United States Department of Agriculture

Final Programmatic Environmental Impact Statement for Revision of the Coronado National Forest Land and Resource Management Plan

Cochise, Graham, Pima, Pinal, and Santa Cruz Counties, Arizona, and Hidalgo County, New Mexico

Volume 1: Summary and Chapters 1 through 4

Forest Service Southwestern Region MB-R3-05-16 April 2018

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Front cover photos (clockwise from upper left): Upper Kielberg in the Galiuro Mountains, Sky Island Scenic Byway, Ak Chin Basketmakers, Rustler Park, Parker Canyon Lake, adobe building at Kentucky Camp, poppies in the Santa Rita Mountains, and Mexican spotted owl.

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Abstract: The U.S. Department of Agriculture, Forest Service, Coronado National Forest prepared this programmatic environmental impact statement to disclose the potential effects of a proposed action to revise the "Coronado National Forest Land and Resource Management Plan" (1986, as amended). The Coronado comprises 1,717,934 acres, most of which are located in southeastern Arizona, and 65,823 acres of which are in southwestern New Mexico.

This document reports the results of an effects analysis of management direction in a no-action alternative (the existing 1986 forest plan); the proposed action (the revised forest plan) and two alternatives that specify the same management direction as the proposed action with the following exceptions: alternative 1 proposes 147,018 more acres be designated as wilderness; and alternative 2 proposes 40,255 more acres of lands to be managed for motorized recreation, provides limited direction regarding managing resources during climate change, and recommends no new special areas for designation. The proposed action is the preferred alternative.

Summary

The U.S. Department of Agriculture (USDA), Forest Service, Coronado National Forest (also referred to as "the Coronado"), prepared this environmental impact statement (EIS) to comply with the environmental review and disclosure requirements of the National Environmental Policy Act (NEPA) of 1969 (Public Law (P. L.) 91-190). The environmental impact statement reports the potential impacts of a proposed action to revise the 1986 Coronado National Forest Land and Resource Management Plan, as amended ("1986 forest plan"). The revised forest plan was developed according to provisions of the 1982 Planning Rule, as authorized in transition direction in the 2012 Forest Service planning rule.[1]

The Coronado National Forest covers 1,717,934 acres, most of which are in southeastern Arizona; a small portion of the Coronado (65,823 acres) is located in the Peloncillo Mountains of southwestern New Mexico.

This environmental impact statement discloses the potential effects of a no-action alternative; a revised forest plan (proposed action); alternative 1, which provides the same management direction as the proposed action and recommends additional forest land for wilderness designation; and alternative 2, which provides most of the same management direction as the proposed action, with the exception that it contains limited direction regarding management of disturbances resulting from climate change; recommends no new special areas designations (e.g., wilderness, research natural areas, zoological-botanical areas); and allocates forest lands specifically for motorized recreational use, including related facilities.

Three alternatives were considered but dismissed from further consideration: (1) no grazing, (2) recommendation of 31 areas for wilderness designation, and (3) recommendation of parcels that do not meet the need for change for designation as wilderness.

Comparison of Alternatives and Environmental Effects

Table 9 in chapter 2 provides a comprehensive summary of the differences in general plan direction among the alternatives. Table 10 through table 27 provide a detailed comparison of their potential environmental effects. For a full description of effects, refer to chapter 3.

[1] 36 CFR 219.17(b)(3)

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List of Acronyms

ADEQ	Arizona Department of Environmental Quality
AGFD	Arizona Game and Fish Department
ASLD	Arizona State Trust Lands Department
ASP	Arizona State Parks
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
DEIS	draft environmental impact statement
DOD	Department of Defense
EIS	environmental impact statement
EMA	ecosystem management area
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	final environmental impact statement
FHWA	Federal Highway Administration
FSH	Forest Service Handbook
FSM	Forest Service Manual
HUC	hydrologic unit code
LUZ	Land use zone
MA	management area
MIS	management indicator species
MRLUZ	Motorized recreation land use zone
MSO	Mexican spotted owl
NAAQS	national ambient air quality standards
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMSLO	New Mexico State Land Office
NPS	National Park Service
NWR	national wildlife refuge
OHV	off-highway vehicle
PDEQ	Pima County, Department of Environmental Quality
PM	particulate matter
PNVT	potential natural vegetation type
RNA	research natural area
TMDL	total maximum daily load
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VCC	vegetation condition class
VDDT	Vegetation Dynamics Development Tool
WSA	wilderness study area
ZBA	zoological botanical area

Chapter 1. Purpose of and Need for Action

Introduction

The U.S. Department of Agriculture, Forest Service, Coronado National Forest prepared this environmental impact statement to comply with the environmental review and disclosure requirements of the National Environmental Policy Act of 1969. This final programmatic environmental impact statement discloses the potential effects of a proposed revision of the 1986 forest plan. It is organized as follows:

Chapter 1. Purpose and Need for Action. This section discusses the background of the proposal, explains the purpose of and need for revising the forest plan, and briefly describes the action proposed to satisfy the purpose and need. It summarizes public participation in the National Environmental Policy Act review process and lists preliminary environmental and social issues identified during the scoping period.

