motorized and non-motorized uses, and have a more limited ability to address conflicts between uses. Conservation education efforts would be focused on species and resource protection and how the changes in land use zoning would help to accomplish the desired condition for resource protection. Compliance with regulations is expected to be initially mixed under this alternative and include short-term spikes of increased levels of incidents and violations related to the changes in land use zoning, then taper off over time as the public becomes more aware of the reasons why these changes were implemented and as enforcement actions reinforce the need for the implementation. The ability to meet the desired conditions for the service is similar to Alternatives 3, 4, and 6.

Alternative 5 continues to provide a wide range of uses and opportunities. The ability to disburse activities over a larger landscape for conflict resolution is greater than in the other alternatives as much of the national forests are zoned as Back Country. Conflicts between motorized and non-motorized uses are expected to increase over the planning period though, as motorized uses are more fully developed and as the exercise of managerial controls is less than in the other six alternatives. Conservation education efforts are expected to be similar to the existing condition described under Alternative 1. Compliance with regulations and an incremental rise in law enforcement incidents and violations is expected to be similar to the situation described under Alternatives 1 and 2. The ability to meet the desired conditions for the service would be limited as resource conditions are expected to decline over the planning period.

Effects of Biodiversity Management on Law Enforcement

As noted in the affected environment for this section, resource violations constitute a small portion of the overall number of law enforcement incidents that occur on an annual basis. This situation is expected to change over the planning period as more visitation and vehicle travel on the national forests is anticipated. The number of resource incidents is expected to remain low relative to the other types of violations that are more common on the national forests (see table 459: Predominate Categories of Offense Violations from FY 2001 through FY 2003). The amount of increase would also be influenced by the alternative that is selected. Under all alternatives, law enforcement incidents regarding threatened and endangered species are expected to increase over the next 15 years as higher levels of visitation bring more people into contact with at-risk species and as more species become listed. This is expected to result in an increase of closures at site-specific locations or occur at a larger landscape scale (for example, Littlerock Reservoir closure on Angeles National Forest, USDA Forest Service 1999; Court ordered closure for desert tortoise protection on BLM lands, Anon. 2005).

Alternatives 1 and 2 are expected to provide lower levels of resource protection than Alternatives 3, 4, 4a, and 6 as existing conditions predominate. Resource incidents and violations are expected to rise as visitor use and vehicle travel on the national forests escalate over time. Closures for species protection are anticipated with a corresponding rise in related violations until educational and enforcement efforts effect the desired change in use patterns in these locations.

Alternatives 3 and 6 are expected to provide the greatest degree of resource protection and to produce the fewest number of resource violations, as access into more remote areas becomes more restricted and as the conversion of more acreage from Back Country to Back Country Non-Motorized or to special designations such as wilderness occurs. The reduction in access identified in Alternative 6 would also have the effect of reducing resource violations over much of the landscape. The need for area or site-specific closures would be less than in the other alternatives as much of the national forests become less accessible to fewer visitors. A corresponding reduction in resource violations is expected. The need for site-specific or area closures would be lower than for the other alternatives and less likely to occur during the planning period.

Alternative 4 is expected to provide a high level of resource protection and to reduce violations as more intensive controls and mitigation efforts are employed to protect sensitive resources and areas. Resource violations are expected to be less than for Alternatives 1 and 2, similar to Alternative 4a, and higher than Alternatives 3 and 6.

Alternative 4a has a higher level of resource protection than Alternative 4 with the increase in non-motorized land use zoning and special area designations and as public vehicular access via the ML 2 road system is reduced with the BCMUR designation. The need for closures under both Alternatives 4 and 4a is expected to be less than Alternatives 1, 2, and 5.

Alternative 5 would provide the least amount of resource protection and is expected to result in an increase in resource violations, as a greater land base would be available for motorized use that would provide increased access for national forest visitors to more remote areas, and because fewer visitor controls would be used to manage national forest uses and activities. Area or site-specific closures for species protection are expected to occur more frequently under this alternative with a corresponding rise in related violations until educational and enforcement efforts effect the desired change in use patterns in these locations.

Effects of Special Designations on Law Enforcement

Alternatives vary widely in the amount of special designations that are being proposed. The type of designation will affect law enforcement activities and services in these areas. For example, a wilderness recommendation will have a higher level of constraint compared to a research natural area recommendation. The occurrence of law enforcement incidents and violations are low in these locations because of their relative inaccessibility, generally lower use levels, specific capacity limitations in some locations (such as party size limits within wilderness areas), and the prevailing type of management associated with those areas (such as restrictions on activity types). Law enforcement incidents and violations are expected to remain at low levels over the next 15 years. In all alternatives, wilderness values are expected to continue to be compromised in locations that are located across travel routes of undocumented immigrants.

Alternatives 1 and 5 maintain current designations and have the least amount of additional acreage recommended for addition. This is expected to result in a management situation that has violations increasing incrementally over time due primarily to the increase in visitor use. Alternatives 2 and 4 recommend an intermediate level of special designations and are expected to have a reduced amount of violation occurrence. Alternatives 3 and 6 recommend the greatest amount of special designations followed by Alternative 4a and are expected to result in the lowest level of violation occurrence. Access to more remote locations of the national forests would be more restricted under Alternatives 4a and 6. This access limitation is expected to reduce violations over much of the landscape, more so under Alternative 6 than in Alternative 4a.

Effects of Recreation Use and Management on Law Enforcement

Alternatives 3, 4, 4a, and 6 are all expected to have an increased emphasis on conservation education efforts. Environmental education and volunteer programs are expected to have a positive effect on the behavioral patterns of national forest visitors and to help prevent unlawful actions from occurring. These programs (including the participation of campground hosts and concessionaires) are expected to influence law enforcement prevention efforts by providing additional presence and ongoing education and information programs for national forest visitors. The prevention of law enforcement incidents is expected to be lower in Alternatives 1, 2, and 5 due to a reduced emphasis on conservation education and a reduction in managerial controls.

Unlawful behaviors are expected to fluctuate in a manner that reflects trends in recreation demand and use. Conflicts among recreation uses are expected to increase with the introduction of new, non-traditional uses, as capacity limits are reached or exceeded, or where desired opportunities are not available. Concentrated recreation use areas (existing and those expected to develop over time) are expected to remain a focal point for law enforcement actions. Alternatives that utilize capacity limits to protect resources would improve law enforcement prevention efforts, as visitation would be more closely managed in these locations.

Under Alternatives 1 and 2, conflicts among different uses are expected to increase as new or non-traditional forms of land use and recreation activities are introduced and as more uses vie for a limited land base. The expected increase in visitor use associated with concentrated use areas is expected to increase the frequency and amount of law enforcement incidents when recreation opportunities are unable to meet visitor expectations and when facilities are unable to accommodate the influx of additional traffic or visitors.

Under Alternatives 3 and 6, recreational conflicts within the areas managed for non-motorized uses are expected to decrease primarily as a result of more area being less accessible to the public. Conflicts among different uses are expected to increase in the areas that remain open to vehicle access. Law enforcement incidents are expected to increase in locations that retain motorized uses because opportunities are not expected to be able to meet visitor expectations, facilities would not be able to accommodate the influx of additional traffic or visitors, and motorized uses will be concentrated into smaller geographic areas.

In Alternative 4, additional recreational infrastructure and intensive management controls are expected to decrease conflicts between various uses and reduce the amount and frequency of law enforcement incidents that occur as facilities and recreation opportunities would be better able to meet the expectation of national forest visitors over the next 15 years. Alternative 4a responds to conflict resolution to a lesser degree than Alternative 4, to a similar degree as Alternative 3, and to a greater degree than Alternative 6 due to the shifts in land use zoning. Under Alternative 5, conflicts among different uses are expected to increase as new or non-traditional forms of land use and recreation activities are introduced, as more uses vie for a limited land base and as motorized uses are introduced into areas that were previously managed for non-motorized activities. Incidents involving vehicle use are expected to increase along with the increase in National Forest System lands managed for motorized use.

The extent and distribution of land use zones (especially regarding whether motorized access is allowed) is expected to affect the level of law enforcement activity in any given locality and to influence the types of violations that occur. Greater dispersal of the recreating public would be expected to help reduce conflicts among differing recreation uses and to reduce the effects of concentrated use in localized areas and provide a greater range of recreation opportunities; at the same time, dispersal would also provide more opportunity for unlawful behaviors to occur over a broader landscape. In alternatives with more motorized access, off-road impacts are expected to remain a management concern. In addition, land use zone distribution is expected to affect the potential extent of dispersed camping opportunities and affect any restrictions placed upon the activity primarily as a result of how much of a national forests road system is retained for vehicle access by the public.

Alternatives that provide open areas for recreational target shooting with little to no managerial controls are expected to present the highest level of safety risk to the public and national forest employees and the highest risk from shooting caused fires. These locations would also have the highest level of environmental risks and impacts on national forest resources. Law enforcement incidents and violations involving firearms are expected to increase under these types of conditions (USDA Forest Service 1998; personal observations, southern California law enforcement staff; also see Wildland Fire and Community

Protection section, affected environment). In addition, criminal elements (such as urban street gangs) routinely use these locations to practice their firearm skills, often with illegally possessed weapons. The detonation of explosive devices is common in these unsupervised locations (USDA Forest Service 1993; personal observations, southern California law enforcement staff).

Alternatives that provide more intensively managed shooting conditions are expected to produce the opposite effects. Available information on the four southern California national forests suggests that there is a need to move from open shooting areas to more supervised shooting range conditions (USDA Forest Service 1993, 2002; personal observations, southern California law enforcement staff; also see Recreation affected environment and Effects on Recreation environmental consequences sections). Alternative 1 retains the current mixture of open shooting opportunities and supervised shooting locations. Law enforcement incidents involving firearms are expected to increase over time as visitation increases. Alternative 2 reduces open area target shooting and provides a greater degree of environmental protection than Alternative 1. It is expected that firearms violations would continue to increase over time as visitor use continues to increase but at a lower level than Alternative 1. Alternatives 4, 4a, and 5 reduce open area shooting to a greater degree than Alternative 1 but not as much as Alternative 2. Law enforcement incidents are expected to remain similar to Alternative 1 in both frequency and violation type as use levels increase over time. Alternatives 3 and 6 provide the greatest degree of environmental protection and public safety as open area shooting is restricted to a few locations on the Los Padres National Forest.

Effects of Road Use on Law Enforcement

Alternatives vary in the ability to concentrate or disperse limited law enforcement resources. It is expected that improvements in public Forest Service roads (PFSRs) would allow greater amounts of passenger car traffic into more remote locations of the national forests and that unlawful actions and activities would increase along these road corridors. Travel and response times to remote locations of the national forests can often be up to two hours for national forest law enforcement staff or for cooperating law enforcement agencies. This is not expected to change to a large degree with the exception described under Alternative 6. The proliferation of unclassified roads and trails is expected to continue to be an ongoing management concern.

Under Alternatives 1, 2, and 3 transportation systems are not expected to materially change over the next 15 years, with the exception of some modifications to the PFSR system. The transportation system is expected to remain more or less in a static condition, and dispersal of law enforcement resources under these alternatives would be similar to the existing condition. In Alternative 4, vehicle access is expected to be modified more so than in Alternatives 1 through 3 in order to provide sustainable recreation opportunities and to allow a greater degree of separation between motorized and non-motorized uses. Law enforcement resources would be dispersed over a landscape similar to Alternatives 1 through 3. Travel and response times are expected to improve to a greater degree than in Alternatives 1 through 3 because of increased emphasis on maintaining high use roads for passenger car traffic.

Under Alternative 4a, national forest transportation systems would be more limited to public access as some roads and some areas are zoned as Back Country Motorized Use Restricted. The number of roads identified for administrative access under this alternative is higher than the number of roads currently closed to public vehicle travel under Alternative 1 (see Roads and Effects on Roads sections). The ability to concentrate law enforcement resources is similar to Alternative 6 although the number of roads that would become unavailable for public vehicle travel is less than in Alternative 6. Travel and response times for law enforcement staffing would be similar to Alternatives 1 through 3. In Alternative 5, limited expansion of the ML 2 road system is expected as some unclassified roads are brought into the National Forest System roads. Travel and response times are expected to increase because of the increase in land base that is accessible by an expanded ML 2 road system, even though the primary access routes through the national forests in Alternative 5 remain similar in configuration to the other six alternatives. This alternative has the greatest potential to disperse limited law enforcement resources over the largest accessible landscape and would be expected to diminish the overall effectiveness of the law enforcement program.

In Alternative 6, access to the national forests would be restricted primarily to the higher maintenance level 3, 4 and 5 road systems and to state and county transportation systems. Visitor use as well as law enforcement resources are expected to be concentrated to a greater degree than in the other alternatives because of the reduction in access to National Forest System lands as 67 percent of the ML 2 road system becomes unavailable for vehicle use by the public. Travel and response times for law enforcement staffing are expected to improve in locations that are served by the higher maintenance level road network and by the state and county road systems. This alternative has the greatest potential to concentrate limited law enforcement resources over the smallest accessible landscape and is expected to improve the overall effectiveness of the law enforcement program.

Cumulative Effects

The amount and frequency of law enforcement incidents are expected to increase over the next 15 years as national forest visitation increases and as the amount of vehicle travel that occurs through and within the national forests increases over the planning period. It is expected that the law enforcement role will become increasingly complicated as the demands placed upon national forest resources and facilities by the largely urban population continue to increase and as uses of all types are concentrated into smaller geographic areas because of constraining factors (such as conflicts with sensitive resources), or simply because of physical limitations imposed by topography and vegetation types (see the Recreation section, trends and projections).

Law enforcement staffing levels are expected to remain below desired conditions described in the national forest business plans as funding for Forest Protection Officers, Law Enforcement Officers, and Special Agents is expected to remain at, or below, current levels. Attrition through retirements within the law enforcement ranks is also expected to reduce the overall experience level of the field staff. The overall reduction in experienced law enforcement personnel is expected to result in a general knowledge gap regarding how law enforcement activities affect the management of the national forests and also affect the ability to address field issues in a timely manner. This gap is expected to widen over the planning period, as fewer law enforcement personnel are available to address basic resource and visitor concerns.

Effects on Facility Operations and Maintenance

Effects on Roads

Direct and Indirect Effects

The following tables displays the National Forest System road (NFSR) mileages for each alternative according to objective maintenance level and land use zone. Total miles shown (2,958) are slightly less than the miles noted in affected environment section because miles are clipped to conform to zoned lands within the boundaries of and on National Forest System land.

Table 292. Alternative 1 - Miles of roads and land use zone by objective maintenance level (ML)

	BC	BCNM	CB	EF	EW	RW	DAI	Miles of No Public Motorized Access
ML 1	**78**	**5**	**1**	**0**	**15**	**0**	**29**	**128**
ML 2	1,404	**41**	0	**22**	**8**	**0**	362	**71**
ML 3	534	**11**	5	**1**	**0**	**0**	141	**12**
ML 4	119	**1**	0	**1**	**0**	**0**	79	**2**
ML 5	30	**0**	1	**0**	**0**	**0**	69	**0**
Total	2,165	**58**	7	**24**	**23**	**0**	680	**213**

Notes: conflicts in bold; discrepancies in totals due to rounding

Table 293. Alternative 2 - Miles of roads and land use zone by objective maintenance level

	BC	BCNM	CB	EF	EW	RW	DAI	Miles of No Public Motorized Access
ML 1	**87**	**2**	**1**	**0**	**15**	**4**	**19**	**128**
ML 2	1,525	**49**	1	**22**	**8**	**18**	215	**97**
ML 3	569	**6**	5	**1**	**0**	**0**	109	**8**
ML 4	127	**2**	0	**1**	**0**	**0**	70	**3**
ML 5	34	**0**	1	**0**	**0**	**0**	66	**0**
Total	2,342	**60**	8	**24**	**23**	**21**	478	**236**

Notes: conflicts in bold; discrepancies in totals due to rounding

Table 294. Alternative 3 - Miles of roads and land use zone by objective maintenance level

	BC	BCNM	CB	EF	EW	RW	DAI	Miles of No Public Motorized Access
ML 1	**82**	**2**	**1**	**0**	**15**	**8**	**20**	**128**
ML 2	1,499	**31**	4	**22**	**8**	**56**	218	**116**
ML 3	572	**0**	6	**1**	**0**	**3**	109	**4**
ML 4	126	**1**	9	**1**	**0**	**0**	63	**2**
ML 5	34	**0**	1	**0**	**0**	**0**	65	**1**
Total	2,314	**33**	21	**24**	**23**	**67**	475	**251**

Notes: conflicts in bold; discrepancies in totals due to rounding ML: Maintenance Level

Table 295. Alternative 4 - Miles of roads and land use zone by objective maintenance level

	BC	BCNM	CB	EF	EW	RW	DAI	Miles of No Public Motorized Access
ML 1	**87**	**2**	**1**	**0**	**15**	**4**	**19**	**128**
ML 2	1,544	**32**	1	**22**	**8**	**17**	215	**79**
ML 3	576	**1**	4	**1**	**0**	**0**	109	**2**
ML 4	128	**0**	0	**1**	**0**	**0**	69	**2**
ML 5	34	**0**	1	**0**	**0**	**0**	66	**0**
Total	2,369	**35**	7	**24**	**23**	**20**	477	**211**

Notes: conflicts in bold; discrepancies in totals due to rounding

Table 532. Alternative 4a—Miles Of Road And Land Use Zone By Objective Maintenance Level

	BC	BCNM	CB	EF	EW	DAI	RW	BCMUR	Miles of No Public Motorized Access
ML 1	52	**9**	1	**0**	**15**	**17**	0	**35**	128
ML 2	1,173	**19**	2	**22**	**8**	196	6	**412**	467
ML 3	562	**2**	4	**1**	**0**	98	0	**23**	26
ML 4	114	**1**	7	**1**	**0**	63	0	**12**	14
ML 5	36	**0**	1	**0**	**0**	62	0	**1**	1
Total	1,937	**31**	15	**24**	**23**	436	6	**483**	636

Notes: conflicts in bold; discrepancies in totals due to rounding

Table 296. Alternative 5 - Miles of roads and land use zone by objective maintenance level

	BC	BCNM	CB	EF	EW	RW	DAI	Miles of No Public Motorized Access
ML 1	**93**	**0**	**0**	**0**	**15**	**0**	**20**	**128**
ML 2	1,593	**0**	0	**22**	**8**	**0**	215	**30**
ML 3	582	**0**	0	**1**	**0**	**0**	109	**1**
ML 4	129	**0**	0	**1**	**0**	**0**	69	**2**
ML 5	35	**0**	0	**0**	**0**	**0**	66	**0**
Total	2,431	**0**	0	**24**	**23**	**0**	478	**160**

Notes: Conflicts in bold; discrepancies in totals due to rounding

Table 297. Alternative 6 - Miles of roads and land use zone by objective maintenance level

	BC	BCNM	CB	EF	EW	RW	DAI	Miles of No Public Motorized Access
ML 1	**47**	**36**	**1**	**0**	**15**	**9**	**19**	**128**
ML 2	631	**902**	4	**22**	**8**	**50**	221	**982**
ML 3	556	**8**	7	**1**	**0**	**7**	113	**15**
ML 4	123	**3**	10	**1**	**0**	**0**	63	**4**
ML 5	34	**0**	3	**0**	**0**	**0**	63	**1**
Total	1,392	**950**	25	**24**	**23**	**66**	477	**1,130**

Notes: Conflicts in bold; discrepancies in totals due to rounding

Zones that restrict public motorized access are Back Country Motorized Use Restricted (BCMUR), Back Country Non-Motorized (BCNM), Critical Biological (CB), Experimental Forest (EF), Existing Wilderness (EW) and Recommended Wilderness (RW). Under all alternatives, the same 128 miles of Level 1 NFSR would continue to be closed to vehicular traffic. Public motorized access on the remaining level 2 through 5 NFSR would be restricted on 85, 108, 123, 88, 32, or 1,002 miles under Alternatives 1 through 6 (excluding 4a), respectively. Alternative 4a would have 517 miles of roads with restricted public motorized access. Under Alternative 4a, 248 of 1,502 individual roads would be within the BCMUR zone. Of 248 BCMUR roads, 201 are closed all year now, leaving 47 more that would be closed to conform to the forest plans' intent.

Maintenance responsibility for roads zoned for restricted public motorized access will shift to permittees and landowners where they are the primary users of the roads. In the group of NFSR within BCMUR zoning, emphasis will be to keep the key fire suppression roads passable for initial attack equipment. Remaining roads (typically dead end spurs less than one half mile) would be allowed to deteriorate and transition to level 1, available to open for emergency or project purposes.

Effect of Land management Plan Decisions on Roads

Alternatives 1, 2, 3, 4a and 6 would reduce the miles of unclassified roads (because they would be converted to trails or decommissioned). Alternatives 4 and 5 would incorporate those miles of unclassified road that are located outside CB, BCNM, EF, EW, and RW zones and environmentally sensitive areas into the NFSR system after site-specific analysis if they meet a public need and . Unclassified roads within the above zones would become candidates for the non-motorized trail systems.

Unclassified roads would become candidates for the motorized or non-motorized trail systems subject to conformance with land use zone suitability and further site-specific analysis.

Under Alternatives 1, 2 and 3, road safety deferred maintenance would be emphasized. Alternatives 4, 4a, and 6 would focus on the level 4 and 5 roads. Alternatives 4 and 5 would require some reconstruction of unclassified roads to meet minimum Forest Service Standards (FSM and FSH). The process of reconstructing unclassified roads and adding them to the system would result in short-term soil disturbance expected to last 3 to 5 years (Ketcheson and Megahan 1996, Luce 1997, Madej 2003).

Alternatives 1, 2, 3, 4a, and 6 would decommission unclassified roads. The process of decommissioning would create short-term soil disturbance for a period of 3 to 5 years following the activity. In table 298: Unclassified road miles by land use zone by alternative, page 352, the Back Country Non-Motorized (BCNM), Existing Wilderness (EW), and Recommended Wilderness (RW) land use zones restrict the use of unclassified roads. In BCNM, unclassified roads are restricted to non-motorized uses, while in EW and RW they are restricted to non-mechanized uses. The total area under restriction is indicated in the row labeled conflicts (Ketcheson and Megahan 1996, Luce 1997,Madej 1998). Alternative 5 would retain all NFSR miles and have the fewest road and land use zone suitability conflicts.

As part of the roads analysis process (RAP), a risk-assessment procedure was developed to attribute all National Forest System road segments in the INFRA database with both a species and watershed risk rating (or score), and an administrative and public benefit rating (or score). The complete RAP is in the reading room (available online). The species risk rating was determined based on the following road attributes:

- Location within a riparian conservation area:
- Location within occupied or suitable habitat for threatened and endangered plant and animal species; and
- Intersections of the road segment with a stream within occupied or suitable habitat within a riparian conservation area.

The watershed score was determined by two variables: slope stability class and watershed condition class. Each score was calculated on a scale of 0 to 5. A score of 0 indicates that no risk variables were present on a given road segment; a score of 1 or 2 indicates a low risk; a score of 3 indicates a moderate risk; and a score of 4 or 5 indicates that the road is considered high-risk for its potential effect on species or the watershed. The GIS layers that include the risk coverages for watershed and species were intersected with the INFRA travel routes road layer to find total miles by the criteria under evaluation.

Benefits of National Forest System roads were broken into two types: public/recreational and administrative. Public importance criteria establish a baseline of use, or importance, for each road by determining the number of recreational and public opportunities accessed by the road and the number of users that benefit from accessing those recreational opportunities, including recreation special uses. Administrative importance criteria establish a baseline of use or benefit for each road by determining the number of administrative opportunities accessed by the road and the number of users that benefit from accessing those opportunities. Administrative activities include fire suppression, fire prevention, prescribed fire, vegetation management, resource evaluation and management, special use access and administration, law enforcement, mining, oil and gas development, and any other roaded access needed to manage the national forests. The environmental scores are balanced with the importance scores to develop the tables and maps in the following categories: High Priority for Mitigation, Low Priority for Mitigation, and High Risk Low Importance.

Many roads identified in the RAP as High Priority for Mitigation and Low Importance, are zoned as BCMUR with restricted public motorized use. The effects to sensitive plants in these zones associated with motorized use will be minimized under Alternatives 4a and 6.

Effects of Vegetation Management, Fire, Insect Pests and Disease on Roads

Years of drought have led to vegetation mortality in some areas of the southern California national forests, with corresponding community protection needs. The need to accomplish vegetation management beyond recent levels is urgent. Vegetation management requires the use of more roads at one time than in the recent past. Many roads need repairs to safely accommodate the equipment needed for tree removal and prescribed burning treatments. In addition, some temporary roads are needed to remove trees.

Roads are important for wildland fire suppression and community protection activities. Both system and temporary roads are needed to access community protection zones for dead tree removal. Seventy percent of National Forest System roads are maintained only for high-clearance vehicles. One-third of these require reconstruction in many locations to accommodate wildland fire engines.

Alternatives 4 and 5 make unclassified roads available for conversion to National Forest System roads and therefore have the most road miles available. Alternatives 1 and 2 have about the same mileage of open roads and offer more access for fire suppression and vegetation management, than Alternatives 3, 4a, and 6.

Effects of Biodiversity Management on Roads

Habitat improvement projects could include improvements to roads to mitigate threatened, endangered, proposed, candidate and sensitive species issues, as well as road closures (both permanent and seasonal). Road density would also be limited in some areas. Generally, public motorized and mechanized access would be reduced in those alternatives that place greater emphasis on biodiversity; access reduction is most pronounced under Alternative 6, followed closely by Alternative 4a, then Alternative 3.

Effects of Watershed Condition Management on Roads

All alternatives emphasize the repair and mitigation of the effects of roads located in riparian areas, wetlands and uplands. Watershed condition analysis identifies the watersheds that roads are expected to affect the most. Mitigation options include seasonal closures, crossing improvements, rerouting roads and trails out of riparian areas, surfacing, storm water runoff protection and scour protection (Copstead and others 1998).

Table 299. Road Density by Acres

Road Density miles/sq mi	ANF	CNF	LPNF	SBNF	TOTALS	Percent of Totals
> 4.0	56,964	26,427	32,548	70,203	186,142	5%
2.0 - 4.0	136,075	67,944	169,173	143,212	516,404	15%
0.5 - 2.0	151,698	94,889	285,617	146,247	678,451	19%
< 0.5	318,245	231,618	1,288,198	289,482	2,127,543	61%
	662,983	420,877	1,775,536	649,143	3,508,539	

Road density in miles per square mile is one of many indicators in the watershed condition analysis. Overall, 80 percent of the national forests' acres by density class fall into the lower density classes of fewer than 2.0 miles per square mile, while 20 percent have greater than 2.0 miles per square mile (see table 299: Road Density by Acres).

Overall, 20.6 percent of the total 3,780 miles of National Forest System roads (or 778 miles) were found to be in high-risk locations (see table 300: High Risk Locations by Road Miles, by Forest). A high-risk road location was defined as having a watershed risk score of 4 to 5 or a species risk of 4 to 5 (high to very high). Watershed and species concerns are combined in each maintenance level. Of the roads in high-risk locations, most are in the ML 2 category; however, a substantial amount of the mileage also falls into the higher maintenance levels (ML 3 through 5).

Table 300. High Risk Locations by Road Miles, by Forest

Maintenance Level (ML)	ANF	CNF	LPNF	SBNF	Totals
Level 5	2.7	5.2	5.1	4.5	17.6
Level 4	23.6	8.6	18.5	3.9	54.7
Level 3	48.5	6.5	24.0	45.2	124.1
Level 2	247.5	65.8	71.7	156.2	541.2
Level 1	16.9	0.0	4.5	18.7	40.1
Total ML 1-5	339.3	86.1	123.8	228.4	777.6
Percent of Total ML 1-5	37.1%	20.6%	10.5%	18.0%	20.6%
Level 3-5	74.9	20.3	47.6	53.6	196.4
Percent of Total ML 3-5	28.1%	20.9%	11.8%	16.1%	17.8%
Level 1-2	264.4	65.8	76.2	174.8	581.2
Percent of Total ML 1-2	40.7%	20.5%	9.9%	18.7%	21.7%

ML: Maintenance Level

In order, Alternative 6 restricts public motorized access the most at 1,130 miles, then 4a at 645, then Alternatives 3, 2, 1, and 4 for about 200 miles, and Alternative 5 at 160 miles.

Watershed condition management would vary by alternative and would affect the season of use and priority for repairs based upon the total miles of roads in the areas of concern. Alternative 5 would have the most miles, followed by Alternative 4. Alternatives 1 and 2 have the fewest existing miles and unclassified roads in inventoried roadless areas that would be decommissioned. Alternatives 3 and 6 would retain the fewest NFSR road miles. Alternative 6 (through the process described above) would result in only the high-standard, upgraded miles remaining for administrative uses and public access.