Chapter 2. Alternatives, Including the Proposed Action. This section discusses the proposed action (revised forest plan), no action, and a range of reasonable alternatives. It also explains why other alternatives were dismissed from further consideration. It includes a summary table in which the consequences of implementing each alternative are compared.

Chapter 3. Affected Environment and Environmental Consequences. This section reports the results of a multiple resource analysis of the environmental consequences of implementing the proposed action and alternatives. It describes the affected environment, by resource areas, as a baseline against which the impacts of alternatives are measured. The description of the environment is followed by disclosure of the potential direct, indirect, and cumulative effects of implementing the proposed action and each of the alternatives.

Chapter 4. Consultation and Coordination. This section lists the credentials of those who prepared this environmental impact statement and identifies the agencies, government officials, and selected other parties who were consulted regarding the proposed action.

Glossary. This section provides a glossary of terminology.

References. This section reports full citations for the sources cited in the text.

Appendices. Consisting of multiple parts, these sections provide detailed information that supports the analyses presented in the environmental impact statement, such as an index, public comments and responses, maps, and other information as necessary.

This final environmental impact statement and supporting documents, which comprise the administrative record of the National Environmental Policy Act review (also referred to as the project record), are on file at the Coronado National Forest Supervisor's Office, 300 West Congress Street, Tucson, Arizona. Electronic copies of the environmental impact statement and other planning documents are posted online at The Coronado National Forest web page (http://www.fs.usda.gov/detail/coronado/landmanagement/planning/?cid=fswdev7_018702). The Coronado National Forest point-of-contact regarding the review is Rose Robinson, Forest Planner, at (520) 388-8491.

Summary of Changes from the Proposed Plan and Draft Environmental Impact Statement

Changes made in the final plan and this environmental impact statement were driven by specific comments from the public, employees, other government agencies, and tribes on the proposed plan and draft environmental impact statement.

Changes made to the forest plan include the following:

- Added a watershed section to better describe the connections between the forest plan goals and the land management intent.
- Updated timber suitability analysis using new sample data that will improve the accuracy of the analysis and modeling for management outcomes.
- Updated range suitability analysis to provide information that will explain the difference between range capability versus suitability and how to meet range capability goals that are conducive to the management direction within the forest plan.
- Updated recreation section to reflect current recreation management.
- Updated the "Range Management" section and "Santa Catalina Ecosystem Management Area" section by adding an additional standard regarding the use of domestic sheep and/or goats for grazing or packing will not be permitted due to the risk of disease transmission to bighorn sheep.
- Modified the "Tribal Relations" section by adding an additional management approach to include the development of a Memorandum of Understanding with neighboring tribes based on public input.
- Updated tables and figures based on updates to information between the draft and final documents.
- Made other relatively minor changes, including factual corrections.
- Clarified language throughout the plan.
- Modified scenery guideline to account for safety hazards.
- Updated chapter 4, which includes maps associated with each ecosystem management area.
- Updated draft environmental impact statement appendix F (now appendix K) to include Forest Service manual and handbook direction and additional publications providing guidance.
- Modified vegetation guidelines to support old growth characteristics and snag retention.
- Modified montane meadows, wetlands, and riparian area guidelines to better clarify the intent and provide a higher level of resource protection.
- Updated glossary.
- Removed wilderness guidelines associated with research; approval for research falls under a special use permit which is issued on a case by case basis therefore is not within the scope of the forest plan; duplication of existing wilderness direction and guidance.
- Removed cultural resource objective to complete Native American Graves Protection and Repatriation Act of items collected prior to 1990; this objective has been accomplished.
- Removed management approach in tribal relations section to document traditional and cultural importance of the Santa Rita Mountains; this management approach has been accomplished
- Updated references cited.
- Modified recommended wilderness areas to include Chiricahua Addition North and Whetstone in addition to the recommended wilderness areas identified in the proposed plan, Ku Chish and the Mount Graham Wilderness Study Area; based on public input and evaluation process as outlined in Forest Service Handbook 1909.12, chapter 70. Modified Chiricahua Addition North and

Whetstone recommended wilderness areas to remove roaded areas from inclusion and maintain a reasonable distance from the proposed Arizona Sun Trail.

- Modified a portion of the Santa Catalina Ecosystem Management Area in the Redington Pass area from roaded backcountry to motorized recreation; based on public input to provide management direction consistent with existing area activities.

Changes made to thefinal environmental impact statement include the following:

- Updated and expanded appendix B, which includes coordination with other planning efforts.
- Added appendix A, which includes responses to public comments on the proposed plan and the draft environmental impact statement.
- Added appendix H: "Crosswalk Between Key Direction from the 1986 forest plan and the revised forest plan to help the reader identify the changes between the two documents and to provide transparency on the framework of an analysis.
- Updated tables and figures based on updates to information between the draft and final documents.
- Made other relatively minor changes, including factual corrections.
- Clarified language throughout the final environmental impact statement based on three qualifiers: new analysis, updated information, or response to comments.
- Updated the map appendix (now appendix L), which includes maps associated with each alternative.
- Added appendix I, which includes comment letters received from Federal and State agencies, local governments and Native American tribes.
- Considered four additional alternatives in response to public comment. These alternatives were not analyzed in detail because they didn't meet the goals or objectives of the purpose and need (see chapter 2).
- Updated the proposed action to include two additional recommended wilderness areas: Chiricahua Addition North and Whetstone.
- Updated the proposed action to reflect changes to the Santa Catalina Ecosystem Management Area in the Redington Pass area from roaded backcountry to motorized recreation based on new motorized travel land use zone maps.
- Modified Chiricahua Addition North and Whetstone recommended wilderness areas to remove roaded areas from inclusion and maintain a reasonable distance from the proposed Arizona Sun Trail.
- Added recommended wilderness maps for each alternative.
- Updated effects analysis for mixed conifer forest vegetation communities to better reflect current treatment information.
- Updated and modified portions of the final environmental impact statement (and the revised forest plan) regarding wildlife species affected by the proposed action:
    - Updated species information to be consistent with analyses and effects determinations in the biological assessment.
    - Eight species were removed from the fine-filtered federally listed species affected environment and environmental consequences sections of the final environmental impact statement. Two species, southwestern willow flycatcher (*Empidonax traillii extimus*) and masked bobwhite (*Colinus virginianus ridgewayi*), were removed from the final environmental impact statement as they are not included in the biological assessment because neither the species nor their habitat are known to occur on the Coronado. The Stephan's riffle beetle (*Heterelmis stephani*) was a candidate for listing under the

Endangered Species Act but was recently withdrawn as a candidate for listing because it is believed to be extinct. The following five species were removed due to status change from candidate species for listing under the Endangered Species Act to not warranted for listing:

- Mountain plover (*Charadrius montanus*)
- Arizona tree frog (Huachuca/Canelo DPS) (*Hyla wrightorum*)
- Sonora Desert tortoise (*Gopherus morafkai*)
- Huachuca springsnail (*Pyrgulopsis thompsoni*)
- Lemmon fleabane (*Erigeron lemmonii*)

- Stephan's riffle beetle, Arizona tree frog, and Huachuca springsnail have been moved to the regionally sensitive species section.
- Five species were added to the fine-filtered federally listed species affected environment and environmental consequences sections of the final environmental impact statement. Four species, Mexican gray wolf (*Canis lupus baileyi*), Yaqui catfish (*Ictalurus pricei*), spikedace (*Meda fulgida*), and loach minnow (*Tiaroga cobitis*), have been added as they are listed in the biological assessment but were previously overlooked for inclusion in the final environmental impact statement. Finally, roundtail chub (*Gila robusta*) has been added because its status changed from candidate to proposed as threatened and it is included in the biological assessment.
- Two snails, the pungent talussnail and the heart vertigo snail, were included in table 74 but were inadvertently overlooked for inclusion in table 106. Those additions to the table have been made.

Location of the Coronado National Forest

The Coronado National Forest (also referred to as "the Coronado") consists of 1,717,938 acres of National Forest System land, most of which is located in southeastern Arizona. A small portion of the total (65,823 acres) is located in the Peloncillo Mountains of southwestern New Mexico (figure 1). Elevations on the Coronado range from 3,000 to 10,720 feet above mean sea level across 12 widely scattered mountain ranges, referred to as "sky islands" because they rise dramatically from the desert floor and contain unique and geographically isolated ecosystems. Figure 2 shows the locations of the five ranger districts that make up the Coronado National Forest and the ecosystem management areas within them.

Background

Overview of National Forest Management

Regulatory Framework

Legal mandates governing the management of national forests in the United States originated with the Organic Act of 1897, which directed they be managed for the dual purposes of protecting and conserving water flows and providing a continuous supply of timber for the American public. Decades later, the Multiple Use-Sustained Yield Act (1960) was enacted. It authorized and directed the Secretary of Agriculture to develop and administer the renewable resources of timber, range, water, recreation, and wildlife on national forests for multiple uses and sustained yield of forest products and services. This was the first law that addressed these five major uses of national forests on an equal basis.

In 1976, Forest Service units were directed by the National Forest Management Act[2] (NFMA) to develop land and resource management plans (also called forest plans) and use the direction in them to manage the natural resources and human uses of each national forest. A key requirement of the act is that forest plans be revised when environmental conditions, social conditions, or both have significantly changed. The act recommends revision occur at least every 15 years (the National Forest Management Act, section 6 (f)(5)). Today, many forest plans are over 20 years old and have not been revised within the recommended period for various reasons. This includes the Coronado National Forest Land and Resource Management Plan, which was completed in 1986 and has been amended 12 times.

Since 2005, an interdisciplinary group of Forest Service resource specialists has been developing a proposed revision of the 1986 plan. In 2012, the Forest Service issued a new planning rule that incorporates transition language at 36 CFR 219.17(b)(3), which allows national forests to use provisions of the 1982 Planning Rule to amend or revise plans. The revised forest plan addressed in this environmental impact statement was prepared using the 1982 provisions.