Effects of Soils Management on Roads

Emphasis would be placed on maintaining the quality of water, riparian areas and soil stability. Proper road design and maintenance and other techniques mitigate negative effects on resources from roads. Under all alternatives, planned sediment disposal sites beneficially affect roads by avoiding the emergency placement of sediment from road/slope failure onto inappropriate sites that may cause further loss of road infrastructure and negative effects on other resources. Seasonal closures for native, surfaced roads to protect the watershed and soil resources would continue in all alternatives.

About 70 percent of NFSR miles are unsurfaced, and most soils on the national forests are highly erosive. These roads are nearing 70 years old and have long been stabilized, except where vegetation is lost due to fires and soil is lost during major storm events. However, the old design standards did not focus on erosion minimization. Many low standard roads need erosion protection improvements in order to increase their sustainability to better survive the cycle of fires and floods.

Effects of Management of Geologic Resources and Hazards on Roads

The more dramatic the landscape, due often to the geologic character, the more people are going to want to drive there on roads. Table 291: High-Risk Slope Zones 7 and 10, National Forest System Road miles by Forest indicates the number of miles of National Forest System roads in high or extreme slope hazard ratings (EUI, GIS, Access Database). This table also shows that 29 percent of the total miles of passenger car maintained roads (ML 3 through 5) are in slope zones 7 and 10, while 26 percent of the miles for high clearance vehicles (ML 2 and 1) are in slope zones 7 and 10. In addition, almost 50 percent of NFSR miles within the Angeles National Forest are in high or extreme slope hazard ratings compared to between 18 percent and 27 percent on the other three national forests. Therefore, the Angeles National Forest is particularly prone to slope failures and landslides during major storm events. Mitigation of geologic hazards and location of stable approved disposal sites improves safety of National Forest System roads and trails.

Table 291. High-Risk Slope Zones 7 and 10, National Forest System Road miles by Forest

Maintenance Category	ANF	CNF	LPNF	SBNF	Totals
Levels 3-5	129.7	39.9	71.4	74.0	315.0
	41.2%	17.6%	22.2%	28.6%	48.8%
Levels 1-2	315.2	36.2	162.8	176.2	690.4
	11.3%	21.1%	18.8%	25.8%	48.6%
Total Levels 1-5	445.0	76.1	234.2	250.2	1005.5
	18.2%	19.9%	19.7%	26.6%	48.6%

Seasonal closures for native, surfaced roads to protect geologic resources would continue through all alternatives.

Effects of Roadless Areas and Special Designations on Roads

In general, alternatives that have higher acreage or miles recommended for designation as wilderness or other special designations will limit or exclude motorized roads to a greater extent.

Overall on the four southern California national forests, Alternatives 6 and 3 recommend the most wilderness (582,000 and 470,000 acres), followed by Alternatives 2, 4a, and 4 (179,000, 87,000, and 81,000 acres, respectively). Alternatives 1 and 5 recommend no wilderness.

The disposition of the 1,045,281 acres of IRAs to land use zones that restrict public motorized access (RW, BCNM, BCMUR) varies by alternative as follows: 1) 381,000; 2) 433,000; 3) 819,000; 4) 391,000; 4a) 722,000; 5) 0; and 6) 905,000. BCMUR only applies to Alternative 4a.

The effects on roads from the need to protect wild and scenic river values and classification vary from non-construction to mitigation. Effects on road access are most pronounced in recommended wild river corridors; road construction is not allowed and even roads outside the river corridor might be incompatible if they detract from the primitive character or an outstandingly remarkable value. In recommended scenic river corridors, construction of roads and bridges that occasionally cross or reach the river would not affect the classification, assuming such roads are infrequent and relatively inconspicuous. Extensive road systems would be allowed to continue in recommended recreational rivers. Alternatives 3 and 6 recommend designation of the most wild river and overall miles, followed by Alternatives 2 and 4. Alternatives 1 and 5 recommend no miles.

Effects of Recreation Use and Management on Roads

Roads providing access to popular recreation sites would require upgrading to accommodate the projected increase in demand. Parking at developed and popular dispersed recreation locations would need to be provided or enhanced. In descending order, Alternatives 6, 4a, 4, 3, 2, 1, and 5 limit the motorized opportunities of the public to 2,650, 3,135, 3,529, 3,544, 3,564, 3,567 and 3,620 miles of the 3,780 miles of NFSR. Alternatives 4 and 5 would add some suitable unclassified road miles to the system. As recreation visitation and use increases, improvements that address transportation capacity and safety may also be needed, along with appropriate resource protection measures.

Recreation traffic has the largest impact on road and trail conditions of all national forest activities because it generally has higher volumes of use. National Forest arterial and collector road systems handle traffic ranging from 100 to more than 1,000 vehicles per day; the Forest Service road maintenance program has not been able to keep pace. Furthermore, the national forests estimate that 1,300 individual rights-of-way cases are needed to provide full public access to all ML 2, 3, 4 and 5 roads, with 95 percent of these needed for the ML 2 roads. This would be the same under Alternatives 1, 2, and 4a, and reduced under Alternatives 3 and 4a. Alternatives 4 and 5 have the strongest emphasis on rights-of-way acquisition to offer more miles for public use.

Effects of Transportation System Construction/Maintenance and Infrastructure

On average, the national forests are able to maintain only 20 percent of the NFSR miles to standard with expected annual funding. The deferred maintenance backlog continues to grow each year and maintenance needs are not fulfilled. An essential function of the road system and the initial rationale for its construction in the 1930s was to provide a network of truck trails to facilitate access for wildland fire suppression engines to remote parts of the national forests. Some of these 1930s era ML 2 roads have sections that have eroded to uneven bedrock. Few, if any turnouts exist. These sections are impassable by modern wildland fire equipment. Other problems that have contributed to the loss of available road of drivable width include: small landslides, heavy brush encroachment, eroded outsloped sections, lack of improved water crossings, and tight horizontal radius curves through vertical solid rock cuts.

Little progress is currently being made to rectify these critical road "pinch points." On occasion, the national forests receive some funding for projects to reduce deferred maintenance needs; however, many times these funds are directed toward higher standard roads with high public use. Under scenarios with higher budget levels, additional funding would be directed toward safety improvements on ML 3, 4 and 5 roads, and on the ML 2 roads that have "pinch points" restricting fire suppression, community protection, prescribed fire, mortality tree removal and vegetation management access.

Alternative 4 and 4a emphasize upgrading the higher ML roads for safety and capacity to serve developed and dispersed recreation facilities and activities. Alternative 6 focuses on investments for ML 3 through 5 roads. Alternative 3 would focus on NFSRs not eliminated by special designations that have wildland fire engine access "pinch point" concerns. Alternatives 1 and 2 would attempt to balance public access and wildland fire engine safety. Alternative 5 and, to a lesser extent, Alternative 4 include the incorporation of suitable unclassified roads into the transportation system.

Under Alternative 4a, 248 of 1,502 individual NFSR roads are proposed to be BCMUR. Of 248 BCMUR roads, 201 are currently closed all year, leaving 47 additions to that group to conform to the forest plan's intent. Alternative 6 closes more roads and miles to motorized public use, Alternative 5 the least, then Alternatives 4, 2, 1, and 3.

Effects of Special Forest Products on Roads

The alternatives vary in how they would help meet the growing demand for special products by providing road access. Alternative 5 would offer the most access to the most acres for special forest products, and Alternative 6 the least. Alternatives 1 and 2 would provide essentially the same road system as currently available, while Alternative 4 would have more mileage and Alternative 3 less mileage.

Effects of Non-Recreation Special Uses on Roads

Roads that provide access to currently authorized non-recreation special uses are not affected by any of the alternatives, except that maintenance responsibility for roads zoned for restricted public motorized access will shift to permittees and landowners where they are the primary users of the roads. Acres available for new proposals would vary by alternative, as would the construction of new roads associated with new proposals. Alternative 5 would be the least restrictive, followed by Alternatives 4, 1, 2, 4a, and 3. Alternative 6 would be the most restrictive.

Effects of Minerals and Energy Operations/Development on Roads

Oil and gas exploration and development may require roads for exploration, well construction, production and maintenance. Mineral exploration and mining also require roads for production. The amount of new roads would likely be few, and some may be only temporary. New roads would still be required to follow proper procedures before initiation.

Cumulative Effects

Before the 1930s, travel within the southern California national forests was limited to a few unsurfaced county roads and state highways, with some wagon roads through the public domain lands. During the 1930s, many roads were constructed by the CCC as fire protection truck trails. Some of the important routes have received minor upgrading. Many road miles from the 1930s are no longer available for motorized use after wilderness designations were assigned from the 1960s to the present.

As populations grow and urban development expands, the continuous use of National Forest System roads and trails will increase. There is currently a greater demand for a variety of recreation uses in both motorized and non-motorized settings. The arterial and major collector roads that connect the national forests to these areas will experience the most increased day-use traffic, particularly on weekends. This traffic adds to the maintenance work required but there is no additional funding to accomplish the work. National Forest System lands adjacent to population centers are affected the most by user-created trails that access the national forests from residential properties.

As travel to and through the national forests increases, there will be more impacts on surrounding public roads. Many state and county roads through the national forests provide commuters access from homes to jobs. All types of recreation use will significantly increase in volume on the national forests. The level of heavy truck traffic has increased considerably in the protection zones near communities in the San Bernardino and Cleveland National Forests during tree mortality removal operations.

Under all alternatives, coordination and collaboration with national, state and county officials in the management of transportation facilities to and through the national forests would be continued to ensure that access is maintained, standards are consistent, safety issues are addressed and efficiency is considered at all times. The Forest Service is required to provide reasonable access to private inholdings. As ownership changes, the access required may also change. Proposed subdivisions would result in the national forests requesting jurisdiction changes with the county public road agencies.

Overall, the transportation system for the southern California national forests will strive to be efficient and safe, provide access to areas of interest and provide for the variety of modes of transportation used by all to the greatest extent possible.

Alternative 5 has 69 individual NFSR roads out of 1,521 restricted, or 4.5 percent; Alternative 4 has 149 roads restricted or 8.5 percent; Alternative 1 has 162 roads restricted or 10.7 percent; and Alternative 2 has 187 roads restricted or 12.3 percent. Alternative 3 has 230 roads restricted or 15.1 percent, Alternative 4a has 503 roads or 33 percent, and Alternative 6 has 726 roads or 48 percent restricted.

The numbers show that Alternative 5 and Alternative 4 would be the most open to the public, and Alternative 4a, then Alternative 6 would be the most restrictive of public use. Alternatives 1, 2, and 3 would fall in between. In terms of acres, Alternative 6 would restrict public motorized use on 80 percent of all acres, Alternative 4a on 72 percent, Alternative 3 on 69 percent, and the combination of Alternative 4 on the Angeles, Los Padres and San Bernardino National Forests and Alternative 2 on the Cleveland National Forest (the preferred alternatives) would restrict public motorized access on 47 percent. Alternative 5 would only restrict public access on 33 percent of acres, the total of existing wilderness areas.

Under Alternative 4a, public motorized use would be restricted on 72 percent of all acres. Fewer fire starts are projected, heritage resources would be better protected, non-motorized recreation activities would be enhanced, and biodiversity would be improved. Permittees and landowners would take a greater role in maintaining their access where the public is not allowed on motorized vehicles. Motor vehicle effects to soils and watersheds should be reduced; however, closed roads without annual access needs would receive less maintenance than currently and may increase watershed impacts slightly. Opportunities for driving for pleasure would be slightly reduced in the Level 2 High Clearance Vehicle category.

Maintenance responsibility for roads zoned for restricted public motorized access would shift to permittees and landowners where they are the primary users of the roads. Under all alternatives, emphasis for the group of NFSR restricted to public motorized use will be to keep the key fire suppression roads passable to initial attack equipment. Remaining roads (typically dead end spurs less than one half mile) will be allowed to deteriorate and transition to level 1 (available to open for emergency or project purposes).

Effects on Non-Motorized Trails

Direct and Indirect Effects

Non-motorized trail management direction within the national forests generally allows shared-use (foot-travel, stock-use, and mountain biking) on designated non-wilderness trails, unless a forest order specifically restricts or prohibits this use. Wilderness trails and the Pacific Crest National Scenic Trail are restricted to non-motorized and non-mechanized use only (foot travel and horseback riding).

Four main factors most affect non-motorized trail opportunities:

- Effects on non-motorized trails from land use zoning. Changes in recommended wilderness zoning may increase potential opportunities to convert environmentally sustainable unclassified roads and ML 1 and 2 roads to non-motorized and/or mechanized trails. Recommended wilderness designations would decrease existing and potential mechanized trail opportunities. The motorized emphasis in Alternative 5 would decrease opportunities for construction of new non-motorized trails.
- Effects on non-motorized trails from increased use. Increased use of the non-motorized trail system may directly change the condition of the trails and the trail-user experience. Estimates of historical maintenance accomplishments suggest that the national forests' ability to supply adequate trail maintenance given increased use may decline. Encounters with other visitors would likely increase.
- Effects on non-motorized trail conditions from changes in network mileage. Changes in total trail mileage would indirectly change the trail condition. Estimates of historical maintenance accomplishments suggest that the national forests' ability to provide adequate trail maintenance, given an increase in trail mileage, may decline. A decrease in trail mileage may result in an improvement in trail conditions. Trail conditions and maintenance accomplishments are influenced by volunteer participation and funding, including funding from non-traditional sources (see cumulative effects section below).

Expansion of non-motorized trail opportunities must be in compliance with all pertinent laws and the revised forest plan direction before the expansion would be considered. Plan standards and design criteria found in the revised forest plan would be the basis for construction, maintenance and operation of the non-motorized trail resource. Specific resource mitigation measures will be identified in project-level analysis before constructing new trails or reconstructing existing trails.

Existing non-motorized National Forest System trail mileage would be retained for public benefit. Mileage available for mechanized opportunities (mountain biking) would be determined. Mileage available for potential expansion of the existing system would be determined. The major differences among the alternatives are:

- unclassified road mileage potentially available for conversion to non-motorized use
- maintenance level (ML) 1 and 2 road mileage potentially available for conversion to non-motorized use
- National Forest System mileage available for mechanized use
- expected change in trail conditions

Under all alternatives, an incremental mitigation method would be used to address environmental and visitor conflicts (see Appendix D, Adaptive Mitigation for Recreation Uses in Part 3 of the forest plan). Under all alternatives, the focus of trail management is primarily on maintenance and improvement of existing National Forest System trails. This includes improvements to trails that are open to mechanized use (mountain biking). Managers anticipate modest growth and improvement. Management is not based on the concept of no-net gain, but rather on a concept of limited expansion over time. Under all alternatives, existing and anticipated budget constraints would affect timeframes for meeting trail-related objectives as well as the need for program support from non-traditional sources such as volunteers, grants and partnerships.

In Alternative 1, management of the non-motorized trail system would occur in accordance with current land management plan direction as supplemented by the province biological opinion. Non-motorized trail mileage, road mileage available for conversion to non-motorized use, and mileage available for mechanized use would be unchanged.

In Alternative 2, environmentally sustainable non-motorized National Forest System trails would be retained. Environmentally sustainable unclassified roads may be converted to non-motorized, mechanized or motorized trails based upon land use zone and need. In general, non-motorized trail mileage would remain the same as in Alternative 1, with a focus on improved trail maintenance (maintaining what the national forests have).

Existing mechanized trail-based opportunities would decrease by approximately 91 miles based upon recommended wilderness zoning.

In Alternative 3, environmentally sustainable non-motorized National Forest System trails would be retained. Environmentally sustainable unclassified roads and level 1 and 2 roads may be converted to non-motorized and/or mechanized trails, based on land use zone and need. Due to the amount of unclassified roads and ML 1 and 2 roads in recommended wilderness, this alternative would supply the greatest opportunity for an increase in the non-motorized trail system and is similar to Alternative 6 (approximately 153 miles would be available for conversion).

The decrease in mechanized trail-based opportunities due to recommended wilderness zoning would also be greater than in any other alternative. Existing mechanized trail-based opportunities would decrease by approximately 244 miles based upon recommended wilderness zoning.

In Alternative 4, environmentally sustainable non-motorized National Forest System trails would be retained and may be expanded based upon land use zone and need. Environmentally sustainable unclassified roads and ML 1 and 2 roads may be converted to non-motorized, mechanized or motorized trails, based upon land use zone and need. Due to the amount of unclassified roads and level 1 and 2 roads in recommended wilderness, Alternative 4 would increase potential non-motorized trail mileage slightly more than Alternative 4a but substantially less than Alternative 3 or Alternative 6 (approximately 26 miles would be available for conversion).

The decrease in mechanized opportunities would be similar to Alternative 4a. There would be a 37-mile decrease in existing trail mileage available for mechanized opportunities due to recommended wilderness zoning.

In Alternative 4a, environmentally sustainable non-motorized National Forest System trails would be retained and may be expanded based upon land use zone and need. Environmentally sustainable unclassified roads and ML 1 and 2 roads may be converted to non-motorized, mechanized or motorized trails, based upon land use zone and need. Due to the amount of unclassified roads and ML 1 and 2 roads in recommended wilderness, Alternative 4a would supply the second lowest potential non-motorized trail mileage (approximately 17 miles would be available for conversion).

The decrease in mechanized opportunities would be the second lowest among the alternatives. Existing mechanized trail-based opportunities would decrease by approximately 32 miles due to recommended wilderness zoning.

In Alternative 5, environmentally sustainable non-motorized National Forest System trails would be retained and may be expanded slightly based on land use zone and need (primary focus is on improvement of the motorized trail system). Generally, ML 1 and 2 roads would be retained for motorized use based on land use zone and need. No wilderness areas are recommended. Mileage available for conversion to the non-motorized system would be the lowest among the alternatives.

Existing trail-based mechanized opportunities would remain unchanged. There would be no decrease in mechanized opportunities.

In Alternative 6, environmentally sustainable non-motorized National Forest System trails would be retained. Environmentally sustainable unclassified roads and ML 1 and 2 roads may be converted to non-motorized and/or mechanized trails based upon land use zone and need. Due to the amount of unclassified roads and ML 1 and 2 roads in recommended wilderness, this alternative would provide the second highest opportunity for an increase in the non-motorized trail system (approximately 133 miles would be available for conversion).

Existing trail-based mechanized opportunities would be slightly greater than in Alternative 3, with forest-specific variation. Existing mechanized trail-based opportunities would decrease by approximately 219 miles within the four southern California national forests based upon recommended wilderness zoning.

Cumulative Effects

Cumulative effects on the non-motorized trail system are a function of increased demand and changes in trail mileage (potential decrease or increase) based on land use zoning. Increased demand and a decrease in potential trail mileage (as determined by land use zoning) may negatively affect both the trail condition and the trail-based experience, including the number of visitor encounters. Increased conflict among visitor groups may also result. An increase in demand and an increase in trail mileage may also affect trail conditions and the trail-based experience.

Maintenance accomplishments are not expected to increase with the addition of new trail mileage. Added trail mileage and increased demand would increase the need and opportunities for program support from non-traditional sources such as volunteerism, grants and partnerships. The future condition of the trail resource will likely depend on active participation from user groups.

Effects on Motorized Trails

Direct and Indirect Effects

Off-Road Vehicle Use

Unmanaged recreation (especially impacts from off-highway vehicle [OHV] use) has been identified by the Chief of the Forest Service as one of the key concerns facing the nation's forests and grasslands. As noted in a recent communication piece from the Washington Office regarding OHV use, "Off-highway vehicle travel off designated roads and trails cannot be sustained without damage to basic forest resources or compromising other resource objectives and values" (USDA Forest Service 2003).

Under all alternatives, unrestricted off-road vehicle use would compromise the national forests' ability to achieve resource management objectives, promote public safety, and minimize conflicts with other uses. The effects of unrestricted and unmanaged off-road vehicle use are well documented (General Accounting Office 1995; USDA Forest Service 2001, 2003, 2004, 2004). Examples of national forest values that are at risk when an unrestricted off-road vehicle use policy is in effect include:

- Protection of threatened and endangered species, riparian areas, and cultural resources;
- Maintaining water quality;
- Conserving soil resources;
- Maintaining long-term land productivity;
- Preventing the spread of undesirable/non-native species;
- Prevention of vehicle-caused fires;
- Retention of scenic integrity values;
- Providing a safe, efficient, and environmentally sound transportation system; and
- Providing sustainable recreation opportunities for OHV enthusiasts.

Federal regulations are structured around where vehicle use can occur and speak specifically to the management of off-road vehicle use. Off-road vehicle travel means that vehicle use occurs on National Forest System trails that are designated for motorized use, unclassified trails, in areas designated as open to cross-country vehicular travel or, unless specifically prohibited by forest order, cross-country. Vehicle travel on unclassified roads is also off-road vehicle travel, as it does not occur on National Forest System roads. Off-road vehicle travel can be "encouraged" by open terrain, lack of vegetation that would prevent vehicle passage, or topographic features that favor cross-country vehicle travel, such as low slope percentage.

The risk of vehicle-caused fires would increase if cross-country vehicle travel is allowed because dry, flashy fuels (such as annual grasses) are more likely to be encountered during a cross-country driving or riding experience and because flammable material easily comes into contact with hot catalytic converters or other exhaust systems. Restricting vehicle use to designated routes and to the limited open areas currently designated for use would reduce the risk of vehicle-caused fires.

The protection of imperiled species and their habitats and the protection of cultural properties cannot be assured when the possibility of random, off-road vehicle incursions can happen at any time; the national forests' ability to prevent this type of action is limited.

Scenic integrity values are compromised by the development of "spaghetti trail systems" as enthusiasts develop their own convoluted riding patterns on the landscape that visually present an uncontrolled and chaotic pattern of line elements not found in natural-appearing landscapes (see Agriculture Handbook 701, USDA Forest Service 1995).

An unrestricted off-road vehicle management policy would compromise wilderness values when many miles of wilderness boundary cannot be effectively posted or patrolled. A restricted off-road vehicle management policy would provide a higher level of protection from vehicle trespass into wilderness areas.

Ongoing use of unclassified roads and trails that have not been engineered or designed will further compromise national forest resources and encourage the continued development of unauthorized routes. Of particular concern is the potential for an increase in the unclassified roads and trails associated with the dead tree removal on the San Bernardino National Forest, and, to a lesser extent, on the Angeles and Cleveland National Forests. This is particularly true where this activity is located adjacent to the mountain communities, because skid trails and temporary roads offer easy access into the national forests.

Past experience has demonstrated that once forest vegetation is removed during a wildfire, there has been a clear tendency by the recreating public to travel cross-country through the burned areas (personal observations, southern California OHV managers). Unless adequately closed, dozer lines and hand lines created during fire suppression activities (as well as fuelbreaks and associated vehicle access needed for vegetation management) often become unclassified roads and trails over time and become attractants for OHV enthusiasts (personal observations, southern California OHV managers). When large acreages of vegetation have been removed by a wildfire, it is often necessary to close the burn areas for a period of rehabilitation to prevent off-road vehicle travel (for example, Turtle Fire closure 2000, Blue Cut Fire closure 2001, Louisiana Fire closure 2002, and Old Fire 2003, all on the San Bernardino National Forest).

The ability to restrict motorized use to designated routes has other benefits. As described in the proposed rule for Travel Management, *Designated Routes and Areas for Motor Vehicle Use* (USDA Forest Service 2004), "…the agency identified benefits associated with restricting cross-country wheeled motor vehicle use. These benefits included substantial reduction of use conflicts associated with cross-country travel; improvement of motorized and non-motorized recreation experiences; substantial reduction in impairment of visual aesthetics; and enhanced protection of habitat and aquatic, soil, and air resources in the analysis area" (USDA Forest Service 2001). In addition, "[b]enefits of designated roads and trails included less interruption of natural processes, such as fire; improvement of the ecological and hydrological functions in and around riparian areas, wetlands, and streams; and increased public safety" (USDA Forest Service 2004).

Off-Highway Vehicle Use

The development of functional OHV systems is important for the long-term sustainability and management of the activity, the protection of national forest resources, the enjoyment of enthusiasts, and the prevention of conflicts among activities (FSM [Forest Service Manual] 2355 and FSH [Forest Service Handbook] 2309.18; California Department of Parks and Recreation June 2002d). Systems that have not been designed to current engineering standards and that do not provide the type of opportunities for which enthusiasts come to the national forests are expected to experience long-term degradation that would result in increasing impacts on resources (Trail surveys, 3W11, OHV staff, San Bernardino National Forest; USDA Forest Service 2001). The development of trail systems that meet fundamental design elements would address the needs of OHV enthusiasts while providing protection of national forest resources and reduce conflicts with other uses (California Public Resources Code, Sections 5070.7, 5075.3, 5077.2 and 5090.02; California Department of Parks and Recreation 2002d; Crimmins 1999, Makel 1988, USDA Forest Service 2003, 2004; Wernex 1994). As OHV systems become more fully developed and provide the types of opportunities that enthusiasts are seeking within a national forest setting, the following benefits can be anticipated:

- greater compliance from enthusiasts by staying on the designated route system;
- reduced development of unclassified roads and trails;
- fewer safety issues and law enforcement incidents (including unlawful use on undesignated routes, state highways, and county roads);
- off-route impacts would be reduced over time; and
- a higher level of enthusiast satisfaction would result because of having the opportunity to travel on well-maintained and well-managed systems (Richer and others 2002a; California Department of Parks and Recreation 2002d).

Management of the activity would benefit from further research on the subject of route development and how it relates to enthusiast satisfaction and the protection of resources (California Department of Parks and Recreation 2002d). The Forest Service has acknowledged a need for additional scientific information in this area and research on the subject is ongoing (Chavez and Knap 2004, USDA Forest Service 2003 [multiple briefing papers]).

Existing OHV systems are expected to become less responsive to the needs of enthusiasts over time unless substantive changes are undertaken to address system deficiencies, such as those described below:

- As a result of increasing urbanization within and adjacent to the national forests, safety and law enforcement issues are expected to increase as non-highway licensed riders access riding opportunities via state and county highways, use non-designated National Forest System roads and trails, and mix with highway licensed traffic or with non-motorized users.
- The use of undesignated routes by enthusiasts to safely return to off-loading sites after recreating can often be attributed to the lack of bypasses between easy and more difficult riding situations or to the lack of development of an adequate riding system. Route design or designation problems can result in less experienced riders being directed into situations that require advanced riding skills.
- Access to the non-highway licensed vehicle systems or riding localities is limited or unavailable in many locations. This results in the development of unauthorized off-loading sites that subsequently result in an increase of resource impacts in localized areas (personal observations, OHV staff, southern California national forests).
- In many instances, riding localities or systems do not provide adequate mileage for an enjoyable riding experience. The use of loop trails that meet the different experience levels of OHV enthusiasts is inadequately developed in many localities and often results in the unauthorized development of trails that create "riding opportunities" that meet the enthusiast's level of riding experience.
- Connectivity between riding localities, staging areas or with larger OHV systems is often inadequate or non-existent. Many segments of designated OHV route are isolated from any other riding opportunities or are not associated with any designated OHV system. The use of these unconnected route sections often results in the unauthorized extensions of the routes as enthusiasts leave designated routes in search of ways to connect authorized routes together.

Improvements in technology are expected to continue to increase the performance capabilities of off-highway vehicles and could outpace the national forests' abilities to be responsive to resource and enthusiasts needs. Innovations in technology can be expected to create new forms of vehicular use, some of which will challenge current thinking regarding OHV management and how laws are structured regarding vehicle use and operation (USDA Forest Service 2004). For example, in recognition of the introduction of a new ATV that carries an operator and one passenger, the state law regulating this vehicle type was recently modified to address the change (California Vehicle Code, Section 38506). With better technology and more power, more users will gain the ability to traverse more difficult conditions, further supporting the need for routes that are properly engineered and designed for the types of vehicles that will be using them. Field reviews indicate that trails that have sections with grades greater than 10 percent present maintenance difficulties and will often require trail hardening in order to protect the investment, reduce maintenance costs, and protect soil and water resources (personal observations, OHV staff, San Bernardino National Forest 2000 to 2001; Poff and Ryan 2002).