In addition to the National Forest Management Act, there are many other laws and regulations that apply to management of the national forests including, but not limited to, the Clean Air Act, Clean Water Act, Endangered Species Act, and National Historic Preservation Act. These laws are generally not repeated or referenced in a forest plan unless there is an issue that merits citing direction in the law. Additional direction and policy for management of national forests are provided in executive orders, the Code of Federal Regulations (CFR), and the Forest Service directives system, the latter of which consists of Forest Service manuals and Forest Service handbooks. Such direction is also not repeated in a forest plan.

[2] http://www.fs.fed.us/emc/nfma/includes/NFMA1976.pdf

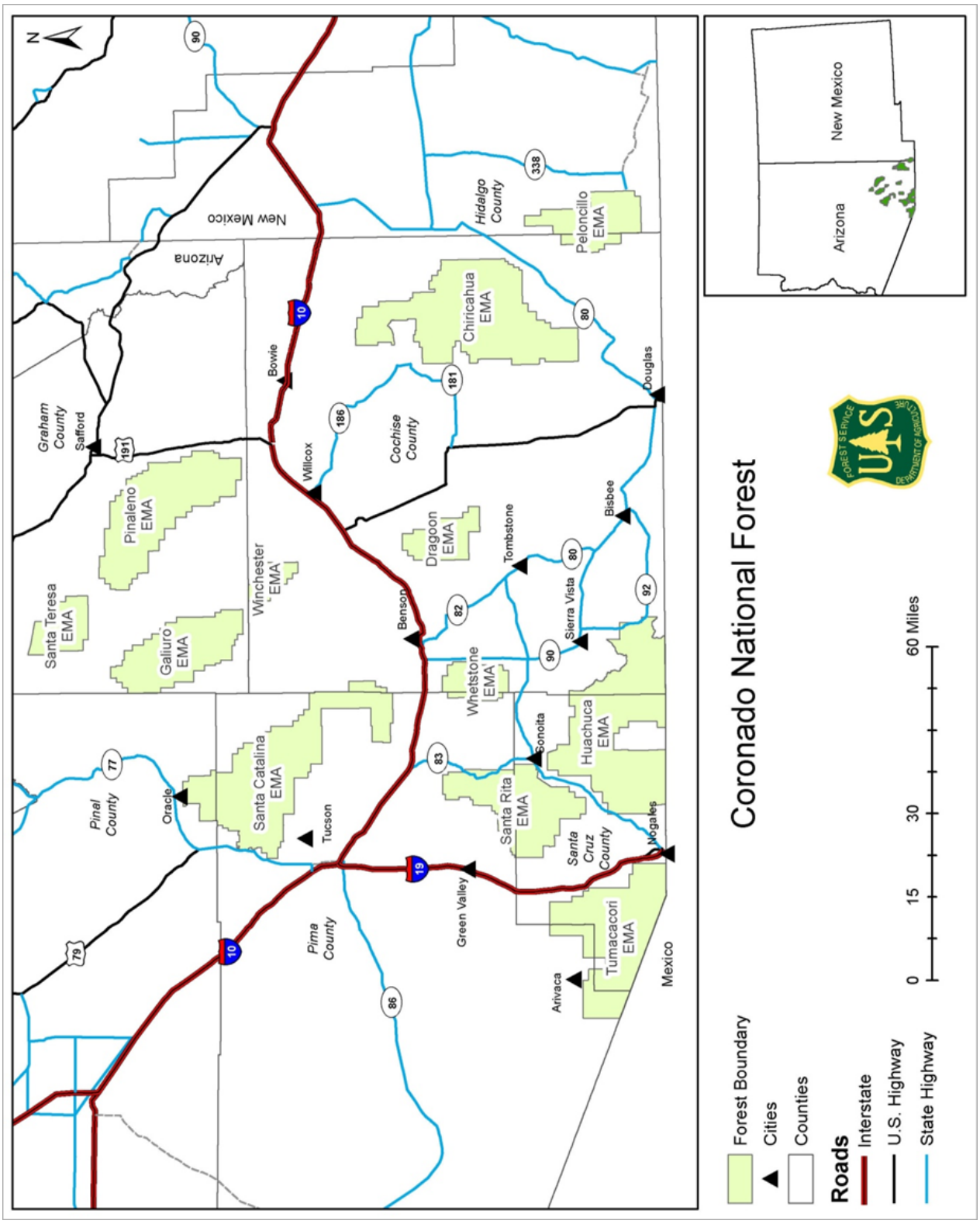

Figure 1. Location of the Coronado National Forest

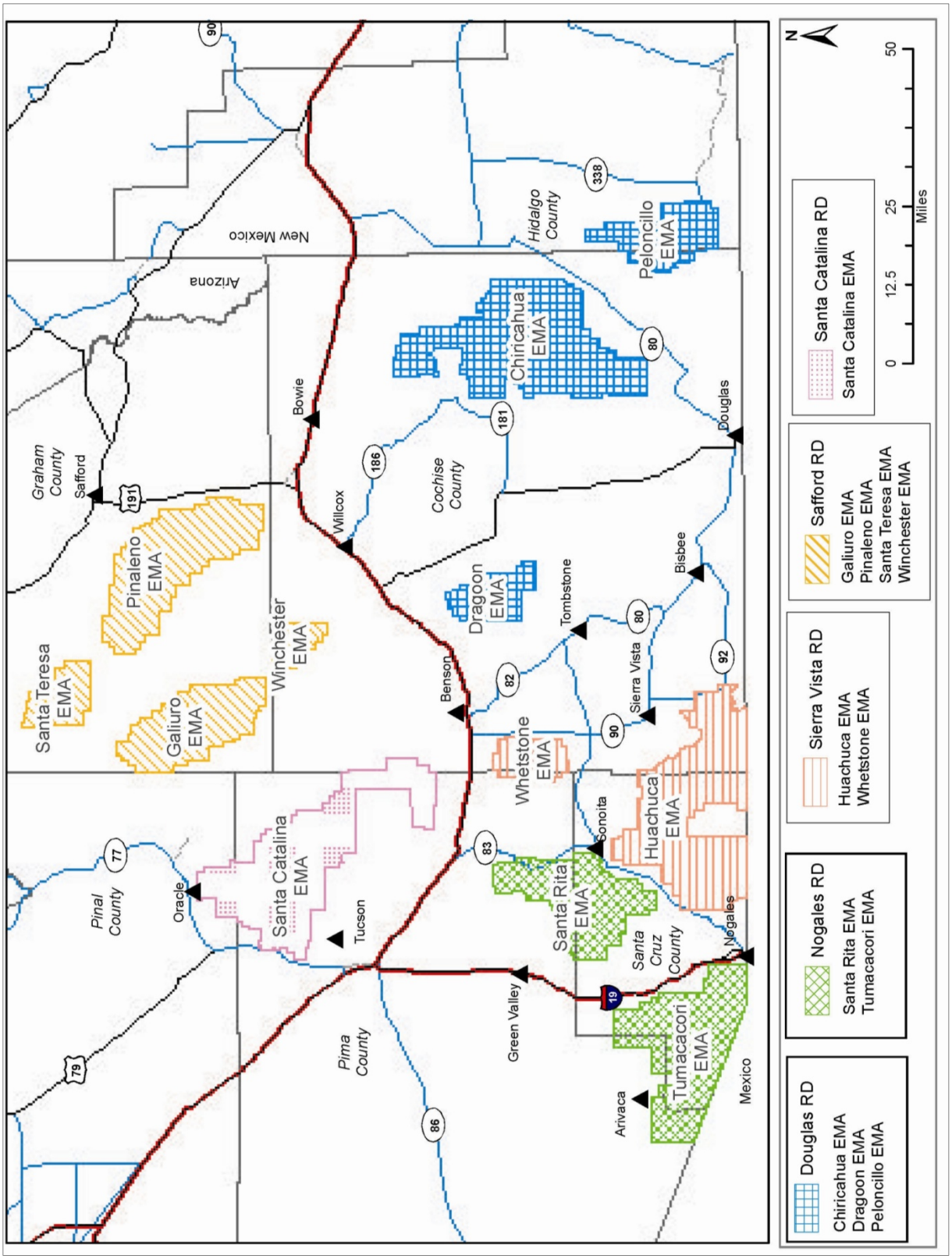

Figure 2. Location of five ranger districts on the Coronado National Forest and the ecosystem management areas (EMAs) contained within them

Forest Plan Content

The revised forest plan includes plan decisions and other content. Once the forest plan is approved, any substantive changes to plan decisions will require an amendment. A change to other content may be made using an administrative correction process. In an administrative correction, nonsubstantive errors, (for example, misspelled words or typographical mistakes) are corrected or information (such as data and maps) is updated. The public is notified of all plan amendments and administrative corrections before they become effective. Plan decisions are displayed in the revised forest plan with a grey border to provide clear differentiation from other plan content.

Plan Decisions

Plan decisions include goals (hereafter referred to as desired conditions), objectives, standards, guidelines, special areas, management areas, suitability, and monitoring and evaluation.

Desired conditions set forth the desired social, economic, and ecological attributes of the Coronado National Forest. They attempt to paint a picture of what we (the public and Forest Service) want the forests to look like, the goods and services we want them to provide, or both. Desired conditions are normally expressed in broad, general terms and are timeless in that there is no specific date by which they are to be completed. Desired conditions may only be achievable over a long timeframe (in some cases several hundred years). In some cases, a desired condition matches the current condition and the goal is to maintain it. Desired conditions are aspirations and not commitments or final decisions to approve projects.

To be consistent with the desired conditions of the plan, a project or activity, when assessed at the appropriate spatial scale described in the plan (e.g., landscape scale), must be designed to meet one or more of the following conditions:

- Maintain or make progress toward one or more of the desired conditions of a plan without adversely affecting progress toward, or maintenance of, other desired conditions
- Be neutral with regard to progress toward plan desired conditions
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward or maintenance of one or more desired conditions in the short term
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward other desired conditions in a negligible way over the long term

The project documentation should explain how the project is consistent with desired conditions and describe any short-term or negligible long-term adverse effects the project may have on the maintenance or attainment of any desired condition.