It is anticipated that ongoing use of unclassified roads and trails would continue to have detrimental effects on national forest resources and encourage the proliferation of unauthorized routes (Milburn 2000; California Department of Parks and Recreation 2002d; USDA Forest Service 2002, 2003, 2004). Even though they appear to provide the type of opportunities that enthusiasts want, unsustainable (albeit readily available) routes (such as skid trails, user-created trails, or fuelbreaks) would not improve a national forest's OHV system if these facilities are indiscriminately adopted into a national forest's OHV system, and they would result in an escalation of impacts on national forest resources. Unclassified routes are not engineered or designed to any standard and, in many cases, would not be able to be maintained to design standards as required by manual direction (FSM 7723 - Trails, FSH 2309.18—Trails Management Handbook). Many of these unclassified routes are candidates for full decommissioning because they cannot meet the soil standards currently in place for the State and as adopted by Region 5 for OHV management (California Department of Parks and Recreation 1991, Poff and Ryan 2002)

Four-Wheel Drive (4WD) Use

High-quality 4WD routes are hallmarks of Forest Service recreation opportunities. Well-known examples of the type of 4WD opportunities the Forest Service offers are the Rubicon Trail, located on the Eldorado and Tahoe National Forests, and the Dusy-Ershim 4WD route, located on the Sierra National Forest. While these routes are famous for the type of 4WD opportunity they offer, they are remote and not readily accessible to southern California enthusiasts. "Genuine" 4WD routes are the most limited set of OHV opportunities that the four southern California national forests provide, and they are highly valued by the OHV community. This type of recreation opportunity is expected to remain a limited and valuable resource for present and future generations of enthusiasts as older routes that have traditionally been enjoyed for many years are closed because of the effects the routes are having on other resources (primarily to riparian areas, threatened and endangered species habitat, or cultural properties).

The highest level of OHV use on all four southern California national forests is by 4WD/SUV-type vehicles on the ML 2 road system. Many of the ML 2 roads that are open to vehicle travel provide a minimal 4WD experience, although this can vary substantially with changes in the weather, road surface conditions, and with driver experience. 4WD routes are not typical ML 2 roads. The characteristics that make 4WD routes desirable as a recreation experience (such as steep or rough grades, rock shelves and boulder obstacles) present maintenance difficulties that are not normally encountered on the ML 2 road system. Implementation of standard maintenance practices used for ML 2 roads are generally not desirable for the retention of the 4WD experience so modified maintenance practices are used to retain the opportunity and to protect resources adjacent to the routes. For example, corduroy puncheon may be used to cross a seasonally wet area where a typical application on a ML 2 road would involve the placement of filter cloth and gravel base to prevent road deterioration. Providing a wide range of 4WD opportunities would enhance enthusiasts' enjoyment of the national forests and also provide access opportunities for a broader range of recreation activities that have a primary purpose other than 4WD use (USDA Forest Service 2004). For example, 4WD capability provides hunters and fishers with the ability to access remote areas of the national forests in the pursuit of their activities, and in many locations having 4WD capability is highly desirable or even necessary to access remote wilderness trailheads.

Effects of Forest Plan Decisions on Off-Highway Vehicle Use

Assumptions used in this analysis include the following:

- Areas and trails are classified as to whether or not off-road vehicle use may be permitted in accordance with 36 CFR [Code of Federal Regulations] 219.21(g) and 36 CFR 295.2.
- All four southern California national forests designate roads and trails for non-highway-licensed vehicle use. Cross-country vehicle travel will be prohibited except within the open areas currently designated on the Angeles and Cleveland National Forests.
- Designated open areas on the Cleveland National Forest would be converted to a designated route system through the plan amendment process under Alternatives 2, 3, 4, 4a, and 6. Alternatives 1 and 5 would retain the existing open areas on the national forest.
- Non-highway licensed vehicle use is restricted to low maintenance standard roads, trails, and open areas that are designated for use by vehicles registered as off-highway vehicles (California Vehicle Code, Sections 38006, 38010, and 38012).
- Forest orders will be developed, updated, or revised as needed to restrict off-highway vehicle use to roads and trails that are designated for motorized use and to the existing open areas on the Angeles and Cleveland National Forests. These orders will be used to manage the OHV activity until the time that the proposed rule changes to 36 CFR Parts 212, 251, 261, and 295 are codified

and the national forests are able to satisfy all the requirements for application of revised section 36 CFR 261.13.

- All roads and trails are signed for the type and difficulty of use.
- Maps that display the riding/driving opportunities and describe operating conditions are available for each unit in accordance with regional and national direction for the OHV activity.
- When OHV conflicts with resources or other activities are discovered or brought to the national forests' attention, measures outlined in Appendix D of Part 3 of the forest plan (Adaptive Management Protocol for Recreation Activities) will be used to resolve the situation.
- Off-route impacts are treated in a timely manner to prevent the proliferation of unclassified roads and trails. Barriers, barricades, fencing, revegetation and disguise tactics are used to prevent further vehicle encroachment and protect resources.
- Trail maintenance occurs on an annual basis commensurate with trail needs and available funding.
- Law enforcement patrols by Forest Protection Officers and Law Enforcement Officers occur commensurate with the levels and locations of OHV use.
- Off-highway vehicle volunteers and adopt-a-trail clubs are used to assist the national forests with resource protection, visitor education, and information regarding OHV use on National Forest System land.
- A component of the California Recreational Trails Plan (the California Statewide Motorized Trail [CSMT]) remains a viable concept for the overall management of motorized activities on the national forests. This plan illustrates the concept of a statewide OHV route system that connects land managed by the Forest Service, the BLM, and the State of California to offer opportunities for long-distance motorized travel and to enjoy the many diverse cultural, historical, and recreational values of the State. Existing National Forest System roads and trails can be included as part of this system, although the construction of new connector trails may be needed to supplement existing routes. To date, the only segments of the CSMT that have been designated are on the Angeles National Forest.

For Alternatives 1 through 6, management emphasis is on the use of designated routes for all motorized travel. The amount of land zoned where motorized activities are occurring or could potentially occur varies by alternative. It is not the intent to imply that motorized use will occur over the entire area zoned for motorized use in any alternative. The consequences also vary by alternative, primarily as a result of the modifications to land use zoning and to the degree that national forests retain motorized access. Under Alternatives 2 through 4a and 6, the Cleveland National Forest would convert designated open areas to a designated route system and discontinue cross-country vehicle travel in these locations.

Alternative 1. Under current management, OHV systems are not expected to change materially from their existing conditions. Changes in land use zoning would not be made to improve riding opportunities and OHV route connectivity. Incremental changes to the trail networks (such as minor trail rerouting or trail development to connect isolated sections of trail together) would continue to be made primarily for species protection. Designation of some ML 2 roads for OHV use would be made in order to address species concerns or address other resource issues associated with the OHV systems. Four-wheel drive opportunities are not anticipated to materially change because few ML 2 roads would be converted to a 4WD opportunity and few unclassified roads would be brought into the National Forest System roads. Designations of the California Statewide Motorized Trail are expected to be minimal as OHV systems remain more or less in their existing configuration. The ability to achieve the desired condition for the activity would be limited.

Alternative 2. Because of small changes from non-motorized to motorized land use zones, improved connectivity of OHV trail systems and long distance touring opportunities are anticipated in some locations. Designation of ML 2 roads that provide additional OHV experiences for non-highway licensed vehicles would be emphasized for linking disconnected trails and ML 2 roads together. Where the designation of ML 2 roads is infeasible for the purposes of linking disconnected routes together or provide bypasses around sections of ML 1 and 3 roads, trail construction would be a viable option although new trail construction is anticipated to be minimal. Similar to Alternative 1, 4WD opportunities would remain at current levels and are not expected to materially change. Designations of the California Statewide Motorized Trail would be minimal as OHV systems remain more or less in their existing configuration. The ability to achieve the desired condition for the activity would be limited.

Alternative 3. The development of integrated OHV systems would be limited to smaller areas of Back Country zones due to large changes from motorized to non-motorized zoning. Opportunities to improve the existing systems (for example, loop and long-distance trail development) would be limited because more acreage is managed for non-motorized uses and because OHV use is restricted primarily to the current designations. Additional wilderness designations would further reduce motorized activities on all national forests and would convert some motorized trails to non-motorized uses. For example, two popular OHV trails on the San Bernardino National Forest (2W01 and 1W17) would be closed to motorized use under this alternative. Four-wheel drive opportunities would remain in a similar condition as currently exists on the national forests as land use zoning would likely forego the classification of the unclassified road and trail system as National Forest System roads or trails except for use as non-motorized routes. Designations of the California Statewide Motorized Trail would be limited to the existing systems, with reduced opportunities to make long-distance connections to adjacent OHV opportunities within the remaining Back Country zones. The ability to achieve the desired condition for the activity would be more limited than in Alternatives 1 and 2.

Alternative 4. Land use zoning would provide additional opportunities to improve or further develop existing OHV systems. Some inventoried roadless areas would be designated as Back Country to allow for the possibility of developing long-distance trail connections between riding localities. Integrated OHV systems that address the basic attributes of a functional OHV system would be developed as described in the desired condition for this activity; these systems would reflect the recommendations found in Forest Service direction and in other publications, such as *Off-Highway Motorcycle and ATV Trails Guidelines for Design, Construction, Maintenance, and User Satisfaction* (Wernex 1993), and are expected to result in sustainable recreation experiences for OHV enthusiasts. Developments may include providing long-distance riding and loop opportunities for a variety of enthusiast experience levels, connecting isolated riding localities or route segments to form larger route systems, access to designated routes and staging areas, and facility improvement. Safety concerns associated with the systems, protection of resources, and minimization of conflicts with other users and activities would also be addressed. Opportunities to provide additional 4WD routes are expected to increase slightly in Alternative 4 as some of the unclassified road network that is environmentally sustainable and those that would help address the desired condition for the activity are brought into the National Forest System roads as classified roads. Some of the ML 2 road system may provide more of a 4WD experience over time as a result of a reduced ability to maintain the entire ML 2 system as road maintenance budgets remain at a low level or continue to decline. OHV use on ML 1 and 3 roads would be redirected to other locations either by the designation of ML 2 roads, the classification of portions of the unclassified road and trail network, or new trail construction. Additional opportunities to designate sections of the California Statewide Motorized Trail are expected as off-highway vehicle systems more fully develop and trail and road segments are identified which meet the requirements for trail designation. The ability to achieve the desired condition for the activity would be improved.

Alternative 4a. OHV systems would be slowly improved over the next 10 to 15 years utilizing tactics described under Alternative 4 to meet the desired conditions for the activity and for the long-term protection of resources. Small changes in land use zoning would be made to improve national forest's OHV systems that emphasize longer distance riding opportunities or that connect isolated sections of route together. Improvements that result in integrated OHV systems and address the basic attributes of a functional OHV system would be slowly developed. Incremental changes would concentrate on improvements that provide a high level of species protection and that are beneficial for the overall management of the OHV system, such as minor trail rerouting or loop development. Conflicts with resources and other uses would be addressed on a case-by case basis as prioritized through the district/national forest program of work process. Where the designation of ML 2 roads is infeasible for the purposes of linking disconnected routes together or provide bypasses around sections of ML 1 and 3 roads, trail construction would be a viable option although the amount of new trail construction is anticipated to be low. Designation of some ML 2 roads for OHV use is expected to continue in order to address species concerns or address other resource issues associated with the OHV systems. Use of some of the ML 2 road system by the public will be foregone with the designation as Back Country Motorized Use Restricted. With the current level of road maintenance backlog, it is anticipated that 4WD opportunities will improve as ML 2 roads become rougher over time and as limited funding resources are directed to the higher maintenance level roads to retain access for low clearance vehicles. Designations of the California Statewide Motorized Trail are expected to be minimal as OHV systems remain more or less in their existing configuration although long distance connections between systems would materially add to the enjoyment of the California Statewide Motorized Trail network. The ability to achieve the desired condition for the activity would be greater than described for Alternatives 1 and 2 but less than Alternative 4.

Alternative 5. Alternative 5 would have the most opportunity to provide additional motorized activities because most of the land base would be zoned Back Country. New wilderness designations would not occur; there would be increased IRA acreage available for motorized trail development with the intent of connecting isolated or disconnected OHV systems together with the development of long-distance trail linkages. OHV trail systems for non-highway licensed vehicles would be developed beyond the route system described in Alternative 4 and either approach, or in some cases, exceed the upper ends of the mileage scale outlined in the Forest Service Trail Handbook as more land is zoned for motorized uses (FSH 2309.18). Motorized travel would continue to be restricted to roads and trails that are designated for motorized use. To connect isolated or disconnected riding localities together, more trail construction and designation of ML 2 roads for non-highway licensed vehicle use is anticipated. The conversion of unclassified roads and trails into classified facilities is expected to increase the mileage available for both highway and non-highway licensed vehicles under this alternative, more so than in Alternative 4, primarily as a result of more acreage being available for motorized activities and because the greatest number of unclassified roads and trails would be available for consideration as additions to the OHV system. Four-wheel drive opportunities are expected to increase proportionally as more ML 2 roads are identified as a 4WD experience and as more unclassified roads are brought into the National Forest roads system. More opportunities to designate sections of the California Statewide Motorized Trail would be expected as off-highway vehicle systems develop more fully and as trail and road segments that meet the requirements for trail designation are identified. The desired condition for the activity may not be able to be achieved as operating conditions would be more likely to resemble the situation that was prevalent prior to the current forest plans going into effect and as managerial controls are reduced under this alternative. For all practical purposes, in spite of national forests declaring a designated route system, actual conditions would more likely resemble an unrestricted use pattern that was prevalent in the 1970s and early '80's (USDA Forest Service 1972).

Alternative 6. Large changes in land use zoning that increase the acreage managed for non-motorized uses and as recommended wilderness would limit the ability to develop an integrated OHV system and improve its functionality as described in the desired condition for the activity. General public access via the ML 2 road system would be reduced by an estimated 67 percent, as the ML 2 road system would be retained primarily for fire suppression or vegetation treatment activities and not available for general public access with motorized vehicles. Loss of existing motorized trail opportunities would not occur in Alternative 6 as it would in Alternative 3 because of wilderness designation. Four-wheel drive opportunities are expected to be limited to the portions of the ML 2 road system that remain open for motorized access by the public or are part of the designated OHV system that can accommodate full size vehicles. Designations of the California Statewide Motorized Trail are expected to be limited primarily to the existing OHV systems. Long-distance travel opportunities for non-highway licensed vehicles on the trail would be limited. The ability to achieve the desired condition for the activity would be limited similar to Alternative 3.

Other program areas affect OHV systems across the four southern California national forests.

Effects of Biodiversity, Soils and Watershed on Motorized Trails

All alternatives would manage motorized opportunities to protect resources; however, approaches would vary, primarily in zoning available for motorized activities and emphasis on improving the OHV system.

Under Alternatives 1 and 2, national forest resources are expected to sustain increasing levels of impacts (including off-route impacts) as use levels increase and as OHV systems remain more or less in their existing configurations. The development of system attributes such as route connectivity, loop trail development, and access to systems for non-highway licensed vehicles would remain, for the most part, unaddressed. This would result in the possible closure of portions of trail or route systems until reasonable solutions are developed that reduce the effects of the activity on the affected resources.

Under Alternative 3, existing and future OHV opportunities would be reduced because of the emphasis on biodiversity (including more recommended wilderness zoning). The national forests' ability to manage the sections of the OHV systems that remain available for use would be limited as the designated route systems would remain in their current condition, use levels are expected to increase, and the activity would be concentrated into smaller geographic areas. Conflicts between various activities within these concentrated use areas are expected to increase as various forms of use vie for a limited land base. Closure of some locations or individual routes may become necessary, as unacceptable impacts to resources are likely to result from the concentration of motorized uses and the limited ability to disperse the activity. Motorized uses would likely be displaced onto other lands, both public and private, as OHV enthusiasts continue to pursue their activity.

Under Alternative 4, the further improvement of OHV systems that provide the type of opportunities that enthusiasts come to the national forests for are expected to result in reduced effects to soil, water, and biological resources. Off-route impacts and the proliferation of unclassified roads and trails would be reduced over time as more intensive managerial controls, including information and education efforts, are put into effect.

Under Alternative 4a, protection of resources would be emphasized with a reduced focus on the improvement of OHV systems. This alternative is expected to respond to biodiversity, soils, and watershed issues similar to Alternatives 3 or 6 and provide a high level of resource protection within the non-motorized land use zones. Fewer project proposals for the improvement of OHV systems are anticipated, but those that are proposed would be highly beneficial to both resources and the activity. Route closures for resource protection may become necessary as incremental changes to OHV systems may not be able to keep pace with the anticipated rise in visitor use.

Under Alternative 5, the acreages affected annually by off-route impacts are expected to increase because of a lack of intensive managerial controls together with greatly expanded motorized opportunities. Off-route impacts and the ongoing development of unclassified roads and trails are expected to increase as enthusiasts try to connect classified roads and trails together over a larger motorized area than in other alternatives. Route or area closures for resource protection may become more frequent due to reduced managerial controls and expanded motorized zoning.

Under Alternative 6, opportunities to improve the OHV system would be limited because of the emphasis on biodiversity and the reduction in public motorized use on the ML 2 road system. The national forests' ability to manage the sections of the OHV systems that remain available for use would be limited as the systems are further isolated from each other and as the activity would be more likely to be concentrated into smaller geographic areas. Concentrated areas of use would develop with an anticipated escalation of conflicts and impacts to resources similar to Alternative 3. Route closures for resource protection might become necessary as described under Alternative 3. Motorized uses would likely to be displaced onto other lands, both public and private, as OHV enthusiasts continue to pursue their activity.

Effects of Land and Real Estate Management on Motorized Trails

Under Alternatives 1 and 2, the lack of rights-of-way may compromise some riding localities as use on currently designated routes could be disrupted. Although the lack of rights-of-way is expected to affect the ability to develop functional OHV systems in Alternatives 4 and 5, any trail development would strive to avoid rights-of-way issues to the fullest extent possible. Bypasses around constrained rights-of-ways in Alternatives 3, 4a, and 6 would likely require amendments to forest plans that would modify non-motorized land use zones to allow for motorized corridors that would address connectivity issues with the OHV systems.

Effects of Inventoried Roadless Areas (IRAs) and Wilderness on Motorized Trails

In this forest plan revision, inventoried roadless areas are analyzed and recommended for Back Country Non-Motorized zones (equivalent to semi-primitive non-motorized ROS), Back Country zones (usually equivalent to semi-primitive motorized ROS), or new wilderness/additions to existing wilderness designation. The evaluation process is described in Appendix D. Inventoried Roadless Areas (IRAs) (Introduction and Evaluation Process Summary). The most notable change in ROS classification since the mid 1980s has been the inclusion of more public land into the primitive and semi-primitive non-motorized ROS categories due the creation of new wilderness. The distribution and designation of recommended wilderness are expected to affect the ability to disperse motorized uses, provide a varied pattern of riding opportunities and facilitate or restrict the ability to connect riding localities for long-distance touring. Areas of proposed wilderness that are recommended by the national forests and subsequently designated by Congress will eliminate motorized activities from these areas and in some geographic locations would affect the ability to provide long distance linkages between OHV systems.

Roadless areas that are not recommended for wilderness may provide a variety of motorized and mechanized travel opportunities depending on the land use zone assigned. Assignment of some IRA acres to Back Country zoning in Alternatives 2, 4, 4a, and 5 would be made to address specific connectivity issues associated with national forest OHV trail systems. The Back Country zone would facilitate the development of long-distance motorized trail riding opportunities that link isolated or unconnected trails for vehicles 50 inches and less in width. Alternatives 1, 2, 4 and 5 provide the most opportunity to develop motorized recreation use, Alternatives 3, 4a, and 6 the least. The classification of much of the national forests' land base to non-motorized zoning in Alternative 4a would not automatically forego the opportunity to include portions of the unclassified road and trail network into the classified system or to develop trails that would link isolated systems together. Site-specific NEPA analysis would be necessary to affect this type of change by amending a forest plan to accommodate modifications to motorized/non-motorized zoning.

Effects of Wild and Scenic Rivers on Motorized Trails

The congressional designation of wild, scenic or recreational rivers would affect motorized, and, subsequently, OHV activities in a number of ways. Designation as a wild river would forego new opportunities for motorized recreation and the opportunity to link long-distance riding or driving OHV opportunities together between complementary land use zones. Existing uses would be continued. Linkages for OHV use (both trail and 4WD route) among complementary land use zones for the purposes of connecting OHV riding and driving opportunities can be allowed in scenic and recreational river corridors depending on land management plan direction for adjacent land use zoning. Alternatives 3 and 6 recommend designation of the most wild river mileage, followed by Alternatives 2, 4, and 4a. Alternatives 1 and 5 recommend no miles. For the Angeles, Cleveland, and San Bernardino National Forests, there is no difference in effects among Alternatives 2, 3, 4, 4a, or 6 because all eligible rivers are protected by the forest plan pending a suitability study. Suitability studies done for candidate rivers on the Los Padres National Forest took into account the importance of existing OHV recreation opportunities and are reflected in the recommended designations (e.g., segments 2 and 4 of Piru Creek) (see table 166: Eligibility Inventory Summary for Candidate Wild and Scenic Rivers, LPNF; table 103, Suitability Study Summary for Candidate Wild and Scenic Rivers, LPNF - Miles Recommended by Alt and Classification; and Appendix E. Wild and Scenic Rivers, particularly the section on Piru Creek).

Table 166. Eligibility Inventory Summary for Candidate Wild and Scenic Rivers, LPNF

Name	Total Study Miles	Fork	Segment No.	Segment Miles	Total Eligible Miles	Eligible Mileage by Land Owner			Potential Class	Outstandingly Remarkable Values	Free Flow
						Private	Other	NFS			
Monterey Ranger District											
Arroyo Seco River	18.4		1	2.5	2.5	0.0	0.0	2.5	W	Scenery, Recreation, Geology, Fish&Wildlife	Y
			2	0.5	0.5	0.0	0.0	0.5	R	Scenery, Recreation, Geology, Fish&Wildlife	Y
			3	10.5	10.5	0.0	0.0	10.5	S	Scenery, Recreation, Geology, Fish&Wildlife	Y
			4	4.9	4.9	1.3	0.0	3.6	R	Scenery, Recreation, Geology, Fish&Wildlife	Y
Carmel River	9.2		1	9.2	0.0	0.0	0.0	0.0	N/A	None	Y
Little Sur River	24.8	North	1	4.9	4.9	0.0	0.0	4.9	W	Botany	Y
			2	3.3	3.3	2.1	0.0	1.2	R	Botany	Y
			3	4.2	0.0	0.0	0.0	0.0	N/A	None	Y
		South	4	10.4	0.0	0.0	0.0	0.0	N/A	None	Y
		Main	5	2.0	0.0	0.0	0.0	0.0	N/A	None	Y
San Antonio River	8.6		1	7.6	7.6	0.0	0.0	7.6	W	Scenery, Cultural, Historic	Y
			2	1.0	1.0	0.0	0.0	1.0	S	Scenery, Cultural, Historic	Y
Tassajara Creek	10.4		1	5.4	0.0	0.0	0.0	0.0	N/A	None	Y
			2	0.8	0.0	0.0	0.0	0.0	N/A	None	Y
			3	4.2	0.0	0.0	0.0	0.0	N/A	None	Y

Name	Total Study Miles	Fork	Segment No.	Segment Miles	Total Eligible Miles	Eligible Mileage by Land Owner			Potential Class	Outstandingly Remarkable Values	Free Flow
						Private	Other	NFS			
Mount Pinos Ranger District											
Piru Creek	53.6		1	5.8	5.8	0.0	0.0	5.8	W	Recreation, Geology, Fish&Wildlife, Cultural	Y
			2	20.4	20.4	1.8	0.0	18.6	S	Recreation, Geology, Fish&Wildlife, Cultural	Y
			3	4.7	4.7	0.0	0.0	4.7	W	Recreation, Geology, Fish&Wildlife, Cultural	Y
			4	7.6	7.6	0.8	0.0	6.8	S	Recreation, Geology, Fish&Wildlife, Cultural	Y
			6	12.7	12.7	0.0	0.0	12.7	W	Geology	Y
			7	2.4	2.4	1.0	0.0	1.4	R	Geology	Y
Ojai Ranger District											
Matilija Creek	17.9		1	9.1	0.0	0.0	0.0	0.0	N/A	None	Y
			2	1.7	0.0	0.0	0.0	0.0	N/A	None	Y
		North	3	7.1	0.0	0.0	0.0	0.0	N/A	None	Y
Santa Paula Creek	12.1		1	6.3	0.0	0.0	0.0	0.0	N/A	None	Y
			2	2.7	0.0	0.0	0.0	0.0	N/A	None	Y
		East	3	3.1	0.0	0.0	0.0	0.0	N/A	None	Y
Upper Sespe Creek	21.3		1	9.8	0.0	0.0	0.0	0.0	N/A	None	Y
			2	9.5	9.5	1.1	0.0	8.4	R	Scenery, Recreation, Fish&Wildlife	Y
			3	2.0	2.0	0.0	0.0	2.0	S	Scenery, Recreation, Fish&Wildlife	Y

Name	Total Study Miles	Fork	Segment No.	Segment Miles	Total Eligible Miles	Eligible Mileage by Land Owner			Potential Class	Outstandingly Remarkable Values	Free Flow
						Private	Other	NFS			
Santa Barbara Ranger District											
Indian Creek	14.7		1	9.6	9.6	0.0	0.0	9.6	W	Geology, Fish&Wildlife, Cultural	Y
			2	5.1	5.1	0.0	0.1	5.0	W	Geology, Fish&Wildlife	Y
Mono Creek	24.2		1	4.5	4.5	0.0	0.0	4.5	W	Fish&Wildlife	Y
			2	19.7	19.7	0.6	0.0	19.1	S	Fish&Wildlife	Y
Santa Cruz Creek	15.0	East	1	7.1	0.0	0.0	0.0	0.0	N/A	None	Y
		West	2	4.7	0.0	0.0	0.0	0.0	N/A	None	Y
			3	3.2	0.0	0.0	0.0	0.0	N/A	None	Y
Santa Ynez River	26.1		1	3.2	0.0	0.0	0.0	0.0	N/A	None	Y
			2	11.8	0.0	0.0	0.0	0.0	N/A	N/A	N
			3	11.1	0.0	0.0	0.0	0.0	N/A	N/A	N
Santa Lucia Ranger District											
La Brea Creek	29.0	North	1	12.3	0.0	0.0	0.0	0.0	N/A	None	Y
		South	2	13.1	0.0	0.0	0.0	0.0	N/A	None	Y
			3	3.6	0.0	0.0	0.0	0.0	N/A	None	Y
Lopez Creek	11.5		1	6.7	0.0	0.0	0.0	0.0	N/A	None	Y
			2	1.1	0.0	0.0	0.0	0.0	N/A	None	Y
			3	3.7	0.0	0.0	0.0	0.0	N/A	None	Y
Manzana Creek	18.4		1	18.4	0.0	0.0	0.0	0.0	N/A	None	Y
Sisquoc River	4.2	South	1	4.2	0.0	0.0	0.0	0.0	N/A	None	Y
Totals	319.4			319.4	139.2	8.7	0.1	130.4			

W = Wild class, S = Scenic class, R = Recreation class

Table 103. Suitability Study Summary for Candidate Wild and Scenic Rivers, LPNF - Miles Recommended by Alt and Classification

River Name	Eligible Miles	Segment No.	Alt 1	Alt 2		Alt 3		Alt 4 and 4a		Alt 5	Alt 6	
Arroyo Seco River	18.4	1	0.0	2.5	W	2.5	W	2.5	W	0.0	2.5	W
		2	0.0	0.0		0.5	R	0.5	R	0.0	0.5	R
		3	0.0	10.5	S	10.5	S	10.5	S	0.0	10.5	S
		4	0.0	0.0		4.9	R	4.9	R	0.0	4.9	R
Indian Creek	14.7	1	0.0	9.6	W	9.6	W	0.0		0.0	9.6	W
		2	0.0	5.1	S	5.1	W	0.0		0.0	5.1	W
Little Sur River	8.2	1	0.0	0.0		4.9	W	0.0		0.0	4.9	W
		2	0.0	0.0		3.3	R	0.0		0.0	3.3	R
Mono Creek	24.2	1	0.0	4.5	W	4.5	W	0.0		0.0	4.5	W
		2	0.0	19.7	S	19.7	S	0.0		0.0	19.7	S
Piru Creek	38.5	1	0.0	5.8	W	5.8	W	5.8	W	0.0	5.8	W
		2	0.0	20.4	S	20.4	S	20.4	S	0.0	20.4	S
		3	0.0	4.7	W	4.7	W	4.7	W	0.0	4.7	W
		4	0.0	7.6	S	7.6	S	7.6	S	0.0	7.6	S
San Antonio River	8.6	1	0.0	0.0		0.0		0.0		0.0	7.6	W
		2	0.0	0.0		0.0		0.0		0.0	1.0	S
U. Sespe Creek	11.5	2	0.0	9.5	R	9.5	R	9.5	R	0.0	9.5	R
		3	0.0	2.0	S	2.0	S	2.0	S	0.0	2.0	S
Total Miles	124.1		0.0	101.9		115.5		68.4		0.0	124.1	

W=Wild river; S=Scenic river; R=Recreational river

Effects of Recreation Management on Motorized Trails

Demand for motorized and non-motorized recreation activities as well as demand for more primitive recreation settings are expected to increase over time (see Affected Environment section on Recreation). Primitive recreation settings are one of the primary reasons OHV enthusiasts come to the national forests and are highly valued by the OHV community as well as by non-motorized proponents. These recreation opportunities are also expected to become more scarce as visitor levels rise and as more of the national forests are affected by encroaching urbanization. The prevention of resource impacts and the reduction of conflicts among various uses of the national forests can best be accomplished by an alternative which engineers routes for the diversity of public users, facilitates education, and achieves an acceptance of regulations (USDA Forest Service 2003).

The distribution of the various land use zones and the designation into their respective Recreation Opportunity Spectrum (ROS) classes would affect the ability to disperse motorized use over the landscape. These ROS classifications would provide a more varied or restricted pattern of riding opportunities and facilitate or limit the connection of riding localities for long distance touring depending on the alternative that is selected. Motorized users have the ability to travel much farther distances in a given span of time than non-motorized users so the ability to disperse motorized use over larger areas, and subsequently farther away from high use zones, sensitive, or residential areas, is expected to reduce conflicts over time by facilitating an improved distribution of all activities and uses of the national forests.

Alternatives 1 and 2 are expected to continue existing patterns of use and have a reduced ability to disperse recreation activities or to relocate conflicting uses. These alternatives would have a reduced ability to facilitate education efforts or achieve a higher level of acceptance of regulations. Alternatives 3 and 6 would (to a large degree) eliminate the ability to disperse motorized use over a larger landscape and restrict this use to existing systems or in concentrated use areas. Educational efforts would be high but acceptance of regulations regarding motorized activities is expected to be low. Alternatives 4 and 5 offer the greatest ability to disperse motorized activities and separate conflicting uses. Alternative 4 and 4a are expected to have a high level of acceptance for regulations and facilitate educational processes although Alternative 4a would have a reduced ability to disperse motorized uses because of modifications to land use zoning from Alternative 4. With a low level of emphasis on educational processes and managerial controls in Alternative 5, acceptance of regulations in a landscape that has limited managerial controls is expected to be low.

Under Alternatives 1, 2, 3 and 6, enthusiast satisfaction with the OHV program is expected to be low. Existing OHV systems are not expected to be able to meet anticipated increases in demand for OHV opportunities over the next 15 years as some of the basic design needs of OHV systems remain unaddressed. Conflicts with other uses and with private lands are anticipated to increase over time. Under Alternatives 4 and 5, enthusiast satisfaction with the OHV system is expected to improve, as OHV systems are better able to meet anticipated increases in demand for additional OHV opportunities over the next 15 years and as system functionality improves. Conflicts with other uses and with private lands are anticipated to decrease over time under Alternative 4 (public scoping, land management plan revision; OHMVR Commission meetings; quarterly OHV stakeholder meetings). Conflicts between motorized and non-motorized uses are expected to increase in Alternative 5, as motorized uses predominate over a larger landscape than available under any other alternative and fewer managerial controls are in effect. Enthusiast satisfaction with Alternative 4a is likely to be mixed. In general, OHV enthusiasts are likely to be supportive of the protections being provided to national forest resources under this alternative. The slow development or improvement of the existing systems that is being projected by Alternative 4a is likely to be perceived as little change from the existing condition. Conflicts among various uses are expected to decrease under Alternative 4a as more effort is directed into resolving conflict issues and as incremental improvements are made to OHV systems over time.

Effects of Transportation System Use and Management on Motorized Trails

National Forest System roads are limiting factors in the development of functional OHV trail systems. The designation of ML 2 roads can improve a system, primarily by adding routes for less experienced riders or by providing bypasses around environmentally sensitive areas; however, such designation is usually only part of the solution. On many of the ML 2 roads, traffic levels are high enough to raise concerns when considering mixing non-highway licensed vehicles and riders with highway-licensed vehicles. The safety of national forest visitors can be compromised when non-highway licensed vehicles and riders are mixed with passenger car traffic on maintenance level 3, 4, and 5 roads. The identification of public service national forest roads will also affect the ability to use sections of the ML 3 road network for designation as connecting linkages between OHV systems. Trails are the preferred form of opportunity for OHV enthusiasts. Trail construction is a viable option for the development of OHV routes that bypass roads that cannot be designated for use or are upgraded to a higher maintenance level.

All alternatives retain the national forest transportation system more or less in its existing condition with little road construction anticipated over the planning period. Alternatives 1, 2, and 3 would limit improvements of the OHV system primarily to the designation of the ML 2 road system with little trail development anticipated. Any trail development under Alternatives 1 and 2 would likely occur within the Back Country zone and would not require a plan amendment to adjust zoning. Under Alternative 3, trail development to link ML 2 roads together would likely require a plan amendment to modify land use zoning to accommodate motorized use. Alternatives 4 and 5 would consider the designation of more of the ML 2 road system and would be likely to further develop motorized trails for the improvement of OHV systems and to avoid conflicts inherent with non-highway licensed vehicle use on the road system. Alternative 4a would likely concentrate improvement efforts in Back Country zones and utilize the designation of ML 2 roads in conjunction with limited trail development. Alternative 6 would limit OHV use to the existing designated routes. Approximately 67 percent of the road system would become unavailable for motorized travel by the public, as the ML 2 road system is retained primarily for fire suppression or vegetation treatment activities and not available for general public access via motorized vehicles. Further development of the OHV system would likely require a plan amendment to adjust land use zones to accommodate the use.

Alternatives 1, 2, 4, and 4a would not automatically forgo the possibility of adding unclassified roads and trails into the OHV system even though they may be located within a non-motorized land use zone. Exceptions to this would be wilderness recommendations or where motorized use is not suitable, such as in a Critical Biological zone. Candidates for inclusion to a national forest's OHV system would be analyzed and evaluated under the plan amendment process and could result in modifications to the affected land use zone. The intent of Alternatives 3 and 6 is to decommission most, if not all, of the unclassified routes over time or designate environmentally acceptable ones for non-motorized trail use, so the opportunity of adding unclassified routes for motorized use would be very limited or would be forgone altogether.

Effects of Fire Activities on Motorized Trails

Incidents of fires caused by off-highway vehicles are very low. For example, for the period of 1981 through 1995 there were only three fires directly attributable to an OHV out of a total of over 5,000 recorded fires on the San Bernardino National Forest (Sensintaffer pers. comm.). Anecdotal information from fire staff also support the very low incidence of OHV-caused fires. Under Alternatives 2 through 6, fire ignitions caused by OHV use are expected to remain similar to the current condition even with an anticipated increase in use. Although Alternative 6 would limit the greatest amount of ML 2 road available for vehicle use by the public, statistically little to no noticeable change in OHV fire starts is expected due to the very low number of incidents that actually occur, not because of the limited accessibility for motorized use on roads and trails. Designation of roads and trails for OHV use and the limited acreage that is open to cross-country vehicle travel would continue to have the effect of preventing vehicle-caused fires and would be similar under all alternatives.

Under all alternatives, the closure of areas affected by fire to motorized uses can disrupt established travel patterns associated with the designated OHV route system. Area closures can be imposed on a case-by-case basis depending on the local circumstances, the severity of the fire, and resource concerns found within the burned area. Fire closures can affect OHV systems by fragmenting designated routes into disarticulated segments or result in dead ends that can be invitations to travel cross-country through the burns. Care must be taken to adequately close or disguise access points after fire suppression activities have been completed or run the risk of having an unclassified road or trail develop. Vegetation management practices associated with the dead tree removal and with fuel reduction efforts in the WUI Defense zones will also require that similar protection measures be put into effect or the proliferation of unclassified roads and trails can be expected to continue over time.

Cumulative Effects

From a demonstrated performance perspective, and as noted in the affected environment for this section, further development of the national forests' OHV systems is projected to be low. For example, approximately 15 miles of trail additions and the reconstruction of one staging area was accomplished on the San Bernardino National Forest over the last planning period. This contrasts greatly with the projected amount of development from the current forest plans. The other national forests responded to OHV development in a similar manner with a very low level of change that was, for the most part, done in conjunction with a corresponding benefit to resources or to other recreation uses (USDA Forest Service 1995, 1996). From a practical standpoint, this situation is not expected to materially change. Traditional State funding resources have shifted in focus from a development emphasis early in the planning period to a current emphasis on resource protection and law enforcement. Federal funding resources that are directed to this activity are also limited.

The pressures of increasing populations and visitor use levels combined with the limited land base that could support OHV activities are all indications that positive steps need to be taken to address OHV issues during the next 15 years. The national forests will increasingly need to manage the network of roads and trails to accommodate the growing number and variety of recreation uses, to gain the ability to separate conflicting uses, and to anticipate linkages to OHV systems on adjacent public lands. Coordinated planning with other agencies and OHV recreation providers is needed to meet the anticipated increase in the various motorized vehicle use categories. Fully functioning OHV systems would be an asset to a national forest's recreation program and can be expected to provide the national forests with an enhanced ability to manage the activity and to provide better resource protection. An unmanaged program would result in unacceptable levels of impacts to national forest resources and affect visitor satisfaction. Over time, dysfunctional systems can be expected to have a similar effect on resources as if the activity was unmanaged. Requirements described in 36 CFR 219 and 36 CFR 295 for the management of off-road use would not be able to be met as cross-country vehicle use is expected to continue. It is also expected that as resource impacts escalate, more OHV opportunities would be closed. An effect of closures would be that OHV enthusiasts would have a reduced ability to enjoy the national forests in conjunction with the enjoyment of their activity. Displaced enthusiasts are expected to continue to pursue their activity at other locations within the national forests and on adjacent public and private land.

Alternatives 1 and 2 are not expected to materially change the configuration of existing OHV systems and are not expected to be able to meet anticipated increases in demand for additional OHV opportunities. Alternatives 3 and 6 reduce the amount of OHV opportunities by the greatest amount, are not expected to be able to meet anticipated increases in demand for additional OHV opportunities, and have the highest potential to displace OHV enthusiasts onto adjacent public and private lands as national forest opportunities become more constrained. Alternatives 4 and 5 are expected to be better able to meet increases in demand for additional OHV opportunities for the longest period of time. Alternative 4a would likely be able to meet anticipated increases in demand in certain locations where OHV systems are more fully developed and as incremental improvements would most likely be undertaken in these locations. Less developed riding localities or isolated routes would likely become more unresponsive over time to the needs of enthusiasts with the anticipated rise in use and have a greater adverse effect on other national forest uses and adjacent resources. Discontinuance of use in certain locations or additional closures may become necessary as dysfunctional systems are expected to have an increasingly detrimental effect on resources over the planning period.

Effects on Commodity and Commercial Uses

Effects on Special Forest Products

Direct and Indirect Effects

The following assumptions apply in the assessment of the environmental consequences of the activities allowed under the alternatives.

- The demand for special forest products (SFPs) is growing, driven by a growing interest in traditional food gathering, an expanding and diverse population and the expanding nature of a market for the products.
- The types of national forest products in demand will change over time in relation to the changing cultural demographics of the national forest user, and as a result of environmental or human-influenced conditions (i.e., disturbances, over-exploitation) that may reduce the availability of certain national forest products.
- Applicable laws, policy and direction provide the basis for the direction for special national forest products.

- A limiting factor in the assessment of environmental consequences of national forest activities on SFPs is the lack of consistent approaches and information for the management of the collection. That, coupled with the lack of comprehensive knowledge about the range of material that the public and Native Americans are collecting, results in confusion and often barriers to the collection of national forest products that have social or cultural importance to the national forest user. The increase in national forest user groups of different cultural backgrounds is bringing different traditional values regarding national forest use that may conflict with other current and historical cultural uses. The increasing population diversity is resulting in an increased use of different botanical products for medicinal and other purposes and, sometimes, competition for the same national forest product.
- Any activity that involves ground disturbance has the potential to damage or destroy special forest products. Ground disturbance and other means of removal of special forest products (such as fire) have an indirect effect of increasing the potential for the introduction of and competition with noxious weeds. Measures to lessen any effects could include a consistent direction on managing that use as well as an accurate understanding of the use (including mapped locations of where the SFPs occur and any resource conflict). This information can be used in the planning for other activities.

In all alternatives, management activities proposed could directly, indirectly or cumulatively affect the availability of special forest products for the national forest user within the boundaries of the national forests.

Because they promote greater development, Alternatives 4 and 5 would have the potential to negatively affect the availability of special forest products; however, these same alternatives also promote greater access and would make larger areas of the national forest available for collection of SFPs, possibly reducing the competition pressure on SFPs. Alternative 6 would reduce the most access, resulting in the loss of areas to collect from. This could intensify competition for the remaining, available SFPs, indicating that the supply of SFPs would not meet the demand. Alternative 4a provides for a low level of increase in the utilization of the national forest, and the facilities to support the use. It is expected that competition for available SFPs could be similar to what is presently occurring.

Acres by land use zone are shown in table 333: Comparison of Alternative Acres by Land Use Zone, page 26. The land use zones that allow ground-disturbing activities that have the potential to directly or indirectly affect SFPs are Developed Area Interface (DAI) and Back Country (BC). By the nature of its zoning, DAI usually shows a higher level of human use and infrastructure present; acreage for this land use zone remains fairly consistent throughout the alternatives (except for Alternative 1). In contrast, the BC zone changes across the alternatives, and will be used for alternative comparison.

The Back Country zone is also the zone that is the indicator of the degree of motorized access across the national forests. Alternatives 3, 4a, and 6 would have the potential to limit the amount of activities that could directly affect SFPs, but these alternatives are the most restrictive with regard to motorized access. This restrictive characteristic has the potential to create a supply of available SFPs that cannot meet the demand. Alternative 5 has the highest potential to allow activities that would directly affect SFPs but has the potential for the most motorized access, which would help contribute to having a supply of SFPs to meet the demand. Alternatives 1, 2 and 4 are between the other alternatives and are similar.

Effects of Vegetation Management on Special Forest Products

Healthy and diverse vegetation has the potential to provide for a range of biological resources that would be collected as special forest products; however, certain treatment activities pose environmental consequences that may be considered adverse by certain communities. The use of pesticides (including herbicides) is considered in all alternatives, and along with the off-site movement of chemicals, has the potential to result in the contamination of SFP plants and plant material. The plants that are eliminated by herbicide spraying because of their lack of commercial value are often the same plants that are of interest to certain national forest user groups. The use of herbicides may result in certain groups avoiding collecting special forest products in "treated" areas, and that may adversely effect the practice of cultural traditions and lifeways.

Effects of Biodiversity Management on Special Forest Products

Those alternatives that have themes that emphasize biological diversity, and ecological integrity and function (such as Alternatives 2, 3, and 6) may affect the ability for the public to gather SFPs from specific areas of the national forests. Habitat protection measures (including closures) may restrict access by the general public to resource areas of SFPs. Alternatives without a biological emphasis (such as Alternatives 1, 4, 4a, and 5) would not limit the gathering of SFPs by the general public as much.

Effects of Special Designations on Special Forest Products

Special interest areas whose emphasis is on botanical species (as well as other emphases) may result in limiting access or gathering activities within a specific geographic zone, which will result in loss of opportunities. Some plans or special designations may prohibit any activities associated with the procurement of special forest products. Wilderness designations would restrict types of access to areas of the national forest for those who utilize SFPs. Table 304: Wilderness Acres (Existing and Recommended) by Alternative, page 423, indicates that Alternative 4a has, following Alternatives 1 and 5, the fewest acres of wilderness (existing and recommended). Thus, the access effect is less than in Alternatives 2, 3, 4, and 6.

Effects of Recreation Management on Special Forest Products

The increase in areas of recreation and appropriate support facilities can have a direct impact by destroying or damaging SFP locations. Indirect effects would be the trampling of soil and vegetation that reduces the opportunities for collection. In addition, recreation users may displace SFP users to other areas, resulting in competition for a reduced supply.

The anticipated effects on special forest products would be greatest in those alternatives that have the broadest range of recreation opportunities (such as Alternatives 4 and 5, and to a lesser degree, Alternative 2). Since the range of recreation opportunities lessen in Alternatives 3 and 6, the effects on special forest products is also expected to be less than what is currently experienced. Alternative 4a supports a low increase in the utilization of the national forest, and the facilities to support that use, and its effect would be less than Alternatives 2 and 4.

Effects of Law Enforcement on Special Forest Products

Unmanaged vehicle use may occur in areas that have SFPs but have not been surveyed for SFPs, so the effects of this unmanaged use are unknown. Both unauthorized trail proliferation and off-road vehicle use could damage or destroy SFPs and adversely affect the SFP collector's experience associated with the activity. Some groups (such as Native Americans) may require solitude or serenity to perform ceremonies that may be associated with the collection of certain SFPs.

Effects of Social and Economic Conditions on Special Forest Products

An increasing population of Hispanic and Asian origin is bringing different traditions of desired national forest use that may conflict with other current and historical cultural uses. This increasing diversity results in an increased use of different botanical products for medicinal and other purposes.

This effect will be greater in those alternatives that promote greater utilization, such as Alternatives 4 and 5, and will be seen to a lesser degree in those alternatives (such as Alternatives 3 and 6) that may restrict access or, through special designation, manage large portions of the national forests for single purposes. Alternative 4a provides for a low level of increase in the utilization of the national forests, and the facilities to support it. The diversity of this increase may not reflect the diversity of the overall population increase so the potential for conflicts between different traditions may be intensified. Overall, the effect of Alternative 4a would be closer to that of Alternative 3.

The use of access or management restrictions would limit certain segments of the national forest user population from acquiring the material or engaging in the practices that help reinforce their cultural values. The administration of the authorizations for SFP collecting by individuals who do not share the same cultural identity or values as the collector of the SFPs may result in a loss of opportunities due to the lack of understanding about cultural needs or the need for sound management to guarantee SFP viability.

Effects of Tribal Relations on Special Forest Products

Some areas of botanical SFPs may be part of areas considered significant to current cultures (for example, traditional cultural properties). This may reduce access to the areas by users other than Native Americans. The lack of any management direction for these areas may result in competition for collection within areas held to be of cultural significance by the Native Americans, which may result in the ability to have practices or ceremonies compromised.

For those alternatives that provide for an increase of collaboration between the national forests and the Tribal and Native American community, a "prioritized" access in terms of areas and products, at the expense of other national forest user groups, may be allowed. Therefore, Alternatives 2, 3, 4, and 4a provides for an increase in the degree of collaboration between the national forests and the Native American community as well as Tribes, while Alternative 6 also focuses on Native American participation in the national forest management process.

Effects of Roads on Special Forest Products

Many gathering areas (both traditional and contemporary) are accessible by roads. Roads provide essential access to many of these areas. Reducing the availability of roads would limit access by contemporary cultures to areas of cultural concern and importance. Building, maintaining and decommissioning roads can affect plant presence and distribution and have the potential to facilitate the introduction of noxious weeds, which may compete with native plant species that are used as a special forest product.

Alternatives 1 through 4 reduce the opportunities for public access by relatively the same minor amount, while Alternative 6 has the largest amount of access reduction. Alternative 4a reduces the availability of roads for public access more than Alternatives 1 through 4. Most of the public access reduction is the designation of roads as BCMUR.

Effects of Livestock Grazing on Special Forest Products

The use of livestock in an area may affect SFPs through the trampling and possible consumption of SFPs. Access may be restricted through the fencing of allotments.

All alternatives have a reduction in the number of grazing areas and suitable acreage from what is presently available. The reduction is primarily due to the amount of currently vacant acres available by alternative. However, with that said, the effects would be greatest in Alternatives 1 and 5, and least under Alternatives 3, 4, and 6. The effects associated with Alternative 4a would approximate those under Alternative 4.

Effects of Fire and Aviation Management on Special Forest Products

Prescribed fire can be used effectively to promote or enhance the occurrence of SFPs. Fire that is not managed, including activities associated with wildland fire suppression such as firelines, can destroy or damage SFPs. The loss of SFPs and associated habitat reduces opportunities for the public and results in displacement and intense competition elsewhere.

Due to the present situation with vegetation (both trees and brush that are dead or dying from the drought conditions), an increase in acreage burned in wildland fire can be expected from the present level. The effects would basically be similar across all alternatives.

Cumulative Effects

Continued urbanization and development of private land inholdings will continue the current trend of reduced availability of alternative sources of supply for special forest products.

Effects on Livestock Grazing

Direct and Indirect Effects

Consequences for livestock grazing are expressed in the key indicators of suitable acres available for livestock grazing and the number of grazing areas expected to be grazed. For comparing the alternatives, the base acreages are the number of capable acres on National Forest System lands. A rangeland capability and suitability analysis was conducted using the criteria found in Appendix P. Livestock Grazing Suitability Analysis.

Effects of LMP Decisions on Livestock Grazing

It is assumed in all alternatives that:

- Livestock grazing utilization is managed at the moderate use level and takes into account the habitat and forage needs of wildlife.
- If recommendations are made to close areas to livestock grazing, a subsequent site-specific environmental analysis will be necessary before actually closing any area.
- The number of active grazing areas determined to be suitable for Alternatives 1 through 5 does not vary. However, based on the suitability criteria, the number of suitable acres within these active livestock grazing areas does vary among alternatives for Alternatives 1 through 5.
- The number of capable acres was reduced in Alternative 6 based on Alternative 6 capability criteria of slopes less than 20 percent.
- Wild horse and burro territories and herds on the Los Padres and San Bernardino National Forests are not affected by any alternative.
- Livestock grazing areas have localized concentrated impacts such as bedding areas, trails, hoof action, soil compaction, removal and trampling of vegetation, developed watering areas, and localized disturbance to riparian and wet areas.

The determination of rangeland suitability is an interdisciplinary two-step process (see Appendix P. Livestock Grazing Suitability Analysis).

The first step is the determination of those lands that are capable or have the potential of being grazed. Rangeland capability represents the biophysical determination of those areas of land that can sustain domestic livestock grazing. Capability depends on current and potential resource and site conditions. Table 182: Acres Capable of Supporting Livestock, page 360, displays the capable acres for all grazing areas by national forest.

The second step identifies which of those capable lands are suitable for grazing under various management scenarios or land use zones. Assessment of suitability was conducted by the interdisciplinary team to address whether livestock grazing is compatible with other land uses; ecological, social, and economic considerations; and the ability to meet or move towards forest plan desired conditions. Suitability criteria from Appendix P. Livestock Grazing Suitability Analysis were applied to determine the suitability of capable lands for all alternatives.

Table 108: Grazing Suitability by Forest by Alternative, page 64, displays acres suitable for livestock grazing by national forest by alternative from the total capable acres available. The total number of livestock grazing areas varies by alternative. Decreases in the total number of livestock grazing areas are through closure of existing vacant grazing areas. For active grazing areas, the number of suitable acres varies between alternatives; however, the actual number of active grazing areas does not vary in Alternatives 1 through 5. The number of active livestock grazing areas in Alternative 6 was reduced by 19 based on the capability criterion of slope less than 20 percent.

The acres within livestock grazing areas that are currently excluded from livestock grazing due to site-specific conditions are not displayed in table 108. These acres are classified as not suitable because of the need to help protect threatened and endangered species, heritage resources, recreation areas, and other sensitive resources such as riparian areas and rare plants.

Table 183: Number of Vacant Grazing Areas Expected to be Available for Grazing by Alternative, page 64, displays the number of vacant grazing areas and acres retained by alternative by national forest using the suitability criteria. The reduction in the number of vacant grazing areas is due to applying the theme of each alternative as well as various reasons, such as vacancy for a number of years due to lack of demand, lack of access, high impacts and costs to protect threatened and endangered species, heritage resources, recreation conflicts, and loss of open space due to urbanization.

The recommended closure of vacant allotments would eliminate the use of these areas for livestock grazing following a site-specific analysis. The areas capable of supporting livestock within these allotments would be removed from the suitable grazing land allocation for livestock. While closure of vacant allotments does not reduce current permitted AUMs, it does reduce future management flexibility by eliminating the possibility of using these areas to reduce conflicts between livestock grazing and other resources on active allotments or to provide forage in drought years.

The number of livestock grazing areas is expected to decrease by six in Alternative 1. This equates to a reduction of 16,673 suitable acres. The six recent land acquisitions on the Los Padres National Forest totaling 3,774 acres are included in the total capable acres and total numbers of grazing areas analyzed, but are not a part of the actual reductions in Alternative 1, as they are not currently land allocations under the existing forest plan for the Los Padres National Forest. The remaining 12,899 acre reduction from current suitable acreage is due to forest plan land use zoning to help protect Critical Biological zones, Peninsular bighorn sheep range, and critical habitat for the coastal California gnatcatcher. Alternative 1 has a low negative impact on livestock grazing opportunities and rangeland management.

Alternatives 2 through 4 and 4a have similar reductions in vacant livestock grazing areas and suitable acreages. In Alternative 2, the number of vacant livestock grazing areas is expected to decrease by 36 with a reduction of 152,140 suitable acres. In Alternative 3, the number of vacant livestock grazing areas is expected to decrease by 45 with a reduction of 189,945 suitable acres. In Alternative 4, the number of vacant livestock grazing areas is expected to decrease by 39 with a reduction of 153,333 suitable acres. In Alternative 4a, the number of vacant livestock grazing areas is expected to decrease by 39 with a reduction of 153,266 suitable acres. Alternatives 2 through 4 and 4a will have a low to moderate negative effect on livestock grazing opportunities and rangeland management flexibility.

Alternative 5 is expected to decrease the number of vacant livestock grazing areas by 12 with a reduction of 59,345 suitable acres. Alternative 5 will have a low negative impact on livestock grazing opportunities and rangeland management flexibility.

Alternative 6 is expected to decrease the number of vacant and active livestock grazing areas by 62 with a reduction of 514,903 suitable acres. The suitable acres remaining under this alternative are the most productive areas on the national forests within designated livestock grazing areas. This alternative might negatively affect viable ranching operations, including a threat to historical family ranching businesses, by limiting the number and areas where livestock are permitted. There may be a positive effect on sensitive plants due to the reduction of grazing pressure on slopes greater than 20 percent, while a negative effect may result in a loss of vegetative biological diversity from excessive mulch layers (Bartolome and others 1980).

Table 523. Livestock Grazing Utilization Standards

<table>
<tr><th>Location</th><th>Habitat Grouping</th><th>RDM (lbs/acre)</th><th>Woody Browse % Allowable Use</th><th>Perennial Grass and Grass-like Plants % Allowable Use</th><th>Streambank Alteration by Livestock % Allowable</th></tr>
<tr><td rowspan="2">LBV/SWWF Occupied Habitat</td><td>Nesting Season</td><td colspan="4">No Grazing During Occupancy</td></tr>
<tr><td>Suitable Habitat Non-Nesting Season/No Occupancy</td><td>N/A</td><td>35</td><td>35</td><td>≤ 10</td></tr>
<tr><td>Riparian Areas</td><td>N/A</td><td>N/A</td><td>40</td><td>35</td><td>≤ 20</td></tr>
<tr><td>Wet Montane Meadows</td><td>N/A</td><td>N/A</td><td>40</td><td>4" - 6" Stubble Height (based on condition)</td><td>≤ 20</td></tr>
<tr><td rowspan="5">Uplands</td><td>Annual grasslands and oak woodlands with > 10 inches annual precipitation</td><td>700</td><td rowspan="2">40
(20 - On advanced oak tree regeneration)</td><td rowspan="2">50</td><td rowspan="5">N/A</td></tr>
<tr><td>Annual grasslands and oak woodlands with ≤ 10 inches annual precipitation</td><td>400</td></tr>
<tr><td>Annual grassland/pinyon</td><td>200-400</td><td rowspan="3">40</td><td rowspan="3">50</td></tr>
<tr><td>Mixed conifer forests</td><td>600</td></tr>
<tr><td>Chaparral/desert scrub</td><td>200-400</td></tr>
<tr><td>WUI/Fuelbreaks</td><td>N/A</td><td>600</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
</table>

LBV: least Bell's vireo
SWWF: southwest willow flycatcher
WUI: Wildland/Urban Interface
RDM: Residual Dry Matter

There are currently 795,536 acres producing forage and browse in the four southern California national forests (see table 107: Designated Grazing Areas Status, Acreages, and Permitted AUMS by Forest, page 291). Using an estimated average of four acres per AUM, this would yield forage of 198,884 AUMs in the four southern California national forests. Subtracting the total permitted AUMs of 98,777 AUMs from the total leaves approximately 100,107 AUMs available for wildlife and resource protection. Therefore, with permitted grazing on designated grazing areas at the current and projected moderate level, forage and browse will be provided for wildlife and resource protection. Because of the variability of landform and forage production within designated livestock grazing areas across all four southern California national forests, site-specific analysis and monitoring may dictate the need to refine the amount of livestock grazing allowable use to ensure needs for wildlife and resource protection are met.

Reduction in livestock grazing would have an effect on fire suppression because of increased flammable fuels and fire behavior in taller grassland vegetation. Fires would spread much more rapidly and have a higher resistance to control, which presents higher risks to firefighters.