Objectives are concise, time-specific statements of measurable planned results that make progress toward or maintain desired conditions. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving desired conditions. The objectives represent just some of the expected outcomes or actions required for the Forest Service to make progress toward desired conditions. Not every action or objective the Coronado National Forest may initiate is identified in the plan, just the primary ones.

Variation in achieving objectives may occur during the next 15 years because of changes in environmental conditions, available budgets, and other factors. Objectives are strongly influenced by recent trends, past experiences, anticipated staffing levels, and short-term budgets.

A project or activity is consistent with the objectives of the plan if it contributes to or does not prevent the attainment of any of those that apply to it. The project documentation should identify any

applicable objective(s) to which the project contributes and document that the project does not prevent the attainment of any objectives. If there are no applicable objectives, the project must be consistent with the objectives decisions of the plan, and the project document should state that fact.

Standards are constraints upon project and activity decision making. A standard is an absolute requirement to be met in the design of projects and activities. A project or activity is consistent with a standard when its design is in accord with the explicit provisions of the standard; variance from a standard is not allowed except by plan amendment.

Guidelines are components with which a project or activity must be consistent, in either of two ways:

1. The project or activity is designed exactly in accord with the guideline; or
2. The project or activity design varies from the exact words of the guideline, but is as effective in meeting the purpose of the guideline to contribute to the maintenance or attainment of the relevant desired conditions and objectives.

Guidelines must be followed, but they may be modified somewhat for a specific project if the intent of the guideline is followed and the deviation is addressed in a decision document with supporting rationale. When deviation from a guideline does not meet the original intent; however, a plan amendment is required.

Special areas are lands that have designations by Congress or another delegated authority. Special areas are designated because of their unique or special characteristics. The revised forest plan provides direction for the following special areas: scenic byways, national recreation trails, eligible and suitable wild and scenic rivers, botanical areas, zoological areas, recommended and designated research natural areas, and recommended and designated wilderness.

Where the plan provides decisions specific to a special area, a project or activity must be consistent with area-specific decisions. The project documentation should describe how the project or activity is consistent with the area-specific decisions of the plan.

Management areas are spatially defined areas for which a unique set of plan components are defined. The Coronado revised forest plan proposes three types of management areas: special areas, land use zones, and ecosystem management areas (otherwise known as “geographic areas”). Special areas are established at a national level either through legislation (congressional designation) or at a regional or local level through administrative action (administrative designation). The forest plan may recommend the establishment of new special areas. Land use zones are defined by the types of uses and desired settings that would occur in them under the revised forest plan. They occur across districts, mountain ranges, and ecosystems but have commonalities that make their overarching land uses similar. Ecosystem management areas are defined geographically to include one or more mountain ranges. These mountain ranges are used to distinguish the ecosystem management area’s unique social and ecological issues with appropriate plan components.

Suitability describes the appropriateness of applying certain resource management practices (uses) to a particular area of land. A unit of land may be suitable for a variety of individual or combined uses.

A project with the purpose of timber production may only occur in an area identified as suitable for timber production (16 U.S.C. 1604(k)). The documentation for the project should confirm the project area meets the suitability requirements.

Except for projects with a purpose of timber production, a project or activity can be consistent with plan suitability determinations in two ways:

1. The project or activity is a use identified in the plan as suitable for the location where the project or activity is to occur; or
2. The project or activity is not a use identified in the plan as suitable for the location (the plan is silent on the use or the plan identifies the use as not suitable), but the responsible official determines the use is appropriate for the location's desired conditions and objectives.

The project documentation should describe that the project or activity is either (1) a use for which the area is specifically identified in the plan as suitable or (2) not a use for which the area is specifically identified in the plan as suitable, but is nonetheless appropriate for that location.

Monitoring and evaluation consists of key elements that will be monitored as implementation of the forest plan progresses (i.e., future site-specific actions). Monitoring is part of an adaptive management process that measures the performance of plan implementation against the goals and desired conditions and objectives to which it aspires. It also evaluates whether the implementation of standards and guidelines are producing the desired results.

Other Plan Content

Other content in the plan includes the contents of chapter 1, certain sections of chapters 2 through 6 (background, other sources of direction, related plan content) and all appendices. Also included are general descriptions and management approaches, which are described below.

General Descriptions: Explanatory narrative, descriptions of place, and other important information that supports the understanding of, or gives context to, plan decisions are described throughout the forest plan under this heading. General descriptions help managers and the public apply the direction within each of the plan components.

Management Approaches: Most sections of the forest plan include this additional content, which briefly describes the principal approaches to management that the responsible official is inclined to take. Management approaches do not make commitments of resources. They may illustrate suggestions as to how desired conditions and/or objectives could be met, convey a sense of priority among objectives, or indicate a possible future course of change to a program; partnership opportunities and collaborative arrangements may be discussed, as well as potential processes such as further analysis or inventory. The wording structure of management approaches is characterized with a verb ending in "ing" (e.g., managing, cooperating, conducting, or collaborating).