Livestock grazing has localized impacts associated with use such as bedding areas, trails, hoof action or shear, removal of herbaceous and woody vegetation, riparian and wet areas disturbance, soil compaction, threatened and endangered species conflicts and conflicts with other multiple-uses of the national forests.

The degree of impact would be analyzed at the site-specific level and appropriate management actions would be implemented. Land management plan design criteria and guidance (see table 523: Livestock Grazing Utilization Standards) help protect resources and help meet or move grazing areas towards forest plan desired conditions. See other sections in this chapter for the effects of livestock grazing on those resource areas.

Effects of Existing and Recommended Wilderness on Livestock Grazing

Controlled grazing has always been permissible in wilderness areas where such use pre-dated the establishment of the wilderness and where grazing is compatible with wilderness values. Necessary fencing and watering developments in the wilderness are maintained and constructed to support livestock and prevent resource damage (in accordance with the provisions of section 4(d)(4) of the 1964 Wilderness Act). There are 66 designated grazing areas in the four southern California national forests that are, in whole or in part, within a designated wilderness area. These livestock grazing areas occupy approximately 11 percent of the total National Forest System existing wilderness areas on these national forests.

Suitable acres for livestock grazing that exist on the national forests and are not currently or historically within a designated grazing area would be precluded from grazing by any new wilderness designations as per the 1964 Wilderness Act (see Appendix P. Livestock Grazing Suitability Analysis). Alternatives 1 and 5 would have no effect on livestock grazing on lands within recommended wilderness suitable but not in existing or historical livestock grazing areas. Alternatives 4, 4a, 2, 3, and 6 would have the least to most acres, consecutively, in recommended wilderness and therefore would have the least to most reduction in suitable acres available for new grazing areas.

Effects of Special Designations on Livestock Grazing

The effects from special designations are expected to be low to moderate. As research natural areas (RNAs) are established, livestock grazing may or may not be allowed at current levels. There are no proposed changes in permitted livestock grazing areas as a result of recommended RNA designations and thus no differences between all alternatives.

Livestock grazing within a river corridor may occur without affecting its eligibility for wild and scenic river designation. Range improvements and rangeland management would need to maintain a river's outstanding, remarkable values and the natural character of the river corridor. Should costs be involved to protect the river corridor, the cost would be born by the holder of the authorization and Forest Service. Alternatives 1and 5 would have no effect on grazing while Alternatives 4, 4a, 2, 3, and 6, consecutively, could potentially have low to moderate effect on livestock grazing.

If designated, candidate special interest areas (SIAs) may or may not allow livestock grazing at current levels depending on the threat to the values for which the SIA was proposed. Alternatives 6, 3, 4, 4a, 2, 5, and 1, consecutively, have the lowest to highest suitable acres available for livestock grazing (see table 108: Grazing Suitability by Forest by Alternative, page 64) and thus an increasing degree of potential effects; however, Alternatives 6, 3, 4a, 2, and 4 would have the highest to lowest number of candidate SIA acres. Under Alternative 5 candidate SIA acres are minimal, and Alternative 1 has no new candidate SIAs.

Effects of Heritage Resources on Livestock Grazing

As individual sites are discovered during heritage resource surveys, some protection from livestock grazing may be necessary. The loss of suitable acres for livestock grazing for heritage resource protection would result in a negative effect on livestock grazing opportunities. The design criteria and guidance in Part 3 of the forest plans provide for protection of heritage and tribal sites. Alternatives 6, 3, 4, 4a, 2, 5, and 1 have the lowest to highest suitable acres available for livestock grazing, consecutively (see table 108: Grazing Suitability by Forest by Alternative, page 64), and thus potential for loss of suitable acres for heritage resource protection.

Effects of Land Adjustment on Livestock Grazing

The effects on livestock grazing from land ownership changes can result in changes in use of an area, such as increased public visitation or increased non-recreation special uses. These changes could either restrict or enhance livestock grazing. Additions to National Forest System with previous grazing history can augment adjacent existing livestock grazing areas or create new livestock grazing areas; however, it is likely that some adjustments would probably involve existing livestock grazing permittees and their private inholdings and thus not have much effect on livestock grazing levels. If the inholdings are large enough the land adjustment may result in the inability or desire of the permittee to sustain a viable livestock operation and therefore potentially sell their private land outside of the national forests for development. The result would be a loss in open space and wildlife habitat connectivity.

Effects of Recreation Use on Livestock Grazing

Increased recreation use can cause conflicts between recreationists and livestock grazing. These activities include but are not limited to trails, developed recreation facilities, access roads and areas of high attraction. Livestock management practices may be used to reduce conflicts. In some cases, there would be a negative effect on livestock grazing with a reduction in capable and/or suitable rangeland as the result. Recreation visitation and use will increase in all alternatives. Site specific conflicts between livestock grazing and recreation use are resolved utilizing the Adaptive Mitigation for Recreation Uses protocol, Appendix D in Part 3 of the forest plans.

Effects of Road Use on Livestock Grazing

The use of roads facilitates a cost-effective and efficient means for the Forest Service and grazing permittee to access grazing areas to ensure compliance of permit terms and conditions, move livestock, and maintain rangeland improvements. Most administrative roads located within grazing areas are maintained to Forest Service standards by the permittee. Closure of these roads would increase the costs of grazing area administration and reduce the capability to monitor and determine whether desired conditions for resource areas are moving forward or being met.

Conflicts can occur on National Forest System roads that are available to both the public and livestock. These conflicts include livestock being pushed through fences and cattleguards by vehicles; vehicles colliding with livestock; livestock bedding in roads and blocking the road; and vehicles disrupting livestock travel from one area to another. All alternatives have low to moderate effect on road designation and rangeland management. There may be cases where grazing permittees will need to perform more annual maintenance of roads within grazing areas. This will result in a positive benefit to the Forest Service in regards to administrative and fire suppression access. A negative effect would be realized as livestock areas are closed, and there would be a lack of cooperation in maintaining roads for Forest Service administrative and fire suppression access.

Effects of Vegetation Management and Wildland Fire on Livestock Grazing

Wildfires and prescribed burns on gentle slopes can provide excellent transitory range for livestock grazing for three to four years, depending on rainfall and site-specific characteristics (Raymond 1960, Sampson 1952, Sampson and Burcham 1954). A negative effect would occur when natural brush barriers are removed, thus making control of livestock difficult. In addition, in certain areas, sensitive resources may need protection from livestock grazing for one to three years following burning. A site-specific analysis would be needed to make this determination (see standard S54 in Part 3 of the forest plans). In all alternatives, the emphasis over the next planning period will be on Wildland/Urban Interface zones and livestock grazing may be utilized as a tool to maintain these zones.

California annual-type grasslands that dominate southern California rangelands have higher herbaceous plant primary productivity than any extensive vegetation west of the Rocky Mountains in North America (Menke 1989). Annual grasslands are productive and resilient to livestock grazing herbivory (Bartolome and others 1980). There is no known management prescription that will achieve the return to perennial-dominated grasslands (George and others 1992). Livestock grazing at a moderate level and season of use can reduce the negative effects of the annual species on perennial grasses such as *Nassella pulcra.* Annual grasses modify resource availability both above and below ground; this effect may vary temporally (Dyer and Rice 1999), which grazing can affect. The effects of vegetation management and wildland fires would have low to negligible impact on livestock grazing over the long term. Alternatives 1, 5, 2, 4a, 4, 3, and 6, consecutively, would have the highest to lowest level of effects on annual grasslands in southern California national forests and a limited effect on other grasslands, wet montane meadows, coastal sage scrub, oak woodlands, and riparian areas (see table 550: Acres Expected to be Grazed by Key Vegetation Types, page 322).

Effects of Management of Geologic Resources and Hazards on Livestock Grazing

Management of geologic resources, including geologic and geomorphic information, and geologic hazards (such as areas highly susceptible to landsliding, debris flows, erosion or rockfall) helps define where grazing activities are appropriate. The effects of management of geologic resources and hazards on livestock grazing would be determined on a site-specific basis and not at the forest plan level. Alternatives 1, 5, 2, 4a, 4, 3, and 6 would have the highest to lowest level of suitable acreage that may be affected by geologic resources and hazards.

Effects of Biodiversity Management on Livestock Grazing

The effect of biodiversity management on livestock grazing varies by the affected plant and animal species and by location. Site-specific analysis would identify the individual effects and determine appropriate management actions necessary to resolve impacts (see Appendix P. Livestock Grazing Suitability Analysis). Standard 47 in Part 3 of the forest plans would apply to analysis of the effects of grazing in riparian areas (see Appendix E: Five Step Project Screening Process for Riparian Conservation Areas in Part 3 of the forest plans). Properly timed livestock grazing may be beneficial in some habitats. For example, vernal pool habitat has been shown to benefit from managed livestock grazing, promoting biological diversity (Barry 1995).

Alternatives 6, 3, 4, 4a, 2, 5, and 1 would have the greatest to least emphasis on and protection of biodiversity, based on the levels of suitable acres available for livestock grazing (see table 108: Grazing Suitability by Forest by Alternative, page 64). The Critical Biological zone is unsuitable for livestock grazing and would have the highest to lowest acres of designation within livestock grazing areas in Alternatives 6, 2, 4, 4a, 3, and 1, consecutively. Alternative 5 would have no acres of Critical Biological zoning in livestock grazing areas.

Cumulative Effects

Management of the various resources and uses on the southern California national forests can have both a positive and negative effect on the management of livestock grazing on and off the national forests. As recreation use continues to increase, the complexity of management of livestock grazing also increases. Livestock grazing and people often prefer the same areas, and conflicts between the two can also be expected to increase. Cumulative effects resulting from designation of special areas (such as research natural areas) would include some present and future loss of livestock production opportunities. Many ranchers depend on grazing areas administered by the Forest Service to provide a portion of their year-round operations and viability. Many of the grazing areas are expected to continue to support livestock operations and remain an element of multiple-use management of the four southern California national forests. This in turn would provide for stability in the ranching communities in the remaining rural areas in and around the national forests. Urbanization, increases in property values, high recreation use, and increased listing of threatened and endangered species have led to the decline in the demand and desirability of some grazing areas. As ranchers sell out, their private ranches are subdivided, there is a net loss of open space and habitat linkages, and this can result in an increase in urbanization conflicts such as trespass and unauthorized use of National Forest System lands. All of these effects are expected to increase through the planning period.

The recommended closure of vacant grazing areas removes land from the suitable land base for livestock grazing. This can have a positive or negative effect on management depending on site-specific conditions. While closure can resolve present concerns and conflicts in some locations, it also can limit management flexibility in resolving present and future conflicts between livestock grazing and other resources, or in providing forage in drought years. This in turn can affect the management or use of the private lands within and adjacent to the national forests. Many of the ranches surrounding the national forests provide open space and valuable wildlife and species habitat. The loss of these ranches and possible subsequent development would have a negative impact on these resources and the economic stability of the ranching communities.

Loss of livestock grazing permittees negatively affects wildlife and recreation stock due to the lack of maintenance on developed water sources, roads, and trails. Current Forest Service staffing would be insufficient to maintain all existing structural improvements on the four southern California national forests.

Livestock grazing (when managed at the moderate use level) can exist as a multiple-use of the national forests while providing protection of other valuable biological, botanical and vegetative communities located in the diverse ecosystems on the national forests. Through the implementation of land management plan design criteria, the sustainability of the national forests' resources are protected and help meet or move towards desired conditions for the reasonably foreseeable future.

Effects on Minerals and Energy Development

Direct and Indirect Effects

The southern California national forests have a long history associated with mining and mineral resource production. In this analysis, effects of the alternatives on minerals management are assessed in two ways: (1) acres subject to mineral withdrawals; and (2) acres subject to increased mitigation requirements (permit stipulations). Non-renewable energy resources (such as oil and gas) have been produced for decades on the Los Padres National Forest, and some potential exists for development on the Angeles National Forest. Renewable energy resources (such as wind, solar and hydroelectric power) have had limited applications on National Forest System lands, but the potential for their development will likely be explored in the future.

This analysis will use projections on the type of activities and the amount of applications expected by the agency under each of the alternatives.

In order for the Forest Service to administer its minerals and energy program to provide commodities and energy sources for current and future generations commensurate with the need to sustain the long-term health and biological diversity of ecosystems, the following must be an integral part of its management:

- Assure that minerals and energy resources are integrated in the national forest's project and landscape-level planning and implementation process.
- In coordination with public comment environmental analysis assure permit conditions and stipulations are reasonable and economically feasible to implement, and that they limit or mitigate effects on other resources.
- Ensure that mineral or energy activities conducted in congressionally designated or other withdrawn areas are supported by valid existing rights.

Land that contains mineral and energy resources also contains physical, biological, recreational and cultural resources. At times, conflicts exist between objectives for mineral resource management and those for physical, biological, recreational and cultural resource management. These conflicts are resolved through project-specific mitigation requirements and permit stipulations. The laws, policies and direction that govern project specific planning are consistent across all alternatives.

Surface-disturbing activities associated with accessing (road building), exploring (drilling and geophysical investigations) and developing (structures and facilities) the minerals or energy resource result in impacts to the land and other resources that are addressed in site-specific project analysis. However, mine reclamation projects can have positive environmental effects, such as restoration of damaged areas within watersheds, eradication of invasive species, preservation, protection and interpretation of historic mining areas, development of educational materials on mining history, and improvement of public safety.

Effects on mineral and energy resources management stem from issues relating to access, exploration and development of the resource. When mining or energy operations are proposed or located in certain sensitive areas, recommended mitigation or avoidance measures could have an adverse impact on the operator or leaser, because access to mineral rights or water rights for exploration and development may be restricted by conditions and stipulations. Those sensitive areas include, but are not limited to:

- Areas with highly erodible soils on steep slopes;
- Areas with sensitive habitats and species;
- Areas with highly unstable slopes, or in areas with unique geologic resources; and
- Sensitive watersheds or riparian areas, or where water quality or quantity or aquifer conditions are likely to be affected.

Some mitigation measures may be cost-prohibitive and could deem the operation uneconomical to develop. Areas are not withdrawn specifically to protect soil resources, although soil may be one of various considerations leading to recommendation for withdrawal.

Reserving and withdrawing lands from mineral entry has the effect of reducing the amount of lands available for minerals location, leasing, and mineral materials development. Table 312: Percent of Land Area Expected to be Withdrawn from Mineral Entry, page 65, lists expected percentages of withdrawals for each national forest, by alternative. Alternatives 3 and 6 would propose considerably larger acreages of mineral withdrawals, while Alternative 5 anticipates little to no increase from current (Alternative 1) levels. Alternatives 2, 4 and 4a would have moderate increases in acres proposed for mineral withdrawal. The Forest Service only requests or recommends mineral withdrawals. The Bureau of Land Management (BLM) is the agency that actually has the authority to withdraw lands from mineral entry. Since disposal of leasable and salable minerals is discretionary, proposals for withdrawal are generally only needed under the locatable mining laws.

The direct effect of placing conditions or stipulations on applications for permits would result in either the increase in mining costs or the abandonment of the operation, depending on the type of restriction and whether a small operator or a large mining company was being affected. The size of that effect cannot be estimated except on a case-by-case basis, depending on the size and location and timing of that operation. At one end of the scale are large firms who pursue large mining operations that are typically mined on a year-round, 24-hours-per-day basis. Costs for reasonable design measures to mitigate environmental concerns are usually anticipated. However, restrictions requiring seasonal shutdowns are not economically or physically practical for a large operation; therefore, large companies would likely avoid projects in areas with seasonal restrictions. Small operators could likely accommodate seasonal restrictions because they generally operate on a seasonal basis and are physically equipped to accommodate temporary shutdowns. However, small operators are less able to afford costly design measures. Certain restrictive design measures or seasonal closures may be so constraining that they preclude mining altogether, regardless of the size of the operation. When this occurs in areas that are open to locatable mineral entry, such measures or actions could be contested legally as a "takings." There is precedent in law for this, because the locatable mining laws convey a legal right to explore and develop the mineral resource.

The impact of conditions and stipulations on minerals and energy operations depends mostly on where those operations are located and what resources or activities they may affect. Those restrictions are likely to be similar under all alternatives for any given area. Alternatives 6, 3 and 4a could impose additional restrictions for increased protection of species, habitats and watersheds.

Some watershed areas have been withdrawn in the past specifically to protect watershed integrity and water quality and quantity, such as the Angeles Front Country. No similar withdrawals are proposed in any alternative.

On the San Bernardino National Forest, the Forest Service, BLM, U.S. Fish and Wildlife Service, the mining industry, the California Native Plant Society and other claimholders and landowners have coordinated their efforts for more than four years to develop a Carbonate Habitat Management Strategy (CHMS). The CHMS includes specific criteria for conservation, land acquisition and mining. This strategy would be applied to all alternatives and consists of:

- Conserved lands, where protection of the carbonate endemic plants is the mandate;
- Managed lands, which allow uses compatible with the conservation of carbonate endemics; and
- Industrial lands, where mining and other extractive uses are the dominant use.

The conservation goal is protection of the surface from mining and relinquishment of existing claims, which would offer permanent protection. BLM incorporated the CHMS into its draft environmental impact statement for the West Mojave Plan, released in the summer of 2003. The BLM portion of the CHMS document would be implemented by actions in the West Mojave Plan, if approved.

The effects of different alternatives are related mostly to issues of access and conflicts with other resources or uses. Those alternatives which provide the most road and trail access and least additional withdrawal from mineral entry (primarily wilderness additions), especially Alternative 5, provide the best opportunities for mineral and energy exploration and development. Alternatives 2, 3 and 4 would increase slightly the miles of roads where motorized use is allowed. Alternative 4a has a small decrease, and Alternative 6 has a major decrease from current.

Effects of Management of Watersheds, Air and Geologic Resources and Hazards on Minerals and Energy Operations

Measures designed to improve watersheds (i.e., soil, water quality, slope stability, etc.) could conflict with operations and facilities necessary at mines, oil and gas facilities, and energy facilities; however, those measures applied to roads would usually benefit access for minerals and energy operations.

Air quality facilities or management activities could conflict with location and development of minerals and energy operations. Air quality regulations that restrict emissions from minerals or energy operations could increase operating costs or restrict periods of operation.

Management of geologic resources (such as caves, fossils, special interest areas, etc.) could affect exploration and development of minerals and energy resources if restrictions are placed on land uses in order to reduce impacts to geologic resources. For example, if significant cave resources were discovered in the carbonates in the San Bernardino National Forest, measures to protect those resources could alter mining plans. Management of geologic hazards such as areas highly susceptible to landsliding or rockfall could impose restrictions on both access to and location of minerals and energy operations and facilities.

Effects of Socioeconomics and Law Enforcement on Minerals and Energy Operations

Social and economic activities in general involve the building or upgrading of existing infrastructure. They also involve the increase or decrease in social services (fire, police and schools), population numbers and local government revenues (taxes, fees). Effects of social conditions would include changes in employment and population, services provided by local governments, tax revenues and levels of traffic, noise and aesthetics.

An increase in social services and activities would generally result in a positive impact and increased demand on minerals and energy resources. An improved transportation system increases opportunities for mineral development. An increase in social services and schools benefits mineral development since it provides a high quality of life for companies employees and contractors. However, more people using the land could also increase conflicts between mining or energy operations and other national forest users.

A decrease in the quality and the quantity of the social infrastructure would generally be adverse to mineral development, but energy resources would likely still be needed.

The law enforcement program can benefit authorized minerals and energy operations by reducing impacts from vandalism and trespass. Law enforcement activities can also limit unauthorized mining activities.

Effects of Heritage Resources and Tribal Relations on Minerals and Energy Operations

When mining or energy operations are proposed or located in areas with heritage resources or in areas with tribal considerations, recommended mitigation or avoidance could have an adverse impact on the mining operator or leaser, because access to mineral rights for exploration and development may be restricted by conditions and stipulations. Often minerals and energy activities continue or restart in areas of historical mining, which may contain buildings, trails and sites of cultural significance. Expanded mining or energy operations could affect those old features. Some mitigation measures may be cost-prohibitive and could deem the operation uneconomical to develop. Heritage resources are not generally withdrawn specifically to protect those resources, although they could be among the various considerations leading to recommendation for withdrawal. Effects of mineral resource development are addressed in site-specific project analysis and are not expected to vary by alternative.

Effects of Recreation and Non-Recreation Special Uses Management on Minerals and Energy Operations

Increasing populations in southern California are expected to increase recreation use of National Forest System lands. More traffic on National Forest System roads and more dispersed recreation across National Forest System lands is likely to bring the public in more frequent contact with lands occupied for mining and energy operations. Those alternatives (such as Alternatives 4 and 5) that provide the broadest range of recreation opportunities would also create the most opportunity for conflict between recreationists and minerals and energy operations. Vandalism to water lines and sources, power units, facilities and equipment can become a problem. Active management of recreation activities and planning of campgrounds and trails to reduce encounters with minerals and energy operations can reduce adverse effects.

Conversely, opportunities to educate the public (e.g., at developed campgrounds or interpretive sites) about the values derived from minerals and energy resource development can result in more public support for multiple uses.

Effects of special use activities and administration on minerals and energy operations are generally the same as for recreation.

Effects of Biodiversity Management and Special Designations on Minerals and Energy Operations

When mining or energy operations are proposed or located in areas where sensitive wildlife or plants (particularly threatened, endangered, proposed, candidate or sensitive species) are likely to be affected, and especially in those areas with Critical Biological zoning, recommended mitigation measures could have an adverse impact on the minerals or energy resources operations since access to mineral rights for exploration and development may be restricted. Some mitigation measures may be cost-prohibitive and could deem the operation uneconomical to develop. Some Critical Biological zones may be proposed for

Table 311. Recommended Acres for Withdrawal from Mineral Entry in Critical Biological Zones by Forest and Alternative				
Alternative	**ANF**	**CNF**	**LPNF**	**SBNF**
1	2,481	1,210	0	0
2	3,534	6,001	0	1,967
3	5,247	4,922	798	1,848
4	3,793	6,001	0	1,834
5	1,440	0	0	0
6	4,729	6,715	852	2,426
4a	3,920	2,131	1,762	2,281

mineral withdrawal specifically to protect species and habitats; the acreage varies by alternative (see table 311: Recommended Acres for Withdrawal from Mineral Entry in Critical Biological Zones by Forest and Alternative).

Designated wilderness areas and other special area designations may have an adverse affect on the location, exploration and development of mineral operations. If recommended areas become designated as wilderness they would be withdrawn from mineral entry. Alternative 5 fosters the most commodity uses, Alternative 3 and 6 the least (see Chapter 2, alternative comparison).

Upon wild and scenic river designation, wild rivers would be recommended for withdrawal from mineral entry. Alternatives 3 and 6, followed by Alternatives 2 then 4 and 4a, recommend the most mileage for wild river designation. In addition, 28 miles of scenic rivers would be recommended for withdrawal in Alternatives 2, 3, 4, 4a and 6. Some types of mineral exploration may not affect the classification of a river as scenic or recreational, as long as the free flow, water quality and outstandingly remarkable values are protected and classification objectives are maintained. In the interim pending designation, resource protection for recommended wild and scenic rivers would be provided in the revised forest plans and in 36 CFR 228.8.

Alternatives 2 through 6 identify a portion of the Angeles National Forest (the San Francisquito Canyon) as an eligible river under the Wild and Scenic Rivers Act. Activities that would affect the river's eligibility would not be allowed pending suitability analysis and a final recommendation to Congress. The area is classified as high potential for oil and gas development (see Appendix I. Oil and Gas Potential).

Additionally, other special management directions resulting from surface protection measures to restrict, limit and prohibit access to or exploration and development of the mineral resources causes an adverse effect on the mineral and energy operation.

Effects of Landscape Management on Minerals and Energy Operations

Developments of mining, oil and gas, or energy operations often are visible from long distances. The scenery management program objectives can be at odds with mineral and energy developments, depending on their location and scope. Maintenance of scenic integrity could require costly mitigations for mineral and energy operations. On the other hand, hydropower facilities resulting in reservoirs may enhance scenic qualities and benefit from scenery management objectives.

Effects of Roads and Trails on Minerals and Energy Operations

Mining and energy operations generally require roads and other conveyance systems, so existing or proposed systems are advantageous to those operations as long as they are not restricted from use. Roads and trails facilitate both operator and Forest Service administrator access to operations and help ensure compliance with permit terms and conditions. Road cuts which expose bedrock are often beneficial to understanding the local geology and mineral potential during exploration activities.

Increased public use of roads and motorized or non-motorized trails can result in increased visits to operations and consequently in increased vandalism or illegal entry. Roads with limited public access would be beneficial to minerals or energy operations by providing operator access while restricting unauthorized entry. Alternatives that restrict road use by the public (especially Alternatives 6 and 4a) provide some added protection to exploration and developed operations, beyond the current level represented by Alternatives 1 and 2. However, use of existing roads in areas zoned as Back Country Motorized Use Restricted by permitted activities would undergo added restrictions to maintain the character of the land use zone. Roads and trails under Alternatives 5 and 4 would be the most open to public use and have the fewest restrictions. Alternative 3 would have moderate levels of restrictions. Impacts from mining roads and developments are assessed during project proposals and plan of operation development on a project by project basis.

Effects of Livestock Grazing on Minerals and Energy Operations

Effects from livestock grazing activities on minerals and energy resources result from increased use of the land by livestock and their caretakers. Grazing activities are generally not compatible with active mining operations. The effects are generally threats to livestock from hazardous conditions and disruption of mining activities if livestock interfere with mining or energy operations. The effects would be common to all alternatives, but more likely where increased numbers of livestock come into contact with increased minerals and energy activities.

Effects of Water Managed as a Commodity on Minerals and Energy Operations

When mining or energy operations are proposed or located in areas where water is scarce, or where it is being used for water bottling, snow-making, agricultural, or other high quantity uses, competition for the resource could cause conflicts and recommended mitigation measures for sharing or conserving the resource could have an adverse impact on the minerals or energy resources operator. Some mitigation measures may restrict the amount of available water (which usually is important in mining developments) or the types of exploration allowed (such as drilling in a key aquifer). Mitigations may be cost-prohibitive and could deem the operation uneconomical to develop. The Forest Service controls management of water as a commodity only when the water source is on National Forest System lands. Off-forest extractions of groundwater could affect on-forest operations in any alternative.

Effects of Land Ownership Adjustment on Minerals and Energy Operations

If mineral resources are not evaluated before disposal or acquisition of land or before issuance of permits for activities that might be detrimental to minerals or energy resources, then those resources or operations might be overlooked or compromised. The result could be acquisition of or relinquishment of land with minerals that could be developed and that could require additional administration. Those alternatives that place emphasis on acquisition of additional land could acquire additional administrative responsibilities. Land acquisition is emphasized in Alternatives 1 through 4a and 6. Alternative 5 would not be expected to increase the National Forest System land base.

Effects of Vegetation Management, Wildland fire and Community Protection on Minerals and Energy Operations

Vegetation management such as thinning, prescribed burning and management of fuelbreaks and buffers could affect minerals and energy operation if fires burned through developed operations or vegetation removal conflicted with minerals and energy operations, access, or facilities. A positive effect would occur when clearing of vegetation exposes new outcrops that facilitate mineral exploration or opens new areas to improved access for wind or solar facilities.

The effects of fire management and community protection on minerals and energy operations are generally the same as the effects of vegetation management.

Cumulative Effects

The cumulative effects on mineral and energy resources result primarily from the following factors:

- The increasing acreage of public land that is withdrawn from mineral entry such as wilderness, research natural areas and other special management areas. In addition to withdrawal, there may be other loss of mineral extraction opportunities due to special designations.

- The increasing number of stipulations and conditions associated with permit processing and granting.
- The increased cost of reclamation and bonding by regulatory agencies.
- Loss of alternative sites as more land area is urbanized.
- Increased vandalism and conflicts with other national forest users.

These factors combine to reduce the amount of land available to exploration and development of minerals and energy operations on National Forest System lands.

Effects on Non-Recreation Special Uses

Direct and Indirect Effects

Public and private requests for non-recreation special use authorizations, including the designation of corridors and sites, to use and occupy National Forest System land must provide public benefit, abide by all pertinent law, comply with land management plan direction, conform to agency policy, and qualify for application status prior to consideration. Special use authorizations are not exclusive; therefore, other compatible activities may be allowed in authorized areas as needed for public benefit and resource protection.

Specific requirements for use and occupancy of National Forest System land by non-recreation special use authorizations (including designation of corridors and sites) are identified in a project-level analysis prior to development or changes in the authorized use. Before an authorization can be issued or modified, the proposal is reviewed subject to policy, applicable law, and the forest plan. If the use complies with the forest plan, a new authorization may be issued; if not, the use must be modified or discontinued, or the forest plan amended, before a new authorization may be issued.