Environmental Analysis for Plan Revision

The 1982 Planning Rule requires that an environmental impact statement be prepared as National Environmental Policy Act compliance documentation for the proposed action of revising a forest plan. An environmental impact statement that discloses the effects of a proposed policy, plan, or program, any of which is intended to provide direction for the design of future site-specific actions, is referred to as "programmatic."

This programmatic environmental impact statement discloses the potential environmental effects of the policy and direction established by the revised forest plan prior to a decision to proceed with its approval. It does not report the impacts of site-specific actions. Each future proposed action will be designed to follow direction in the revised forest plan, and each must be consistent with specific standards and guidelines expressed in the revised plan and its amendments, if any. More importantly, future site-specific actions will undergo a site-specific National Environmental Policy Act compliance review as they are proposed. This environmental impact statement will provide information that may be incorporated by reference in future site-specific National Environmental Policy Act documents, but the environmental impact statement is not a decision document for future site-specific actions.

The analyses in this environmental impact statement consider the effects of implementing the revised forest plan or one of the alternatives. Comments submitted during public involvement that are beyond the scope of the plan revision process are not addressed in the revised forest plan; therefore, they are not evaluated in this environmental impact statement. Examples include concerns regarding hunting regulations, which while important, are beyond the authority or control of the Forest Service; and wild and scenic river suitability determinations, which are the result of a specific screening process apart from this National Environmental Policy Act review.

Purpose of and Need for Action

The proposed action evaluated in this environmental impact statement is a revision of the 1986 forest plan. Revision of the 1986 plan is needed to update or replace 1986 plan direction in light of changing resource conditions, visitor uses, and administrative needs during the past 30 years. Revision of the plan is also necessary to comply with the National Forest Management Act and the 1982 Planning Rule, the latter of which recommends that forest plans be updated about every 10 to 20 years. Updating will ensure that plan direction for forest management evolves as resource conditions and public uses change, so we can best achieve the Forest Service motto of "caring for the land and serving people."

The need for plan revision is directly correlated to five overarching "needs for change" we identified during iterative pre-revision collaborative dialogues, meetings, focus groups, studies, and assessments. These efforts involved our forest plan revision team of interdisciplinary resource specialists and many public groups, organizations, agencies, officials, and individuals.[3]

Two preliminary plan revision documents presented an analysis of the collaborative reports[3]: the "Coronado National Forest Social and Economic Sustainability Report" (USDA FS 2008c) and "Coronado National Forest Ecological Sustainability Report" (USDA FS 2009b). The analyses in the two documents were the basis of the final needs for change reported in "Coronado National Forest Comprehensive Evaluation Report" (comprehensive evaluation report) (USDA FS 2009c)[4] and supplement (USDA FS 2010a). Of these, five priority needs for change in plan direction were identified in the comprehensive evaluation report. These included ecosystem restoration, safety and information, public access and travel patterns, preservation of open space, and collaboration and partnerships. The priority needs were then used as the basis for five topic areas to which the proposed action (revised forest plan) responds. A brief discussion of why they are needed follows:

1. **Ecosystem restoration and resiliency:** various aspects of a resilient ecosystem require both new and updated individual and integrated direction regarding habitat conservation and restoration, species conservation, management of vegetative fuels, management of wildfire and ecological responses to it, management of invasive species, and dealing with the effects of climate change.

[3] Initial collaborative assessments defining the needs for change include the "Southwest Forest Assessment," The Nature Conservancy and Forest Service (2005); "Socio-Economic Assessment of the Coronado National Forest," University of Arizona (2005); and "Coronado National Forest Monitoring and Evaluation Trends Analysis, 1986-2011" (2012). Needs for change were refined in future forums documented in "Values, Attitudes and Beliefs Toward National Forest System Lands: The Coronado National Forest," John C. Russell and Peggy A. Adams-Russell (2005); and "Topics, Threads and Themes: A Catalog of Results from June 2006," "Collaboration Meetings; Engagement Report from September 2006," "and Collaboration Meetings; and Engagement Analysis Report: Desired Conditions: Fall 2007," by John C. Russell. Conclusions and information from all the preceding reports are incorporated herein by reference.

[4] The comprehensive evaluation report and a supplemental comprehensive evaluation report also provide an "analysis of the management situation" as required by the 1982 Planning Rule.

2. **Visitor experiences:** updated direction is needed to balance competing uses (e.g., supporting both quiet recreation areas and areas that accommodate noisy or other incompatible uses and activities), and new direction is needed to address public safety issues related to illegal activities across the Coronado.
3. **Access to National Forest System lands:** updated direction is needed to guide cooperation and collaboration with private and other agency land managers to acquire or restore public and administrative vehicular access to areas of the Coronado where it is currently unavailable or compromised and to maintain access for future users.
4. **Preservation of open space:** new direction is needed to support the retention of the "rural" character of southeastern Arizona and southwestern New Mexico, while at the same time accommodating rapidly growing populations and municipalities. Important to achieving this objective is direction that encourages the sustainability of undeveloped landscapes within the national forest boundary and emphasizes coordination with private land owners and other governments to protect open space within and adjacent to the Coronado National Forest.
5. **Communities, collaboration, and partnerships:** new direction is needed with regard to the use of collaboration and partnerships as tools for attaining both forest and community goals, existing and future social and working relationships among the Coronado and leaders in the communities it serves, including Native American nations. Positive relationships will require a mutual understanding of direction in the revised forest plan and its compatibility with the regulations, plans, and interests of other entities.