The number of special use authorizations and the acres authorized has declined since the original land management plans. However, an increase in special use authorizations on National Forest System land is expected to meet future demand for land use and occupancy as the supply of available non-National Forest System land in southern California is reduced through development. Various state, county, and local government agencies (as well as individuals and corporations) are increasingly considering National Forest System land in major investment studies and proposals to meet future demand for transportation corridors, utility corridors, development of infrastructure, and sites for groundwater extraction.

Furthermore, southern California will continue to rely on energy, water, communications, raw materials and manufactured goods from outside the area to sustain population and growth. As the site of two major and several smaller ports, southern California will continue to support a major transportation industry. As a result, there are numerous situations where National Forest System land will continue to be needed for infrastructure to support commerce.

Proposals for infrastructure to support surrounding development may require road construction or reconstruction for installation and maintenance of facilities. Helicopters and other methods may be used to reduce the need for new roads. Increased development adjacent to and within the national forests may require more authorization of National Forest System land for temporary roads. Access to private inholdings may be required per the Alaska National Interest Lands Conservation Act in all land use zones.

Existing utility corridors would be needed through the land management plan period and would be expected to accommodate demand for the areas they serve. A summary of these designations is listed in table 307: Utility and Transportation Corridors and Communication Sites (Currently Designated), page 303. The location of new utility facilities within or near existing corridors would reduce the areas affected by utilities. Widening of existing corridors is preferred over new corridors. Utility corridors would be available for consideration of compatible non-recreation special uses. Different types of utilities have different impacts; therefore, new rights-of-way may reduce impacts. Not all authorized utilities are in corridors.

Existing transportation corridors would be needed through the plan period. Demand for new highway facilities and added transportation capacity is expected to increase between areas of high population growth where people rely on commuting through the national forests to other urban areas, and within transportation routes that link southern California with the rest of the country. This is likely to occur in the areas surrounding Riverside and Orange counties and near the Cajon (Interstate Highway 15) and Tejon (Interstate Highway 5) passes.

Communication sites designated in existing land management plans would continue and would be needed through the plan period. Existing communication sites can meet the demand for radio and television transmission for their coverage areas. Where additional areas adjacent to and within the boundaries of the national forests do not presently have communication coverage, a limited number of new sites in suitable land use zones may be needed. An unmet demand for wireless telecommunication sites in transportation corridors and along arterial roads would be met through new sites in suitable land use zones and along transportation corridors.

Sediment placement sites will be needed through the plan period to contribute to soil and watershed stability and to avoid disposal of sediment (including emergency situations such as road or slope failure) onto an inappropriate site with potential for mass failure or conflicts with other resources. Existing sediment placement sites on the Angeles National Forest would continue; however, they are not expected to fully accommodate demand for the plan period. Consideration of proposals for additional sediment placement sites are expected in national forest land use zones suitable for this use. There is also unmet demand for sediment placement sites on the Los Padres National Forest along California State Highways 1, 133 and 156. Consideration of proposals for sediment placement sites in suitable national forest land use zones is also expected for these locations.

Effects of LMP Decisions on Non-Recreation Special Uses

The key consideration or main factor that affects the management of non-recreation special uses, and the designation of sites and corridors, is the suitability of land use zones for consideration of these uses. The land use zones suitable for consideration of non-recreation special uses and the designation of sites and corridors on National Forest System land are the Developed Area Interface, Back Country, and Back Country Motorized Use Restricted zones. Alternatives that include more acreage zoned as suitable for these uses and include more access would have a higher potential to consider and meet the demand for non-recreation special-uses. Table 308: Acreage Suitable for Consideration of Non-Recreation Special Uses, page 65, illustrates the variation in suitable acreage by alternative.

To help identify demand for future utility corridors, the Forest Service participates with major western gas, electric and telecommunication companies, and other agencies, in a partnership that studies corridor needs. This study identifies priority corridors desired for present and expected future demand (Western Regional Corridor Planning Partnership, Priority Corridors, Map Date: July 10, 2003). Two newly-identified unoccupied priority utility corridor segments have been identified that are not designated as utility corridors in any of the alternatives. They are both located on the Cleveland National Forest and transverse the areas of Elsinore Mountain and San Mateo in the Elsinore Place, and El Cajon Mountain in the San Diego River Place. Table 309: Suitability of Unoccupied Priority Corridors of the Western Regional Corridor Planning

Table 309. Suitability of Unoccupied Priority Corridors of the Western Regional Corridor Planning Partnership

WRCPP Priority Utility Corridor	Suitable Alternatives	Approximate Length (Miles)	Approximate Area (Acres)
Elsinore/San Mateo	1,4,4a,5	23.0	8,495
El Cajon Mountain	1,2,4,4a,5	6.0	1,920

Partnership shows in which alternatives the two utility corridor segments identified by the Western Regional Corridor Planning Partnership (WRCPP) study would be zoned as suitable and may be designated in the future.

Alternative 1. Under Alternative 1, the overall acreage suitable for consideration of non-recreation special uses would be unchanged from the levels of the existing land management plans. The newly-identified unoccupied Elsinore Mountain to San Mateo and El Cajon Mountain utility corridor segments would be in suitable land use zones in this alternative. A portion of the Back Country Non-Motorized zone within the Elsinore place (Cleveland National Forest) may have to be modified to accommodate for existing utilities in the designated Valley Serrano Corridor.

Alternative 2. Under Alternative 2, the acreage suitable for consideration of non-recreation special uses would be reduced by nearly 4 percent when compared to the acreage available in the existing plans. Alternative 2 would not include the newly-identified unoccupied Elsinore Mountain to San Mateo utility corridor segment in suitable land use zones but would include the newly-identified unoccupied El Cajon Mountain utility corridor segment in suitable land use zones. In this alternative, a portion of the Back Country Non-Motorized zone within the Elsinore place (Cleveland National Forest) may have to be modified to accommodate for existing utilities in the designated Valley Serrano Corridor.

Alternative 3. Under this alternative the area suitable for consideration of non-recreation special uses would be much less than existing plans. The reduction in suitable acreage would be approximately 43 percent that of the current forest plans. The decrease can be largely attributed to Recommended Wilderness zoning. In this alternative, the newly-identified unoccupied Elsinore Mountain to San Mateo and El Cajon Mountain utility corridor segments would not be in suitable land use zones. A portion of the Recommended Wilderness zone within the Elsinore place (Cleveland National Forest) may have to be modified to accommodate for existing utilities in the designated Valley Serrano Corridor. If use in these corridors or sites decrease to a large extent, the national forest would evaluate the possibility of returning the land use zones to that of the surrounding area.

Alternative 4. Under Alternative 4, the suitable acreage for consideration of non-recreation special uses would be almost unchanged from the existing land management plans, with a 1 percent reduction in total acres available for consideration compared to present management plans. Under Alternative 4, the newly-identified unoccupied Elsinore Mountain to San Mateo and El Cajon Mountain utility corridor segments would be in suitable land use zones. A portion of the Back Country Non-Motorized zone within the Elsinore place (Cleveland National Forest) may have to be modified to accommodate for existing utilities in the designated Valley Serrano Corridor.

Alternative 4a. In this alternative, the area suitable for consideration of non-recreation special uses would be approximately 22 percent less than the existing land management plans. Alternative 4a recommends an 8 percent increase in wilderness acres over existing forest plans. Under Alternative 4a, the newly-identified unoccupied Elsinore Mountain to San Mateo and El Cajon Mountain utility corridor segments would be in suitable land use zones.

Alternative 5. The suitable acreage for consideration of non-recreation special uses would be greatest in this alternative, offering a 27 percent increase over present plan levels. This alternative does not recommend any additional wilderness. Under Alternatives 5, the newly-identified unoccupied Elsinore Mountain to San Mateo and El Cajon Mountain utility corridor segments would be in suitable land use zones.

Alternative 6. The area suitable for consideration of non-recreation special uses would be much less than that of existing land management plans in this alternative. Suitable acreage would be reduced nearly 62 percent from existing plan levels. Alternative 6 recommends the largest increase in wilderness acreage. The newly-identified unoccupied Elsinore Mountain to San Mateo and El Cajon Mountain utility corridor segments would not be in suitable land use zones. A portion of the Back Country Non-Motorized zone within the Elsinore place (Cleveland National Forest) may have to be modified to accommodate for existing utilities in the designated Valley Serrano Corridor. If use in these corridors or sites decrease to a large extent, the national forest would evaluate the possibility of returning the land use zones to that of the surrounding area.

Effects of Special Designations on Non-Recreation Special Uses

Special designation areas (i.e., wilderness, proposed wilderness, research natural areas, and wild and scenic rivers) and Critical Biological land use zoning would affect, and in some cases, preclude management of non-recreation special uses. All present non-recreation special uses are expected to be compatible with special designations. There are no major effects on non-recreation special uses in any of the recommended special designation areas.

Existing wilderness and roadless areas exclude most water uses, including reservoirs, diversions and aqueducts. This is expected to continue to be true in the future as well. Future water uses resulting in road construction or other ground-disturbing activities may be limited by these designations. Proposed water uses could be influenced by the various alternatives, and changes in wilderness and roadless designations among alternatives would have the greatest potential for influence.

In wild and scenic river corridors identified as eligible or suitable for designation, non-recreation special use authorizations (such as water use or motion picture filming authorizations) would need to be managed to maintain or enhance the classification. This would include improvements proposed to facilitate the authorized special use. Where improvements or impacts are short term and maintain the natural appearance of the river corridor, the river may maintain scenic or recreational classification. Management of non-recreation special uses to address requirements associated with wild and scenic river designation would have a potentially positive effect on visual as well as natural resources. Should costs be involved to protect the river corridor, the cost would be born by the holder of the authorization.

Effects of Vegetation Management on Non-Recreation Special Uses

Non-recreation special use authorizations to occupy and use National Forest System land in Wildland/Urban Interface Defense and Threat zones are expected to specify vegetative management activities for fire prevention and fire suppression compatible with forest plan guidelines. It is expected that authorization holders will be responsible for these vegetation management activities.

Effects of Recreation on Non-Recreation Special Uses

Non-recreation special use authorizations to occupy and use National Forest System land may create open spaces and access points that are attractive to national forest visitors for hiking, bike riding, hunting, and so forth (for example, clearings and maintenance routes within utility corridors). It is expected that some effects from recreation will occur on areas authorized for non-recreation special uses.

Effects of Water Use on Non-Recreation Special Uses

Existing special use authorizations issued for non-power generating water facilities (such as diversions for agricultural use or facilities for drinking water) would be expected to continue for the period specified in each authorization. Evaluation of special-use proposals for new water facilities and applications to continue or modify existing authorized water facilities would include analysis on the effects to natural resources. A slow decrease in demand for agricultural water diversion facilities on National Forest System land may occur as this land is reduced through development. A slight increase in demand for facilities to extract drinking water from National Forest System lands is expected.

Effects of Management of Geologic Resources and Hazards on Non-Recreation Special Uses

Management of geologic resources (such as scenic vistas enhanced by spectacular geologic formations, caves, special interest areas, etc.) provide points of curiosity and scientific learning for filming and scientific study special uses. Understanding the groundwater resource and aquifer characteristics aids decisions to permit groundwater extractions. Management of geologic hazards (such as areas highly susceptible to landsliding, debris flows, rockfall, flooding or seismic activity) improves understanding of the hazards and safety issues for special uses such as utility corridors, energy generation and transmission facilities, roads, dams, etc.

Cumulative Effects

Continuous increases in long-term authorizations for major infrastructure would commit greater areas of National Forest System land to development with its potential impacts on watershed, fisheries, wildlife, scenery, recreation, as well as potential social and economic impacts.

Cumulative effects resulting from special designations such as research natural areas, wild and scenic rivers and wilderness would result in some present and future loss of commodity production and special use opportunities.

Effects on Lands and Real Estate Management Activities

Direct and Indirect Effects

National Forest System (NFS) land ownership is adjusted to enhance and protect public access, protect public resources, and efficiently administer the national forests. Acquired land should have no hazardous materials or encumbrances unsuited for national forest management. Land transactions must comply with all pertinent laws and land management plan direction.

Effects of LMP Decisions on Landownership Adjustment

The rapid development of external open space is diminishing the supply of desirable parcels for acquisition. This development of private and other non-NFS parcels within and outside the national forest boundaries permanently affects efforts to improve the manageability of National Forest System land. Because of limited funds for acquisition, national forests are restricted in their ability to respond to opportunities and often must forfeit chances to improve habitat links, wildlife corridors and administrative efficiency.

Under all alternatives, the overall National Forest System land base would increase and consolidate. National Forest System lands in wilderness, Critical Biological, and Experimental Forest land use zones would not be suitable for disposal. Because program size is a function of policy, funding, and available land, the total acres adjusted are not expected to vary greatly. Landownership adjustment will be guided by the Land Adjustment Prioritization Guide in Part 3 of the forest plans. The guide identifies criteria for land acquisition, conveyance, and access. Acquisitions for the protection and management of important habitat, wildlife corridors, and special designation areas are identified as priority 1. In addition to this list of types of priority acquisitions, the theme of each alternative would influence which parcels are selected for adjustment and the benefits obtained.

Under all alternatives, land adjustment is likely to improve uniformity of land use zones commensurate with the character of the surrounding land use zone. For example, acquisition of a non-National Forest System parcel within the national forests may eliminate present or future need for developed access and utility infrastructure across the national forests. Land use zoning could then be made consistent with the surrounding area.

All alternatives that identify eligible or suitable wild and scenic rivers (Alternatives 2, 3, 4, 4a, 5 and 6) have the potential for acquiring private lands abutting designated rivers from willing sellers. Through land acquisition, control over river management would be increased. Wild and scenic river management direction only applies to the extent of the Forest Service’s jurisdiction over federal lands (including new acquisitions), easements and other interests; it does not apply to privately owned lands. The wild and scenic river suitability report notes where land acquisition might enhance wild and scenic river management; however, this would be under condition of a willing seller.

Alternative 1. Under this alternative, the land adjustment strategy would continue to focus on consolidation, habitat improvement, better access, acceptance of donations and publicly initiated cases. Nearly all rights-of-way would be acquired as a result of land adjustment. Mineral withdrawal status would be little changed.

Alternative 2. Existing land adjustment strategies would continue at present levels with an increased focus on adjustment for species habitat protection and preservation of wildlife corridors. Acreage recommended for mineral withdrawal status would increase moderately in this alternative.

Alternative 3. This alternative would emphasize land adjustment strategies with highest priority toward adjustment for species habitat protection and preservation of wildlife corridors to better protect sensitive resources, including acquisitions outside the National Forest System boundary. Acquisition of parcels within wilderness, wild and scenic river corridors and important biological areas would be emphasized. Acreage recommended for mineral withdrawal status would increase considerably in this alternative.

Alternative 4. This alternative would emphasize road and trail rights-of-way acquisition for public access to existing National Forest System land. Land adjustment strategies would support recreation use and visitor access to accommodate recreation demand. Wilderness, lands with high scenic integrity, important heritage resources and lands with dispersed recreation opportunities would be priorities for acquisition. Acreage recommended for mineral withdrawal status would increase moderately in this alternative.

Alternative 4a. Existing land adjustment strategies would continue at present levels with an increase in emphasis on adjustment to sustain, improve, protect and preserve biological habitat, wildlife corridors, public access, community protection, and manageability of National Forest System land. Wilderness, lands with high scenic integrity, important heritage resources, and lands with dispersed recreation opportunities would also be priorities for acquisition. Acquisition would be focused primarily toward consolidation of land within national forest boundaries; however, the national forests may participate in partnerships or other collaborative efforts to acquire land outside of national forest boundaries for habitat linkages or other administrative purposes. The amount of acreage recommended for mineral withdrawal status would increase modestly in this alternative.

Alternative 5. This alternative would continue to focus land adjustment priorities on consolidation, habitat protection and better access. Alternative 5 would emphasize increasing access but would strive for a low level of restrictions on acquisitions. Acreage recommended for mineral withdrawal status would be little changed.

Alternative 6. This alternative would strongly emphasize land adjustment strategies, with a high priority toward acquisition for species habitat protection and preservation of wildlife corridors to better protect sensitive resources. This alternative would most strongly emphasize acquisitions outside the National Forest System boundaries. Emphasis would stress acquisition of parcels within wilderness areas, wild and scenic river corridors, and land important for ecosystem protection. Acreage recommended for mineral withdrawal status would increase the most in this alternative.

Effects of Forest Plan Decisions on Property Line Management

For all alternatives, as the urban interface increases, the number of trespass and claims cases would also be expected to increase. Increased property line identification in developing areas is expected to reduce trespass and associated adverse impacts such as unauthorized construction or ground disturbances on National Forest System land. Areas with unidentified property lines would be at risk for unauthorized occupancy that could result in loss of clear title to National Forest System lands.

Effects of Forest Plan Decisions on Rights-of-Way Acquisition

As the national forests consolidate, access improves and the need for easements is reduced. Legal access to National Forest System land is an important aspect of improving the management of resources and would remain a priority in all alternatives. Though acquisition of additional rights-of-way would increase access, overall access may still be lost because of rapid development along the national forest boundaries.

Effects of Forest Plan Decisions on Mineral Withdrawal Status

For all alternatives, existing withdrawals would continue. The primary addition to mineral withdrawal status would be from additional wilderness designations (see table 244: Acres of Potential Increase to Mineral Withdrawal Status, by Alternative, page 375).

Effects of Management of Geologic Resources and Hazards on Lands and Real Estate

Management of geologic resources (such as groundwater resources, mineral resources, scenic vistas, caves, special interest areas, etc.) provides information to decision makers about the values and tradeoffs of the lands that are being considered for sale or exchange. Management of geologic hazards (such as areas highly susceptible to landsliding, debris flows, rockfall, flooding or seismic activity) provides information about the hazards and safety issues that could be important to consider when assessing land characteristics.

Cumulative Effects

Land adjustment has increased the land base for the national forests at a rate of about 2,000 acres per year. The continuing ownership adjustment of National Forest System land reduces property lines with other lands, increases public access, consolidates ownership, enhances ecosystems, preserves wildlife corridors, and maintains a trend toward safeguarding natural resources of the United States for the long-term benefit of people and their natural environment.

Effects on Wildland Fire and Community Protection

Direct and Indirect Effects

Effects of LMP Decisions on Firefighter Effectiveness and Suppression Access

The alternatives have been compared as to how well they respond to addressing the key fire management issues identified in the affected environment. The rankings of very high (VH), high (H), medium (M) and low (L) reflect how well each alternative addresses these issues (see table 111: Key Fire Management Issues Ranked by Alternative).

Table 111. Key Fire Management Issues Ranked by Alternative

Management Issues	1	2	3	4	4a	5	6
Vegetation Condition	H	H	H	H	H	H	H
Wildland Urban Interface	H	H	H	H	H	M	VH
Suppression Effectiveness and Firefighter Access	H	H	H	H	H	H	M
Recreation Use and Transportation Corridors	M	M	M	M	H	L	VH

All alternatives emphasize implementation of the National Fire Plan in Wildland/Urban Interface (WUI) areas. The Wildland/Urban Interface is defined as that area within one and one half miles of a community; this area is further subdivided into Defense and Threat zones, with the Defense zone being that part of the zone closest to the community. It is anticipated that community protection effectiveness will increase as a result of National Fire Plan implementation. The rate of accomplishment of work in community defense and threat zones, mortality removal, and thinning depends on funding. Implementation of Alternative 6 has two unique features: 90 percent of hazardous fuels reduction occurs only in the urban interface, and naturally occurring lightning fires can be managed for resource benefit as wildland fire use incidents in the large wilderness areas in the northern portion of the Los Padres National Forest.

Progress would be made in reducing the fire threat to threatened communities under all alternatives. Fuelbreaks would be maintained and constructed to help confine fires to single watersheds or to the smallest number of watersheds possible, except in Alternative 6. In this alternative, only those fuelbreaks within the urban interface would be constructed and or maintained. In some cases, where community defense zones are impractical, fuelbreaks around communities may be installed at the national forests' boundary to provide for a limited degree of community protection. Large prescribed burns would be implemented, often to greatly increase the width of fuelbreaks or to form a secondary line of community defense using fuelbreaks, natural features, and wildland fire areas as part of that line of defense. It is anticipated that structural losses will increase for the next five to ten years and then decrease because of increased defensible space and decreased hazardous fuels adjacent to communities. Prescribed burns should not result in adverse effects on flood-control activities related to downstream communities, but wildland fires would occasionally result in this effect.

While wildland fires burning under extreme weather conditions (such as Santa Ana winds or drought conditions) often burn through recently treated areas (Keeley 2002), wildland fires burning under more typical conditions often stop at the boundaries of other recent fires (Minnich 1983, 1987, 1989). Firefighters have made the same observations regarding fuelbreaks. Under extreme conditions fires often jump fuelbreaks, and under moderate to severe burning conditions fuelbreaks (especially roaded fuelbreaks) have been effective in providing firefighters with preplanned fire control lines, safety zones, and escape routes. Prescribed burns of the past were often only hundreds of acres in size; larger prescribed burns are more likely to affect the spread of future fires, especially when strategically planned based on fire history. The use of prescribed fire contains a degree of risk and potential government liability.

Because of densification and high mortality in timber stands, firefighter effectiveness has been moderately reduced, and in each alternative extensive community defense projects and tree thinning are planned to make both communities and the national forests more resilient to wildand fire. The rate of implementation of these mitigation measures depends on the level of budget. Since the tree mortality situation will require many years to deal with, some of these mortality areas are likely to burn in the inevitable wildfire prior to proactive treatment.

In all of the alternatives, the vegetation management program would be expanded because suppression effectiveness cannot be improved without direct community protection, vegetation thinning and vegetation mortality treatments, and resolution of key national forest health issues. Mortality removal will be conducted within one and one half miles of threatened communities. While sometimes similar to salvage logging, the term 'mortality removal' also includes the removal of non-merchantable trees and dead shrubs. Mortality removal will also occur along evacuation routes, within one-third of a mile of government and permitted facilities, and at developed recreation sites.

Under Alternatives 1 through 5, chaparral would be treated both in high-hazard areas near communities and as a strategic tool to limit wildfire spread in other areas of the national forests. Under each of these alternatives, 75 percent of all hazardous fuels reduction projects would be located within the Developed Area Interface zone. Indirect community protection concepts are important in these alternatives: the primary function of fuelbreaks and large prescribed burns is to minimize wildfire patch size, thus limiting the number of communities threatened by any given fire or flood and limiting wildfire suppression cost. A flexible vegetation management program can shift because of wildfire impacts. This strategy will allow both direct community protection, through development of community defense zones, and indirect protection projects. Substantial treatments in the interior of national forests will be planned to limit wildfire duration and patch size, improve timber stand resiliency to fire, insects and disease, or to improve wildlife habitat. See table 534: Average Annual Hazardous Fuels Program., page 316.

Under Alternative 6, 90 percent of hazardous fuels reduction efforts would be in the direct vicinity of communities. This alternative would provide the highest level of human safety in the Developed Area

Interface zone and the most acres treated adjacent to threatened communities. Outside of the defense zone area, Alternative 6 would provide for 10 percent of the program to address forest health issues, such as protecting forest stands that constitute key wildlife habitat, and other habitat improvement needs. Alternatives 1 through 5 would create a slightly higher level of suppression effectiveness due to the focus on fuelbreaks and large prescribed burns designed to reduce wildfire patch size.

Grazing would eventually be reduced under Alternative 6. Grazing has been used to maintain fuelbreaks, and grazed areas have served to provide firefighter safety zones and to limit wildfire size in the past. The planned reduction in grazing would contribute to decreased firefighter effectiveness.

Improved road access leading to increased efficiency and effectiveness of fire suppression activities is a long-held tenet of fire fighting. Much of the effectiveness of past fire-suppression policies probably can be attributed to increased access for ground crews and equipment, particularly under weather and fuel conditions where fire behavior is not severe. However, under the severe conditions associated with intense, rapidly spreading fires, the value of National Forest System roads for access or as firebreaks is minimal (Gucinski and others 2000).

Although little has been published in the scientific literature to quantify the effects of roads on fire suppression, a study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burnout operations (Salazar and Gonzales-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). Daily costs of fire-fighting activities unfortunately are of little value in answering the question of how much road access increases efficiency, because fire-fighting agencies tend to put money and resources into fighting fires with access, which confounds the results. In spite of this, strong anecdotal evidence supports this effect (Gucinski and others 2000). Each alternative provides for a reasonable level of motorized firefighter access. While Alternative 5 would provide more access than the other alternatives, the benefits of this increased access would be offset by increased fire occurrence resulting from the public having the same access.

The difficulty of constructing fireline through chaparral vegetation presents labor-intensive fireline construction challenges and magnifies the importance of roads and fuelbreaks to suppression strategies in southern California. Fuelbreaks have been used many times to stop wildland fires under severe fire weather conditions, but generally not under the most extreme conditions. During extreme fire weather, fuelbreaks have been useful for reducing the lateral spread of fires, occasionally for stopping head fires during lulls in the wind and for making possible the protection of isolated communities (Green 1977).

Unlike national forests elsewhere in the country where road systems are in part due to past timber harvest programs, many of the ML 1 and 2 roads on the national forests in southern California were built specifically for fire suppression. Many National Forest System roads provide access to or run parallel to fuelbreaks, providing for quick firefighter access and enhanced firefighter safety. Road access to fuelbreaks and the national forests in general has been deteriorating. Maintenance Level 2 roads are typically what are referred to as fire roads. Wildland fire engines are now considerably larger than when the roads were designed and constructed for fire suppression, and the level of road maintenance has declined, resulting in a substantial backlog of maintenance needed to restore the road system. Firefighter safety is being compromised by benign neglect of the existing road system, which is considered essential to limiting wildland fire patch size and gaining access to fires in general.

Effects of Recreation Use and Transportation Corridors on Wildland Fire Management

Alternatives 4A and 6 would result in a slight decrease in wildfire occurrence due to an increase in the number of roads converted from public use to restricted motorized use. These roads would be gated and remain available for emergency access. Alternative 6 would double the number of miles of road that are restricted to administrative use (see table 253: Alternative Comparison of Road Mileage Not Available for

Public Motorized Access, page 352). Angeles National Forest fire occurrence records confirm that human-caused fires associated with gated roads have not been a serious problem. Most of the damaging human-caused fires start outside the national forests in the Wildland/Urban Interface, along major state, county and federal highways, and adjacent to heavily used recreation areas. There is not a substantial difference in how recreation use and transportation corridors influence fire management except on the Angeles National Forest, where fire occurrence has significantly increased during the past three decades. The Angeles National Forest has seen significant increases in recreation use during the past few decades and has a substantial number of wildfires associated with dispersed recreation use. The fire prevention priorities in all alternatives attempt to mitigate the pattern of ignitions, but fire occurrence is expected to increase near the national forests in the near future due to increased traffic in transportation corridors and increased growth on private lands adjoining the national forests.

However, even with a decrease in fire occurrence, an increase in acres burned is expected due to the amount of mortality in various plant communities. While the two alternatives (4a and 6) help reduce fire occurrence, the reduction is not expected to be substantial.

Effects of Wildland/Urban Interface on Wildland Fire Management

Complexity of land ownership patterns is directly related to the potential amount of Wildland/Urban Interface in the future. Alternative 5 would decrease emphasis on land adjustments that might prevent development in hazardous fire areas. The other alternatives emphasize land adjustments to reduce development on private lands within the national forests' boundary and key lands along the administrative national forests' boundary. The pace of development adjoining the national forests is such that an increase in fire occurrence in the Wildland/Urban Interface is a certainty regardless of which alternative is implemented.

Effects of Vegetative Condition on Wildland Fire Management

The planned tree mortality removal near communities will result in disturbance to the landscape in the Developed Area Interface zone. The mechanical removal of dead trees and other dead vegetation is necessary for community protection. If not addressed now, with each passing year more dead trees will fall, creating an increased fire-spread risk on the ground and a major threat to public safety in the form of wildfires and falling trees along transportation and utility corridors. Leaving slash within mortality removal areas would not be permitted. All slash treatments would occur within two years of project completion.

The three counties that have declared vegetation mortality disasters are also supported by a state declaration. San Bernardino, Riverside and San Diego counties have each formed an interagency safety task force. Each task force reports difficult evacuation issues regarding multiple mountain communities, where the safety of the communities and problems with evacuation routes are considered life-threatening in light of the tree mortality in and around these communities.

Those areas that are treated will result in improved community protection, because in many areas the mortality has occurred in thick stands of trees in need of thinning. When mortality removal occurs within and directly adjacent to communities, all other planned treatments meet defense and threat zone standards. These standards are located in Appendix K of Part 3 of the revised forest plans for each of the four southern California national forests.

Costs for vegetation mortality treatments range from $1,900 to $4,000 per acre. Timber sales can be used to remove mortality more cheaply, but merchantability of trees lasts for just a few years. Most of the dead material to be removed will be non-merchantable timber and brush. The least cost will be associated with permanent removal of chaparral in Wildland/Urban Interface Defense zones and broadcast burning of chaparral in Wildland/Urban Interface Threat zones. The more expensive projects will require thinning of mixed conifer forests and slash disposal treatments as part of the per-acre cost. Fuelbreak maintenance and prescribed burning normally cost $200 to $250 per acre; thinning costs range from $250 to $1,200 per acre; and fuelbreak construction costs range from $600 to $1,500 per acre. The per-acre costs include planning costs.

The philosophy of wildland fire management under all alternatives recognizes the importance of fuelbreaks and community protection zones in limiting wildfire damage to communities (Conard and Weise 1998); recognizes the need for fuels treatments to be strategically placed on the landscape to help prevent chaparral lands from burning too frequently (Keeley and others 1999a); and recognizes that past fires greatly influence subsequent fire perimeters (Minnich 1983, 1989; Minnich and Chou 1997).

The forest health component in this program consists primarily of addressing two key issues identified in the *Southern California Mountain and Foothills Assessment* (Stevenson and Calcarone 1999): thinning the mixed conifer forest where it is overly dense, and burning in and around bigcone Douglas-fir stands that could be damaged by high-intensity chaparral fires. Both forest types have been declining because of drought and increased susceptibility to mortality from insects, disease, and wildfire. Bigcone Douglas-fir mortality due to drought is extremely rare, but it is currently occurring on the San Bernardino National Forest and on Palomar Mountain in the Cleveland National Forest.

Most prescription burning of chaparral would be implemented primarily to reduce fire hazard (Keeley 2002). This is true when examining lower and middle elevation Wildland/Urban Interface Defense zones, the planned maintenance of existing and construction of new fuelbreaks, and large prescribed burns that will connect land features that inhibit fire spread to fuelbreaks and recent wildland fire burns. These are the indirect community protection projects under the hazardous fuels program, and they represent the planned actions in Alternatives 1 through 5 that could most limit wildfire patch size.

Budgets for community protection (especially for tree mortality removal) have been significantly increased the past few years. If these budgets are reduced, it may take from 25 to 40 years to complete the Wildland/Urban Interface Defense and Threat zone work on the San Bernardino National Forest, because the scope of the tree mortality and community defense zone needs are greatest there. The trend toward more damage to communities and forest health problems could be reversed by the end of the planning period on all four southern California national forests.

Under the existing land management plans, the strategy of creating age-class mosaics in chaparral was never fully implemented; however, even where they were, the concept included a large mosaic within each project rather than each project being a piece of the landscape mosaic. The projects in each alternative do not reflect a mosaic on the landscape as much as a division of the landscape. Fires in general need to be suppressed to limit the patch size of chaparral fires, because fire frequencies are more of a concern than fire exclusion on chaparral lands (Keeley 2002). Fire exclusion issues are addressed in the mixed conifer forests, with substantial work planned to increase forest resilience within the Wildland/Urban Interface Defense and Threat zones adjoining mountain communities.

Cumulative Effects

At the current budget level, all alternatives have similar cumulative effects. Acres burned in wildfires have increased throughout the West over the past 20 years, and an increase above the current average of 57,120 acres per year is expected due to tree and shrub mortality on the national forests. Increased traffic along major transportation corridors is likely to increase fire occurrence on the national forests, as is increased development in the wildland/urban interface around the national forests. Wildfire acreage increases are anticipated along with structure losses in communities. Suppression costs are likely to increase during the first five to ten years and then decrease as significant numbers of community protection projects are completed.

By the end of the planning period, the amount of community defense zone accomplishment should result in reversing the trend towards structure loss in mountain and foothill communities. Fire agencies working with fire safe councils comprised of concerned residents should also contribute to this cumulative effect.

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures (including financial and technical assistance), in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The revised forest plans will govern management of the southern California national forests' resources for the next 10 to 15 years. The FEIS discloses the analysis of effects for a range of alternatives including no action. It considers effects on the significant issues and other resources for this time frame. In the revised plan, the current condition of several major vegetation communities is far from the desired condition spelled out in the forest plans. To achieve this desired condition during the life of the revised plans would require a dramatic increase in vegetation treatments, such as mechanical thinning or prescribed fire. All resources such as fisheries, wildlife and soils depend on healthy and sustainable vegetation communities. Wide-scale disturbance throughout the national forests to move rapidly toward the desired condition would have significant negative effects on those other resources in the short term, as discussed in the direct and indirect effects sections for each topic area. Over the long term, these same resources would benefit from more sustainable and productive ecosystems that are at a reduced risk to loss to catastrophic wildfire or insect and disease outbreaks.

Unavoidable Adverse Effects

Decisions made in a forest plan do not represent actual irreversible or irretrievable commitment of resources (see next section). The application of forest-wide standards and resource protection measures would limit the extent and duration of any adverse environmental impacts. For a detailed discussion of types of effects expected from future activities, see specific topic areas in this chapter.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road. These land management plans (forest plans) are programmatic in nature and as such do not make decisions to authorize specific activities. There are no irreversible and irretrievable commitments of resources resulting from any of the alternatives.

Chapter 4. Consultation and Coordination

List of Preparers

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Wendy Bailey*—Natural Resource Management*

Education: Bachelor of Science in horticulture, 1980, Pennsylvania State University, University Park, Pennsylvania.

Experience: Writer and editor for the Southern California Forest Plans Revision Team. Experience includes: team coordinator for several Forest Service projects, NEPA reviewer, timber sale layout and contract preparation specialist, and database manager. Wendy has 20 years of experience on National Forests in Colorado and California.

Neil Berg*—Hydrology*

Education: Neil holds Bachelor and Master of Arts degrees in physical geography from the University of California, Berkeley and Davis, and a Doctor of Philosophy in physical geography from the University of Colorado, Boulder.

Experience: Neil is a hydrologist and has worked for the USDA Forest Service since 1977, mostly with the Pacific Southwest Research Station, but with a two-year stint as the National Forest System's national water quality liaison to U.S. EPA. Neil is author or co-author of over 50 publications in hydrology, atmospheric deposition and fish-habitat relationships. He recently helped develop and implement a monitoring plan for Sierra Nevada lakes, assessed the effectiveness of Best Management Practices for forest herbicides and worked on surface resource monitoring in Southern California.

Jan L. Beyers*—Plant Ecology*

Education: Bachelor of Arts in environmental studies-biology, 1976, Whitman College, Walla Walla, Washington; Doctor of Philosophy in botany with minor in zoology, 1983, Duke University, Durham, North Carolina.

Experience: Currently serving as research liaison to the Southern California Forest Plans Revision Team and plant ecologist for the Forest Service Pacific Southwest Research Station. Previous experience includes air pollution research on ponderosa pine, teaching various biology and ecology courses and research on physiological ecology of alpine and arctic plants. Jan has more than 14 years of experience conducting research on National Forest System lands in California (and other western states), including studies on post-fire grass seeding and other emergency watershed rehabilitation practices, fire effects in chaparral, habitat requirements of California gnatcatchers, fire effects on other rare species in southern California, and distribution of invasive plants in relation to fuel breaks.

Mark I. Borchert*—Vegetation Management*

Education: Bachelor of Science in biological sciences, 1967, University of California, Davis, California; Master of Arts in biology, 1970, California State University, Sacramento, California; Doctor of Philosophy in ecology, 1977, University of California, Davis, California.

Experience: Ecologist for the Southern California Forest Plans Revision Team; fire and vegetation ecologist and research natural area coordinator for the Los Padres National Forest; and formerly a rare-plant coordinator. Mark has 23 years of experience in natural resource management, entirely on the Los Padres National Forest.

Brad Burmark*—Natural Resource Management*

Education: Master of Science in forest and range management, 1980, Washington State University, Pullman, Washington.

Experience: Pacific Southwest Region consultant for economics and the planning process for the Southern California Forest Plans Revision Team. Experience includes: regional planning, economics and monitoring positions in Forest Service Regions 1 and 5; forest planning analyst for the Willamette and Beaverhead National Forests; and deputy ranger on the St. Joe District, Idaho Panhandle National Forests. Brad has 24 years of experience in forest planning and resource management in Regions 1 (Montana, Idaho), 5 (California) and 6 (Oregon, Washington).

Fran Colwell*—Recreation, Special Designations*

Education: Bachelor of Science in forest and watershed management, 1977, University of Arizona, Tucson, Arizona.

Experience: Special designations and recreation specialist for the Southern California Forest Plan Revisions Team, including forest and district management positions in timber, fire and recreation. Currently the assistant forest recreation officer for the San Bernardino National Forest. Fran has 25 years of experience in natural resource management on six national forests in the western United States.

Stephen J. Eastwood*—Civil Engineering*

Education: Registered Professional Civil Engineer in California, Master of Science in civil engineering University of California, Berkeley, 1975, Bachelor of Science degree in civil and environmental engineering, Cornell University, 1974

Experience: Interdisciplinary team member since formation of Southern California Conservation Strategy in 1999, with emphasis on transportation and facilities. Coordinated road analysis for the four forests. Twenty-nine years with the Forest Service assigned to the Willamette, Tahoe, Plumas, and Cleveland National Forests, and to the Region Five Regional Office as transportation planner, district, zone, and assistant forest engineer. Steve is currently the assistant forest engineer, Cleveland National Forest.

Participated in the development of the forest plans for the Willamette, Tahoe, and Plumas National Forests in the 1980's. Interdisciplinary team member on project level NEPA for internal and external proposals on four forests including timber sales, recreation improvements, facilities developments, dams, power lines, hydroelectric, water storage and transmission, tunnels, municipal waste disposal, fiber optics, communication sites, highway and freeway enhancements, bridges, and rail crossings. Experience includes planning, design, construction, contract administration, operations and maintenance, and decommissioning of roads and trails, and of recreation and administrative facilities and their associated water, wastewater, electrical and gas utilities. Environmental work includes hazardous materials cleanup and site remediation, and abandoned mine reclamation. Supervision of the Cleveland National Forest engineering workforce and program management including the forest vehicle fleet, are the remainder of assignments.

Scott A. Eliason*—Botany, Viability Assessment Team Member*

Education: Scott has worked in the fields of botany and plant ecology since 1989, and with rare and endangered species conservation and management since 1995. Scott has Bachelor of Science and Master of Science degrees in plant ecology and has worked on the San Bernardino National Forest since 1999.

Experience: His background includes development of habitat conservation plans, recovery plans for threatened and endangered species, collaborative species and habitat conservation planning, and complex analyses of impacts to rare and endangered plants at scales ranging form small projects to forest-wide management. He is an expert in the flora of southern California in general, and in the rare and endangered plants of the mountains of southern California in particular. Scott has worked on province-wide teams of biologists and botanists since the inception of the Southern California Conservation Strategy, and through the entire forest plan revision process. He is currently the Mountaintop Ranger district botanist on the San Bernardino National Forest.

Mike Foster*—Botany, Biology Leader for Final Forest Plans and Final Environmental Impact Statement (FEIS).*

Experience: Species Viability Assessment Team member and leader, as well as botanist for the Southern California Forest Plans Revision Team. Mike had over 19 years of experience in Forest Service natural resource management and earned a Bachelor of Science degree in biology and chemistry from California State University, Chico, California in 1985. Mike worked as a range technician and forest botanist on the Eldorado National Forest; district resource officer on the Mount Pinos Ranger District, Los Padres National Forest; and forest botanist and noxious weed coordinator on the Los Padres National Forest. Mike has worked as a team member and a team leader on a variety of interdisciplinary teams on issues spanning recreation motorized and non-motorized uses, livestock grazing, invasive nonnative species eradication, threatened and endangered species habitat protection and restoration, timber and fuels treatment, prescribed burning, and watershed restoration projects. Mike was a member of the Southern California Forest Plans Revision Team since 1999.

Mike passed away in February 2005. His contribution to this project is beyond categorization. His passing had a profound effect on all of us. He was a stellar human being.

Donna E. Harloff*—Natural Resource Management, Non-motorized Trails*

Education: Donna has been working in the field of natural resource management since 1990. She has a Bachelor of Science degree in business administration, University of Colorado, Colorado Springs, Colorado, 1985, and a Master's degree in landscape architecture with an emphasis in resource analysis and planning, Kansas State University, Manhattan, Kansas, 1989. Donna has worked most of her career in recreation and wilderness management, and lands and recreation special use administration. Her background includes experience in site analysis and design of developed recreation sites, scenic resource analysis, lands and recreation special use permit administration, interpretation, and management of developed and dispersed recreation programs.

Experience: Donna coordinated the wild and scenic river eligibility assessment for the Sequoia National Forest and also administered recreation special use permit operations within wilderness and wild and scenic river corridors on the forest as well. From 1999 to 2001 she served as acting and assistant wilderness management officer for the Gila and Aldo Leopold Wilderness areas in southwestern New Mexico and acting/assistant manager of the Gila Cliff Dwelling National Monument. Donna worked as the Cleveland National Forest landscape architect and an interdisciplinary team member on the Southern California Forest Plans Revision Team between March 2002 and 2005.

Richard D. Hawkins*—Fire and Aviation Management*

Education: Bachelor of Science degree in natural resources management, 1975, California Polytechnic State University, San Luis Obispo, California.

Experience: Rich works as a fire management specialist and has thirty-one years of service on five national forests in California. Twenty years of service on local and national incident management teams with past assignments regarding suppression of forest fires to nine western and southern states. He also has additional experience in management of natural fires in wilderness areas.

Rich has provided supervisory leadership to the following district and forest level program areas during his career; fire suppression, prescribed fire, wildlife management, developed and dispersed recreation management, reforestation, timber stand improvement, aviation operations, minerals management, watershed management, pest management, and miscellaneous forest products sales.

He has served as a fire management specialist in the development of the Forest Land Management Plan, Angeles National Forest, 1985. In this planning effort, he authored the portion on Fire Management and Community Protection, Insect and Disease Control, and portions of the Vegetation Condition and Forest Health chapters.

Trinidad H. Juarez*—Landscape Architecture*

Education: Trinidad has been working in the field of landscape architecture in the Forest Service since 1974. He has a degree in landscape architecture from the University of California, Berkeley. Trinidad's background includes experience in recreation site development, recreation planning, and landscape management. He is licensed by the state of California to practice landscape architecture.

Experience: Trinidad started his career at the Shasta-Trinity National Forest as a trainee landscape architect. He later served on the interdisciplinary team of Los Padres National Forest during the first round of forest planning. Trinidad was promoted to district ranger of the Mount Pinos Ranger District, Los Padres National Forest. He currently serves as regional landscape architect stationed in Vallejo, California, overseeing landscape management activities, recreation planning and recreation-facility development throughout the region. Trinidad provided landscape management expertise for the interdisciplinary team.

Joseph A. Johnson*—Soil Science*

Education: Doctor of Philosophy, soil science, 1990, University of California, Riverside, Riverside, California.

Experience: Interdisciplinary team member for the development of a forest plan, soil scientist for the Southern California Forest Plans Revision Team, member of research team Pacific Southwest Forest Research Station and 6 years experience planning with U.S. Army Corps of Engineers. Joe has more than 5 years of experience on forests in the western United States, and is currently the southern California Province soil scientist.

Allen P. King*—Geology and Minerals*

Education: Allen has been working as a geologist since 1970, and in the fields of engineering geology and natural resource management since 1976. He obtained his Bachelor of Science degree in geology in 1970 from San Diego State University, San Diego, California.

Experience: Allen currently serves as the southern California Province geologist. Allen's experience includes Peace Corps Volunteer (geologist), Honduras, 1970-72; engineering geologist for the Willamette National Forest, Oregon, 1976-80, geologist for four northern Sierran National Forests, California, 1980-95; interdisciplinary team member for forest planning, Plumas National Forest, 1980-85, ecosystem management coordinator, Plumas National Forest, 1990-95; province geologist for four southern California National Forests, 1995-2005; member of the Southern California Plans Revision Team, 2002-

2005, and various international assignments in Central and South America mapping geologic hazards and teaching road improvement techniques (in Spanish). In addition, Allen has served as a trained firefighter for the first half of his career, and as a Burned Area Emergency Rehabilitation team member and infra-red photo interpreter since the early 1980's. He has also taken on numerous assignments as a trained meeting facilitator since 1980.

Allen has focused his academic and on-the-job training on application of geologic and geotechnical principles to improve road function, watershed condition and ecosystem health. He has worked extensively with landslide mitigation, road location and drainage improvement, watershed restoration, burned area geo-hazard assessment and mitigation, abandoned mine reclamation, and interdisciplinary team planning at multiple levels.

Deveree A. Kopp*—Botany*

Experience: Viability Assessment Team member (botanist) for the Southern California Forest Plans Revision Team, and district botanist for the Mountaintop Ranger District of the San Bernardino National Forest. Deveree has 18 years of experience in special status plant management and 15 years of experience in development and management of ecological restoration programs on two southern California National Forests.

Kenneth Kunert*—Landscape Architecture, Recreation Team Leader, Southern California Forest Plan Revisions*

Education: Bachelor of Landscape Architecture, 1972, Michigan State University, Lansing, Michigan. Professional affiliation: Member of American Society of Landscape Architects

Experience: Ken has been working in the field of landscape management and natural resource management since 1970. He worked in the private sector and managed a design firm for 8 years prior to moving to southern California where he is now the forest landscape architect and recreation planner for the Los Padres National Forest. His experience includes all aspects of landscape management including scenery management, site design, contract development and implementation, and recreation planning. Ken completed the inventories that led to the establishment of the visual quality objectives in the last round of forest planning for the Los Padres and developed the process for the implementation of the Scenery Management System utilized in this plan. He has also led the planning for corridor management plan for the Jacinto Reyes Scenic Byway and was instrumental with other landscape architects in the introduction of the rural routes and scenic byway network discussed in this plan. He has a long experience on issues of southern California and has completed projects on the Angeles, Cleveland, Los Padres and San Bernardino Forests.

Ken's experience as a recreation manager included directing the recreation program for the Santa Lucia Ranger District and the establishment of the wilderness plan for the San Rafael Wilderness. Ken has been the lead for the capital investment program on the Los Padres National Forest for 10 years and has helped improve the program within the Pacific Southwest Region.

Ken's interest in social issues has led him to a role as an Equal Employment Opportunities counselor and accessibility coordinator for over 15 years. He was instrumental in the development of accessibility standards utilized nationally and developed several grass root organizations advocating social issues.

Ken was the planning team leader for the oil and gas EIS completed in the mid 80's on the Los Padres National Forest and has participated with numerous interdisciplinary teams on issues including communication sites, utility corridors, recreation projects, habitat rehabilitation, wild and scenic river inventories, fuels and roads. He participated in the Inventoried Roadless Area Review and Evaluations on the Los Padres National Forest as well as the Wild and Scenic river reviews.

Steve Loe*—Wildlife Biology, Viability Assessment Team Member*

Education: Steve has worked in natural resource management since 1968. He has a degree in wildlife management, with considerable course work in fisheries and range conservation.

Experience: He is a Wildlife Society Certified wildlife biologist. He spent several summers with the National Park Service at Mesa Verde National Park. He has worked on four National Forests in Region 3 and Region 5. He served as a district range conservationist on the Prescott National Forest and as forest fish and wildlife biologist on the Prescott and Coronado National Forests. Both of these Forests have large range and recreation program where finding management solutions to conflicts was the focus. Steve spent some time on the Six Rivers National Forest as the forest biologist and range staff at a time when the forest had one of the largest timber harvest levels in the country. Conserving wildlife species and getting out the large cut was the focus of the position.

Steve has spent the last 25 years of his career on the San Bernardino National Forest serving as the forest fish and wildlife biologist and director of ecosystem management. The San Bernardino has an extremely varied workload with one of the most biologically diverse and heaviest recreational visitation levels of any National Forest. Finding solutions to recreation/special uses/biological diversity conflicts has been a focus in these positions. Steve has been an interdisciplinary team member on three separate forest planning efforts. Steve has also worked as a consultant in Orange County developing the wildlife portions of various County Wilderness Park Plans. He served as the Regional Watchable Wildlife Coordinator for Region 5 for many years. He has served as president of The Wildlife Society at Chapter (Southern California) and Section (New Mexico/Arizona) levels. Steve is a Burned Area Emergency Rehabilitation team leader and has served in this capacity on many large wildfire restoration projects.

F. Michael McCorison*—Natural Resource Management, Air and Surface Water Specialist*

Education: Mike has worked in the natural resource fields of forest hydrology and air science since 1971. He has a Bachelor of Science in forestry and a Master of Science degree in forest hydrology and water quality from University of Minnesota. For eight years he worked as a research wildland hydrologist at the University of Minnesota and Oregon State University; he worked for 20 years as a forest hydrologist on the Tongass and Angeles National Forests. From 1998 to present, he has worked as the southern California Province air resource specialist for Region 5.

Experience: His background includes experience in: water quality and hydrologic responses to forest harvesting; hydroelectric development and impact assessment; fish passage design and evaluation; developing evaluation criteria and locating marine estuary log transfer and storage sites; stream channel evaluation of habitat and stability; and measuring and assessing the impacts of airborne pollutants on air quality and terrestrial and aquatic ecosystems.

Mike has worked in the Upper Great Lake States of Minnesota and Wisconsin, for University of Minnesota, in the temperate rain forests of the Pacific Northwest, Oregon and Washington, for the University of Oregon and in Alaska for the USDA Forest Service; and for the Forest Service in the Pacific Southwest in Southern California.

Mike and two other forest hydrologists served as Interdisciplinary Planning Team members and completed the water resources portion of the Draft Tongass National Forest Land Management Plan in 1990. He has been assigned to the interdisciplinary planning team for the Southern California Forest Plans Revision, since the fall 1998.

Michael J. McIntyre*—Archaeology, Team Member for Heritage Resources, Tribal and Native American Interests, Special Forest Products*

Education: Michael has been working in the field of natural resource management and public agencies since 1978. He has a Bachelor of Arts and a Master of Arts degree in anthropology from California State

University, Northridge (1974, 1979). Michael is listed on the Register of Professional Archaeologists (RPA).

Experience: He has more than 23 years of experience in heritage resource management on National Forests in the Pacific Southwest Region. He served on the original forest plan interdisciplinary team for the Angeles National Forest as well as member of many project-planning teams.

Michael has served as the tribal relations program manager for the Angeles National Forest since 1995, and has been involved in government-to-government consultation, as well as issues of concern to the Native American community. These issues include the collection of special forest products, access to traditional areas, and the practice of traditional uses on the Forest. He has been a team member on the Southern California Forest Plans Revision Team since 1998.

***Ahmed Mohsen** –Natural Resources Data*

Education: Bachelor of Science in geology and geophysics, 1985, Mackay School of Mines, University of Nevada, Reno, Nevada.

Experience: Chief exploration geologist, Gold Fields Mining Company, Northern Nevada Operations (1984-1986); minerals program manager, Bureau of Land Management, Nevada (1986-1993); environmental officer, Western Australia Department of Minerals and Energy, Kalgoorlie, Western Australia (1992); NEPA, GIS and planning program manager, California Desert District, Ridgecrest, California (1993-2001); minerals program manager, Forest Service, Wayne National Forest, Ohio (2001-2003).

***Gary D. Montgomery**—Range Management*

Education: Bachelor of Science in range management, 1984, Humboldt State University, Eureka, California. During Gary's career with the Forest Service he has received extensive training in wildland fire suppression and management.

Experience: Gary has been working for the Forest Service on the Los Padres National Forest in the fields of rangeland management, resource management, and wildland fire and fuels management since 1974. Gary is the forest rangeland management specialist and has worked in range for 23 years. Throughout his 32 year career with the Forest Service, his experience in wildland fire suppression and management has included engine captain, hand crew superintendent, prescribed fire boss, and has been a planning section chief on the local Type 2 Incident Management Team and a National Incident Management Team for 18 years. In addition, Gary serves as a resource advisor on wildland fires.

Gary has been an interdisciplinary team leader and team member on site-specific environmental analyses. His project level NEPA experience has involved projects in the fields of recreation, rangeland management; prescribe fires, recreation, heritage resources, watershed improvement, and other resource related projects. He has been the rangeland management specialist team member for the Southern California Forest Plans Revision Team since January 2000.

***Ronald L. Pugh**—Planning Team Leader and Program Leader, Southern California Forest Plan Revisions*

Education: Bachelor of Science in Landscape Architecture, 1975, California State Polytechnic University, San Luis Obispo, California. Ron has been working in the field of natural resource management since 1977. Ron worked for the first half of his career in recreation management. His background experience includes the development of contract ready plans and specifications for developed recreation sites, program management for developed and dispersed recreation, wilderness, wild and scenic rivers, capital investment programs for developed recreation sites and trail bridges, air quality, and the inventory and evaluation of roadless areas for wilderness.

Experience: Ron worked as the planning team leader for the revision of the Rio Grande Forest Plan, which was approved in 1996. Other assignments included the forest service liaison to the Environmental Protection Agency, and membership in the National Rule Writing team for the development of the 2000 Planning regulation. Ron's next assignment was as the forest planning and monitoring program coordinator for Region 3 in New Mexico and Arizona. Ron has been the planning team leader for the Southern California Forest Plans Revision since July 2002.

Gloria Silva*—Planner and Public Affairs*

Education: Gloria earned a Bachelor of Science degree in forestry from Humboldt State University in Arcata, California, and a Master's degree in international relations from the University of California, San Diego, San Diego, California.

Experience: Gloria has been working as a professional forester and manager with the Forest Service since 1980. She has worked in forest management in Region 5 in California and Region 6 in Oregon, including leading a number of interdisciplinary teams in timber sale planning. Gloria has managed a broad scope of program areas and projects in her tenure as a district ranger on two units for over ten years and two details as deputy forest supervisor. Other assignments include details to international forestry and working on appeals in the Regional Office in San Francisco. Gloria has been working on the Southern California Forest Plans Revision Planning Team since June 2002.

Mary L. Thomas*—Biology*

Education: Bachelor of Arts in ecology and conservation, 1979, Governors State University, Park Forest South, Illinois; legal assistant certificate, 1999, University of California Riverside, Riverside, California.

Experience: Viability Assessment Team member (wildlife biologist) for the Southern California Forest Plans Revision Team. Experience includes: USDA Animal Plant Health Inspection Service (1983-1989) as a biological technician in microbiology; Federal Grain Inspection Service (1980-1982) as a biological technician and grain inspector. Wildlife biologist for the Forest Service, Tahoe National Forest (1989-1991) and the Cleveland National Forest (1992 to present). Mary has 15 years of experience in biological resource management in the Pacific Southwest Region of the Forest Service.

Richard Tobin*—Land Management*

Education: Bachelor of Science in forest management, 1977, University of Massachusetts, Amherst, MA.

Experience: Lands special uses specialist for the Southern California Forest Plans Revision Team. Experience includes: management positions in forest timber, fire, lands, recreation, business, and human resources; forest lands specialist for the Cleveland National Forest; and recurring assignments with fire teams and training cadres. Rich has 28 years of diverse experience with federal, state and private land and resource management entities.

Donna C. Toth*—Fisheries, Biology Leader for Final Forest Plans and Final Environmental Impact Statement (FEIS).*

Education: Donna holds a Bachelor of Science degree in natural resources management - fisheries and wildlife management emphasis, 1980, from California Polytechnic State University, San Luis Obispo, California. Professional affiliation: member of American Fisheries Society.

Experience: Species Viability Assessment Team leader and fisheries biologist for the southern California Forest Plans Revision Team. Donna has held positions as district, forest and two-forest zone level fisheries biologist; and as district resource officer responsible for fisheries, wildlife, botany, range and watershed restoration programs. Donna has more than 25 years of natural resource management experience on four National Forests, in two regions, in the western United States. She has worked in Idaho and California and is currently the Los Padres National Forest fisheries and watershed program manager. She has participated with many different interdisciplinary teams at the site-specific project level for issues including timber and forest health management, insect and disease control, livestock grazing, oil and gas exploration and development, minerals development, hydroelectric power development, road construction and maintenance, prescribed burning, watershed and high mountain meadow restoration, aquatic species habitat restoration, and recreation uses such as pack station expansions, off-highway vehicle trail development, hiking trail construction, and wild and scenic river planning. Donna has been a member of the Southern California Conservation Strategy and Southern California Forest Plans Revision Team since 2000.

James M. Turner*—Economics, Sociology, and Natural Resource Management*

Education: Jim earned a dual Bachelor of Science degree in physical science and economics from Colorado State University in 1966 and a Master of Science in natural resource economics and quantitative methods from Colorado State University in 1970. He also did post graduate work at Pennsylvania State University in econometrics in 1972 and picked up additional coursework in statistics and natural resource economics at the University of Arizona from 1970 to 1975.

Experience: Jim's graduate work was supported by the U.S. Geological Survey with a work assignment as an operations research analyst in Arlington, Virginia, 1969. His professional work experience in the Forest Service began as a research scientist with the Rocky Mountain Station in Tucson, Arizona from 1970 to 1975. This was followed by work as a program analyst with the National Forest System in the Regional Office, San Francisco, California from 1975 to 1978. He served as program analysis officer and planner on the Shasta-Trinity National Forest from 1978 to 1993. His current assignment as forest planner on the Los Padres National Forest has spanned 1993 to present.

Jim's work assignments in these jobs include published cost analyses of experimental watershed treatments in Arizona, development of a national data base driven program planning and budgeting program; management of program planning, budgeting and finance on a National Forest; core team member of a forest planning team with responsibility for linear programming models to simulate forest outputs; interdisciplinary team member with responsibility for economic analysis of a proposed ski area; forest NEPA, FOIA, and appeals specialist; and core team member for the current plan revision team specializing in economics and sociology and for coordination of the planning process on his home Forest. Jim also has 17 years of experience working on over 30 fires in most of the western states and in Florida. He is also a national military liaison officer setting up tanker bases utilizing Air Force Reserve and Air National Guard aircraft.

John P. Wambaugh*—Off-Highway Vehicles and Law Enforcement*

Education: Bachelor of Science in forestry, 1980, Humboldt State University, Arcata, California.

Experience: Includes backgrounds in the fire, timber, recreation and law enforcement disciplines, including certification as a timber sale administrator in 1985 and certification as a law enforcement officer in 1986. John served as program manager for the San Bernardino National Forest's off-highway vehicle program for 11 years and is currently serving as the off-highway vehicle advisor to law enforcement for the Angeles, Cleveland, Los Padres and San Bernardino National Forests. John has 26 years of experience in natural resource management on three forests in the Pacific Southwest Region.

Thomas C. White*—Assistant Project Leader*

Education: Bachelor of Science in forest management, 1975, Northern Arizona University, Flagstaff, Arizona; Master of Arts in geography, 1979, San Diego State University, San Diego, California.

Experience: Interdisciplinary team leader, Southern California Forest Plans Revision Team. Experience includes: project coordinator for an interagency chaparral management demonstration and application project, Laguna Morena Demonstration Area; Cleveland National Forest vegetation management specialist focused on integrating tools and techniques such as prescribed fire from the Demonstration Area into forest-wide vegetation treatment programs; program manager for zone (three forests) ecology program for a quantitative chaparral plant community classification project culminating in publication of a handbook on the chaparral plant communities of southern California; and land management planner for the Cleveland National Forest. Tom has also served as acting forest resources staff officer. Tom has 26 years of natural resource management experience on the Cleveland National Forest.

Geographic Information Systems (GIS) Mapping

Aaron Johnson—Geographic information systems specialist for the Southern California Forest Plans Revision Team, 2002 to 2004.

Scott Redlin—Geographic information systems specialist for the Southern California Forest Plans Revision Team, 2001 to present. **Education and Experience**: Bachelor of Arts in geography with GIS certification, 1999, San Diego State University, San Diego, California. Also completed many graduate courses in GIS and remote sensing at San Diego State University from 1999 to 2001. Experience: Scott's first experience with land use planning began in the summer of 1998 as a student intern, while working for the San Diego County Department of Planning and Land Use (DPLU) he assisted with project management. That internship was then followed up by another internship at San Diego State University over the 1998-'99 school year. During this period he worked on designing a GIS database designed to locate where student recruiting should be most focused within the state. This database combined school district maps with student SAT and GPA information to locate areas of above average academic achievement.

After completion of his Bachelor of Arts. in geography in 1999, Scott began graduate studies at San Diego State University with an emphasis on GIS and remote sensing for habitat monitoring and change detection. This habitat monitoring work was focused on Mission Trails Regional Park in San Diego, which provided an ideal setting to study the effects of urban encroachment on the natural landscape, as the park is surrounded by urban development.

Scott's graduate studies eventually lead him to his current position as a GIS specialist on the Southern California Forest Plans Revisions Team. He has been with the planning team since September 2001 and has worked on most of the GIS analysis projects and new mapping efforts associated with the plan revisions, including the development and analysis of the 7 different land use zone alternatives.

Elizabeth Staudenmayer - GIS Coordinator. **Education**: Liz Staudenmayer earned a Bachelor of Science degree in mathematics and a minor in biology from San Diego State University in 1989. She continued her education at Colorado State University where she graduated with a Master of Science degree in fishery and wildlife biology in 1992. During her time in Colorado, she gained valuable natural resource experience by volunteering as a field assistant, becoming an assistant HEP (Habitat Evaluation Procedures) coordinator, acting as a teaching assistant and freshman advisor for the Department of Fishery and Wildlife Biology, and also working as a research associate for Colorado State University following graduation. **Experience**: Liz moved back to California and in 1994 became a fishery and wildlife biologist for the U.S. Fish and Wildlife Service in Sacramento, California. She began taking GIS (Geographic Information Systems) courses from different universities and other educational institutions, and for the next 6 years worked on a wide variety of GIS projects involving the listing and recovery of endangered and threatened species throughout California. In 2001, Liz transferred to the USDA Forest Service in San Diego, California and became the GIS coordinator for the Southern California Forest Plans Revision Team.

Writing, Editing, and Support Services

Charlene Caulfield—Editor and administrative support. Experience: program assistant for the Southern California Forest Plans Revision Team, 2001 to present. Charlene has more than 15 years with the Forest Service in administration support.

Sandiann Engh—Program Analyst/Publication Manager/Record Manager/Web Manager. Sandiann provided analytical and technical support to the team 2000-2005. **Education**: She supplemented her liberal arts bachelor's degree with a certification in Client/Server Technology and serves as a leader in applying available technology to facilitate workflow, decision-making, and document production. **Experience**: Her background includes fifteen years in human resource management, and she brought a strong background in group facilitation and collaboration, information management, Web site management, and customer service into the plan revision team when she joined in May, 2000.

Donn Holmes—Information Technology Specialist. Education: Donn joined the planning team as a student-worker to assist with the automation and management of data. He has studied databases and programming languages at San Diego State University Extension, University of California at San Diego Extension and Palomar Community College. **Experience**: Donn has designed and managed simple, stand-alone databases and large, province-wide networked databases, using Microsoft Access and Oracle. He has also designed and implemented user interfaces to the databases, including typical desktop graphical-user-interfaces, but also Personal Digital Assistants. In addition, to simplify posting and retrieving monthly reports, Donn created and managed a static HTML intranet site. Donn has worked on the Southern California Forest Plans Revision Team from 2000 to present.

Julie Krelle - Editor and administrative support. Provided editing services to the Viability Assessment Team for the Southern California Forest Plans Revision Team, 2003 to present. Julie has a Bachelor of Arts in history from University of California, Los Angeles, California and has over four years experience as a resource technician with the Los Padres National Forest.

Laura Lolly—Administrative support and public collaboration assistant. Program assistant for the Southern California Forest Plans Revision Team, 2000 to present. Laura has more than 13 years with the Forest Service in public collaboration.

Rukmini Read Nyce—Editor/Writer for the Southern California Forest Plans Revision Team for final forest plans and final environmental impact statement (FEIS), 2004 to present. Experience: Rukmini has over 12 years of experience working for the Forest Service. She has worked on four national forests (mainly throughout southern California), as well as in Washington D.C. at the Forest Service's National Headquarters. Her experience ranges from working as a wildland firefighter for the southern California national forests, dealing directly with national forest users while running Forest Service visitor centers throughout southern California, working as a Public Affairs Specialist on the Lassen National Forest, and finally working in Washington, D.C. as a Writer/Editor for the Forest Service's National Headquarters. She holds a Public Relations certificate from the University of California Riverside and is currently pursuing a Bachelor of Arts in history from the University of California, San Diego.

Significant Contributors

Vic Andresen - Hydrologist/geologist and natural resources manager, 2001 to present, for the Angeles National Forest.

Jesse Bennett - Wildlife biologist, 2000 to present, for the U.S. Fish and Wildlife Service, Carlsbad Office.

Bernice Bigelow - Forest representative, 2000 to 2001, for the Angeles National Forest.

Creed Clayton - Fire ecologist, 2000 to present, U.S. Fish and Wildlife Service, Ventura Office.

Christina Dueber - Fisheries biologist, 2004, National Marine Fisheries Service, Long Beach Office.

Diane Freeman - Biologist and forest representative, 2000 to 2002, for the San Bernardino National Forest.

Danella George - Monument manager, 2000 to present, Bureau of Land Management, Santa Rosa and San Jacinto Mountains National Monument.

Kathy Good - Public affairs officer, 2000 to present, for the Los Padres National Forest.

Debbie Hyde-Sato - Species viability biologist, 2001 to 2002, for the Southern California Forest Plans Revision Team.

Jim Kenna - Area manager, 2000 to present, Bureau of Land Management, Santa Rosa and San Jacinto Mountains National Monument.

Clem Lagrosa - Forest representative, 2002 to 2003, for the Angeles National Forest.

Matt McGoogan - Fisheries biologist, 2005, National Marine Fisheries Service, Long Beach Office.

Lisa Mizuno - Fisheries biologist, 2001 to present, for Southern California Forest Plans Revision Team.

Stephanie Morgan - Community planning technician, 2002 to present, for the Southern California Forest Plans Revision Team.

Therese O'Rourke - Forest plan revisions team leader, 2000 to 2001, for the Southern California Forest Plans Revision Team. U.S. Fish and Wildlife Service, Carlsbad Office, from 2004 to present.

Kathy Peterson - Public affairs specialist, 2003 to present, for the Angeles National Forest.

Rich Phelps - Wilderness; wild and scenic; and forest representative, 2002 to 2003, for the Los Padres National Forest.

Doug Pumphrey - Acting forest plan revisions team leader, 2001, for the Southern California Forest Plans Revision Team.

Charles Raysbrook - Biologist, 2000 to present, California Department of Fish and Game.

Robert Sniffen - Settlement coordinator, 2002 to present, for the Southern California Forest Plans Revision Team.

Della Snyder - Biologist, 2004 to present, U.S. Fish and Wildlife Service, Ventura Office.

Sharon Soper - Socio-economic analyst, 2002 to 2003 ,for the Southern California Forest Plans Revision Team.

Anthony Spina - Fisheries biologist, 2000 to present, National Marine Fisheries Service, Long Beach Office.

Richard Wales - Biologist-fish, amphibians, and reptiles, 2003 to present, Angeles National Forest.

Ruth Wenstrom - Public affairs officer, 2000 to present, for the San Bernardino National Forest.

Tom (Skippy) Willis - Public affairs liaison officer, 2000 to 2001, for the Southern California Forest Plans Revision Team.

Craig Wingert - Fisheries biologist, 2000 to present, National Marine Fisheries Service, Long Beach Office.

Joan Wynn - Public affairs officer, 2000 to present, for the Cleveland National Forest.

List of Agencies, Organizations, and Persons to Whom Copies of the Statement Are Sent

Please see the following sections in Appendix M:

- List of Recipients
- Government Agency Comment Letters

Chapter 5. Public Comment on the Draft Revised Forest Plan and DEIS

As a federal agency, the Forest Service is required to solicit public comment on draft plans involving significant actions under the National Environmental Policy Act (NEPA). Further, the agency is directed to "assess and consider [the resulting] comments both individually and collectively." In addition, comments are viewed as critical in shaping responsible plans for management of the southern California national forests (Angeles, Cleveland, Los Padres, and San Bernardino National Forests) that best meet the Forest Service's mission, legal mandates, the goals of NEPA and the National Forest Management Act (NFMA), and the interests of the American public as a whole. During the formal comment period, the public commented on the draft environmental impact statement (DEIS) and draft forest plans' alternative proposals, as well as the extent to which they achieve the purpose and need for the proposed action to revise the forest plans for the four southern California national forests.

Comment Analysis Process

Input received as comment on the proposed forest plans and draft environmental impact statement (DEIS) was documented and analyzed by a government contractor, American Consultants LC, using a process developed and overseen by the U.S. Forest Service Content Analysis Team (CAT), a unit of the Washington Office Ecosystem Management Coordination branch. This content analysis process is designed to systematically manage large volumes of information while capturing the full range of public viewpoints and concerns. Content analysis is intended to facilitate good decision making by helping the planning team clarify, revise, or incorporate technical information to prepare the final environmental impact statement (FEIS) and forest plan revisions. All submissions (letters, emails, faxes, web-based, and other types of input) were included in this analysis.

In the content analysis process, names and addresses of submitters who include one or more original topic-specific comments in their submission were entered into a database, and each original submission was assigned a unique number that enabled those comments to be linked to submissions and submitters.

Each letter was read by an analyst who identified and categorized comments by topic. A comment is an individual quote from the letter. Comments were entered verbatim into a database, along with their topic codes. Comments were then computer-sorted by topic and reviewed by analysts who concisely summarized comments that presented similar arguments or positions. We call this statement that summarizes similar comments a *public concern*. Each summary statement (or public concern) states a requested action or decision and supporting reasons drawn from the summarized comments. Lengthy lists of supporting reasons were edited for publication in Appendix M. Public Comments and Forest Service Response.

Often comments on both sides of an issue were received. In some cases we organized the public's pro and con arguments about similar issues into the same public concern and, therefore, the same agency response. For example, some people support wilderness recommendations because designation would restrict some uses, while others oppose wilderness recommendations for the same reason. Many more reasons were given for requesting that wilderness recommendations be made or not, obviously, but the point here is that opposing positions on the same issue may be answered together. In addition, in cases where the planning team found that the needed response was the same for similar public concerns, these concerns were consolidated for response purposes.

This process and the resulting summaries were not intended to replace original comments, but rather to provide a guide to them. The planning team and the public are encouraged to review letters firsthand.

The forest plan revision process under NEPA, while open and inclusive, is not a legislative process. The content analysis process is not a vote. In a vote the only thing that matters is the count, whereas in land and resource planning and management, many factors to be considered are determined by law and national policy. Regardless of the number of comments received or the affiliation of the submitter, content analysis ensured that every concern was identified for consideration by the project team.

Comments or concerns identified from them were classified by the southern California forest plan revision interdisciplinary team as either in scope or out of scope. Generally, the scope of the plan is the range of connected, similar, or cumulative actions; the alternatives and mitigation measures; and the direct, indirect, or cumulative impacts considered in the environmental impact statement. Comments or concerns determined to be in scope were further classified as either substantive or nonsubstantive. Based on the Council on Environmental Quality's regulations, a substantive comment is one that:

- Questions, with a reasonable basis, the accuracy of information as presented;
- Questions, with a reasonable basis, the adequacy of information as presented;
- Presents reasonable alternatives not considered in the DEIS that meet the purpose and need of the proposed action; and
- Points out errors in fact, policy, or presentation.

Nonsubstantive comments or concerns include those that merely state a position in favor of or against an alternative or policy or otherwise express an unsupported preference.

The Forest Service is required to respond only to substantive comments or the concerns identified from them. However, to inform the public and to use this process as an educational tool, the Forest Service chose to respond to all substantive public concerns identified in the analysis process as well as a number of non-substantive or out of scope comments when it was felt that this would be helpful for educational or other reasons, such as to clarify an agency position.

Responses to substantive concerns are typically more extensive, complete, and, most importantly, offer an explanation of why or why not and where the concern may have resulted in changes to the forest plans or analysis. Public concerns that identify editorial or other errors in the presentation of information in the DEIS were used to revise text and make corrections for the FEIS. The editorial concerns identified by the public are not included in the narrative response to comment. Appendix M. Public Comments and Forest Service Response includes the substantive public concerns along with the Forest Service response.

Project Background

The Forest Service proposes to revise the land and resource management plans (forest plans) for the Angeles, Cleveland, Los Padres, and San Bernardino National Forests. Six alternatives were considered in the DEIS, with a preferred alternative identified for each national forest that offered the best mix of management options relative to the issues that were addressed. The strategic direction included in the revised forest plans will be used to guide all natural resource management activities on the four southern California national forests to meet the objectives of federal law, regulation, policy, and the Forest Service mission: "To sustain the health, diversity, and productivity of the Nation's Forests and Grasslands to meet the needs of present and future generations."

The Forest Service identified five significant issues after a review of the comments received in response to the public meetings and Notice of Intent. Significant issues are defined as those directly or indirectly caused by implementing the proposed action. Based on the issues identified in the Notice of Intent, six alternatives were developed to address the issues in the DEIS.

The six alternatives addressed these issues by emphasizing different primary themes, as follows:

Alternative 1: Emphasize a mix of recreation opportunities and commodities while maintaining biological diversity and ecological integrity.

Alternative 2 (Preferred Alternative: Cleveland NF): Provide a gradual increase in recreation opportunities while maintaining biological diversity and ecological integrity.

Alternative 3: Increase emphasis on maintaining and protecting biological diversity and ecological integrity, and maximize special area designations. Recreation and other uses of the national forests are continued but at a lower level, with increased controls.

Alternative 4 (Preferred Alternative: Angeles, Los Padres, San Bernardino NF): Increased emphasis on recreation with intense levels of management controls, and a focused emphasis on offsetting effects on the biological diversity and ecological integrity of the national forests.

Alternative 5: Increased emphasis on land use zones compatible with national forest resource development.

Alternative 6: Emphasize the protection and restoration of biological diversity and ecological function, and emphasize mitigation of existing impacts from all uses on National Forest System land.

Prominent Themes in Public Comments

The following is a summary of public comments received by the Forest Service during the comment period, May 14, 2004, to August 11, 2004. The Forest Service received 4,356 responses—including letters, emails, faxes and web-based—approximately 3,100 of which are original responses. Of these, one is a petition having 1,685 signatures. 1,256 responses are form letters, defined as five or more letters of identical text submitted by different people. One example of each form type was coded and entered into the database to ensure that the concerns were considered. The rest of the forms were sorted by form type, and the total number of each was recorded in the database. The analysis provided in this document is based on the 3,100 original responses and the one example of each form letter. From these responses, 10,927 individual comments were coded and attributed to a public concern. Rather than being comprehensive, the following summary is intended to provide an overview of prominent concerns.

Decisionmaking/Public Involvement/Agency Organization, Funding, and Staffing

Some respondents emphasized the need for more complete and easily accessible information. They requested that the Forest Service hold more open houses to reach the diverse communities in the area. Also included with some of these comments were requests for information published in Spanish. They would prefer more user-friendly open houses. A number of respondents had difficulty submitting responses through the ePlanning web site.

Some respondents urged the Forest Service management philosophy to emphasize biological diversity and ecosystem integrity, while others requested a multiple-use emphasis. A number of comments expressed concern that special interests might have too much influence in the decisionmaking process. Some respondents suggested that partnerships with various organizations might be an effective way to manage national forests.

Many of the respondents questioned the Forest Service's ability to enforce the proposed actions due to self-acknowledged limitations of funding and staffing. They argued that if the Forest Service has difficulty with enforcement now, how could it enforce new rules with the increased management that the preferred alternatives call for?

Respondents also questioned the methodology and adequacy of specific analysis used in decisionmaking. Some respondents commented on the difficulty of responding to such a large and cumbersome document. Respondents emphasized the need for additional analysis regarding a reasonable range of alternatives, cumulative effects analyses, scientific studies, and the inclusion of more expertise and analysis from professionals regarding natural resource management.

Compliance with the National Environmental Policy Act (NEPA), National Forest Management Act (NFMA), Endangered Species Act (ESA), and other laws

Some respondents commented that the DEIS failed to comply with NEPA in that it did not analyze a reasonable range of alternatives. They urged the Forest Service to rewrite and recirculate the DEIS. Other respondents argued that the DEIS was not in compliance with other federal laws, such as NFMA, the ESA, and the Clean Water Act.

Alternatives

Respondents varied in their support or opposition for each of the alternatives, as well as the reasoning behind their point of view. Some respondents supported the preferred alternatives, 2 and 4, stating that they would do the best job of balancing environmental protection with public access and safety. Support for Alternatives 1 and 5 was generally based on the desire for multiple-use and increased off-highway vehicle (OHV) use. On the other hand, support for Alternatives 3 and 6 was generally based on an ecosystem approach, de-emphasizing motorized use.

A number of respondents questioned why Alternative 6 was changed from the original intent of the Conservation Alternative, which they prefer, stating that it would allow continued access for firefighters into wilderness areas while best maintaining biological diversity and ecological integrity. Some respondents recommended implementing Alternative 6 on the basis that it provides the greatest protection for the wildlife and vegetation in the national forests. Others argued that Alternative 6 goes too far and would unnecessarily restrict public access into the national forests.

In addition to support or opposition of each alternative, respondents requested clarification on how the agency intends to implement each alternative.

Land Use Zoning

Respondents expressed the need for clarification on the definition and intention of land use zoning, specifically regarding the designation of Back Country, Back Country Non-Motorized, and Critical Biological zones. A number of these comments pertained to specific areas of the four southern California national forests. Specific comments regarding recreation and land designations can be found in subsequent sections.

Natural Resource Management

Forest Management General

Respondents suggested a range of different priorities for national forest management, including natural resources protection, diversity, public access, American Indian cultural survival, ecological sustainability, fire protection, economic viability of local communities, public education, and sustainable recreation. Some respondents requested that the Forest Service more adequately address environmental and social justice concerns. Some commenters urged the use of adaptive management techniques. Respondents also requested more up-to-date information, statistics, and maps. Some requested that the Forest Service clarify how it will resolve conflicting goals.

A few respondents requested that the Forest Service maximize each Forest Supervisor's ability to manage the national forests on a day-to-day basis. Others suggested that the Forest Service consider partnerships with for-profit businesses as a way to deal with the Forest Service's acknowledged lack of adequate funding.

Water Management

Some respondents requested more information about how water resources will be managed. Others asked the Forest Service to make the protection of water resources its highest priority or requested intense restoration efforts for watershed resources. There were also requests to maintain and improve groundwater quantity and quality, including requests to protect all groundwater resources from groundwater mining. Some respondents requested that in order to preserve water quality, OHVs must be kept out of watershed areas. Some suggested that the Forest Service actively pursue water rights. Some requested that the Forest Service consider the impact that the forest plans will have on dams. Others requested an increase in water supplies for the benefit of wildlife.

Wildlife Management

A number of respondents requested that the Forest Service make the preservation of wildlife its highest priority. Some respondents suggested that this could be accomplished through the designation of new Critical Biological zones. They suggested that certain areas would provide the necessary protection for flora and fauna, imperiled species, and wildlife habitat. Similarly, some respondents requested adequate viability analyses, citing that current Washington Office policies regarding species viability analyses lead to deterioration to habitats rather than protection of species. More broadly, a number of respondents asked for adequate analyses of wildlife populations and habitat conditions. Some respondents requested the creation and preservation of wildlife corridors to address the problem of habitat fragmentation. There were also requests that stream flows be maintained at levels necessary for fish passage.

Some respondents requested more information about endangered and threatened species in each national forest. Others suggested that the Forest Service broaden its wildlife and fisheries management goals beyond at-risk species. Respondents also expressed concerns about specific species, such as the mountain lion, California condor, arroyo toad, coastal California gnatcatcher, Santa Ana sucker, steelhead trout, and the unarmored three-spine stickleback. Some expressed concern that key species (such as Nelson's bighorn sheep) were not included as Management Indicator Species, while others are concerned that too many species were included.

Respondents suggested that the Forest Service coordinate with different agencies and organizations when making wildlife management decisions, such as the National Oceanographic and Atmospheric Administration Fisheries, the U.S. Fish and Wildlife Service, and water management agencies.

Vegetation Management

Respondents requested more information about vegetation management. Some requested adequate plant viability analyses. Respondents suggested that the Forest Service eradicate invasive nonnative species and restore native vegetation. Respondents expressed concern with the adverse effects of pesticides and herbicides. Some requested that snags be maintained for habitat purposes, while others asked that snags be removed when they present a significant hazard. There were also requests to protect specific vegetation types, such as endangered plants, as well as vegetation for specific uses, such as basket weaving. There are also requests that the Forest Service consider identifying more threatened, endangered, and sensitive taxa.

Wilderness Designations

Some respondents urged the Forest Service to recommend all eligible areas for wilderness designation. These respondents tended to be concerned with protecting wildlife, the natural character of the national forest, endangered species, and watersheds from development, OHV use, and new roads. Other reasons cited were to provide recreation opportunities, meet NFMA requirements, and benefit future generations. Conversely, other respondents stated the Forest Service should not recommend new wilderness areas because of a belief that there is already enough protection for wilderness under current federal and state laws. These respondents also argued that further wilderness designation would limit recreation opportunities or hinder the Forest Service’s ability to comply with the Healthy Forest Restoration Act of 2003, unnecessarily restrict firefighter access, and endanger nearby communities.

Many respondents requested that specific places be recommended for wilderness designation, either as new wilderness areas or as expansions of existing wilderness areas. Conversely, other respondents asked that specific places not be recommended for wilderness designation, including places near communities at risk from wildland fire.

Wild and Scenic Rivers Designations

Respondents urged the Forest Service to recommend all eligible rivers to be designated as wild and scenic. Some respondents were concerned about aquatic species, particularly steelhead, and continued protection of watershed resources. Other respondents believed the Forest Service should not designate eligible rivers as wild and scenic, stating that this designation would hinder national forest management, that there is already enough protection under current federal and state laws, or that further designation would limit recreation opportunities and fire management. Other respondents questioned whether the rivers proposed even meet the criteria for wild and scenic designation. Some respondents were concerned that wild and scenic designation would impact hydroelectric operations.

A number of respondents requested that the Forest Service explain the criteria used when recommending rivers for wild and scenic rivers designation. Some respondents suggested the Forest Service cooperate with state and federal agencies regarding wild and scenic river issues.

Other Special Lands Designations

Respondents urged the Forest Service to support more special lands designations, including research natural areas, special interest areas, and roadless areas. Some requested different forms of habitat protection, including habitat sanctuary preserves and Critical Habitat designations. Some respondents suggested that Inventoried Roadless Areas be redesignated to other designations because of issues surrounding the Roadless Area Conservation Rule. Other respondents requested designations of historic trails and other routes, including special protections for the Pacific Crest National Scenic Trail.

Conclusion

Respondents generally requested that public involvement be a major part of decision making. Whether at the local or national level, the sentiment was that the public should be involved through more public meetings and through the availability of more diverse information.

Support for different alternatives varied, although the reasons were often similar. For the most part, respondents were interested in a forest plan that will balance public access with national forest protection. Comments on Alternatives 1, 2, 4, and 5 most often emphasized public access, while comments on Alternatives 3 and 6 emphasized national forest protection. Many of the comments about Alternative 6 indicated that it should be restored to its original intent. Comments regarding “land use zones” discussed in each alternative requested clarification on how these zones will be defined and managed.

Some respondents commented on the volume and perceived inadequacy of the draft EIS. Some comments suggested this is a result of trying to combine all four southern California national forests into one revision process. Respondents also expressed the importance of compliance with federal laws relating to land management.

Overall, comments regarding forest management emphasized the need to protect and maintain watersheds and water quality, flora and fauna, imperiled species, and wildlife habitat. Other concerns included the need to address fire management to protect private property while maintaining a balance in nature. Comments regarding timber management focused on fire-related issues while emphasizing the need to protect old-growth. Comments on livestock grazing focused on protection of riparian areas. Comments on commercial use and development in national forests included concerns in favor of development, specifically regarding existing permits, and opposition stating that development is detrimental to the health of the national forests.

Comments on transportation and recreation management often overlapped, since the intent is often similar. Respondents expressed concern that management of the transportation system will affect public use of national forests. Comments included concerns that "illegal" roads will be made legal and that increase in National Forest System roads could lead to increased motorized use. Respondents discussed various recreation uses such as OHV use, bicycling, rock climbing, recreational target shooting, and hang-gliding, as well as other specific uses. Discussion of these issues included both support and opposition.

Land management comments centered on wilderness designation, wild and scenic river designation, and other special designations relating to national forests. Some respondents suggested that the Forest Service acquire all land possible and recommend all eligible areas for wilderness designation to protect natural resources. Others opposed recommendations, suggesting they would have negative effects on public access to national forests, including access for firefighting. Some respondents expressed concern regarding the impacts of designations on recreation and hydroelectric operations. Comments regarding wild and scenic river designations questioned the criteria used for designations.

Tribal concerns mainly included requests for coordination with tribal groups to ensure protection of cultural and heritage resources. They requested that Forest Service personnel as well as the public be educated on tribal resources.

In summary, respondents voiced concerns relative to the revision process itself and to virtually every aspect of national forest management. While respondents expressed a wide range of views, they agreed in their desire to see the national forests maintained and preserved in a healthy state. What divides them is a difference in perspective on what is needed to preserve that state. These perspectives informed decision makers of respondents' concerns and values on virtually every topic, and reflected as well the serious consideration respondents give to management of these southern California national forests.

The Forest Service's responses to these and other substantive comments on the draft revised forest plans and DEIS are found in Appendix M. Public Comments and Forest Service Response of the FEIS.

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