Proposed Action

The proposed action (the revised forest plan) has been developed to provide strategic, program-level guidance for management of the Coronado National Forest, including its natural resources and uses, over the next 15 years. For each need for change topic, the forest plan revision team, in collaboration with the public and other agencies, developed a vision of a revised Coronado forest plan that:

- provides the basis for future site-specific, project-level decisions that will be made based on additional detailed environmental impacts analyses and additional public involvement;
- provides a context for future, project-level planning;
- identifies strategies to maintain or achieve goals and desired conditions over time;
- identifies land areas as generally suitable or unsuitable for various uses;
- identifies standards and guidelines to guide the planning of projects and activities;
- identifies areas with special or unique characteristics;
- provides monitoring and evaluation requirements; and
- emphasizes the use of the best available science and adaptive management.

Specific details of the revised forest plan, as it evolved from the public collaborative process and internal evaluations that have occurred since the comprehensive evaluation report was published, are provided in chapter 2. A copy of the most recent revised forest plan and a wilderness evaluation report are provided as companion documents to this environmental impact statement.

Decision Framework

The regional forester for the Southwestern Region (also referred to as Region 3) of the Forest Service is the responsible agency official who will decide whether to approve the proposed action or an alternative to the proposed action. As required by Council on Environmental Quality regulations at section 1505.2, the regional forester will disclose the following information in a record of decision that will be released to the public:

1. the decision (alternative selected) and supporting rationale;
2. alternatives considered and evaluated in the environmental impact statement;
3. public involvement in the National Environmental Policy Act review;
4. mitigation and monitoring factored into the decision and rationale;
5. the environmentally preferred alternative;
6. findings required by other laws;
7. administrative review and appeal opportunities; and
8. the date on which the action may be implemented.

Public Involvement and Collaboration

Development of Revised Forest Plan

Public Meetings Regarding Plan Revision

Since 2005, the Coronado National Forest staff has offered many opportunities for public involvement in the development of a revised forest plan. The following is a chronology of public meetings held to date as part of the forest plan revision effort.

Spring 2005: Focus groups were conducted at locations in proximity to the five ranger districts of the Coronado as part of a Forest Service, Region 3, initiative to identify and/or quantify attitudes toward and values and beliefs related to national forest lands. A Forest Service consultant, John Russell, Ph.D., summarized the results of these group interactions in "Values, Attitudes, and Beliefs toward National Forest System Lands: Coronado National Forest."

April 2006: Regional Forester Harv Forsgren hosted public presentations and question-and-answer sessions in Tucson, Phoenix, and Flagstaff, Arizona, to initiate the plan revision process for all national forests in Arizona.

June 2006: A series of six public workshops was held across the Coronado to establishing social and working relationships with the public and to elucidate the "needs for change" based on the content of the 1986 forest plan. Workshop goals were to provide equitable geographic area representation, afford all participants an equal opportunity to express views, and facilitate productive dialogue among participants. Each workshop began with an orientation that was followed by small (8 to 10 person) group discussions. After each small group met, the content of each group's discussion was shared with all attendees. The small group discussions were hosted by Forest Service employees having formal training in facilitation. Four hundred individuals participated in the workshops in 39 small work groups. Forty topics related to the "Need for Change" were identified as a result of these workshops.

September 2006: To prioritize the 40 need for change topics, 6 workshops were held across the Coronado's service area. A format similar to that of June 2006 was used. Attendance was approximately 250, and there were 30 small work groups.

September and October 2007: Seven workshops, again geographically distributed, were held to begin the development of desired condition statements, based on the prioritized needs for change. Using the same format as previous workshops, the Coronado hosted 152 attendees and 20 small work groups.

November 2008: Seven open houses were held in geographic locations across the Coronado's service area to present the first draft revised forest plan products to the public, including some based on public input to date, as well as others derived from revision team input. There was a total of 240 attendees, some of whom indicated an affiliation with a group, and 56 different groups or organizations were represented. Each open house was structured to provide flexibility to attendees, in that they did not need to commit a specific or large block of time to participate.

March 2010: Six open houses were held in the same localities and format as the November 2008 meetings. At these meetings, draft plan related documents and a preliminary working draft revised forest plan were shared with the public. The working draft described desired conditions, objectives, guidelines, standards, and suitability of uses. Comments from the public meetings were used to modify the working draft. Evaluations of potential wilderness areas were also shared to elucidate public input on the need for new wilderness areas. Approximately 200 individuals attended, representing 54 groups and organizations.

2010 – 2013: After the intense fire season of 2011, forest plan revision efforts were suspended while conditions were reassessed and the results incorporated into the draft environmental impact statement. Collaboration with the public has continued during this interim period in the form of planning team participation in academic forums and meetings with other groups. A major collaborative effort underway is the Integrated Lands Assessment Project Sky Islands project, which is testing revised forest plan objectives for vegetation treatments.

November 2013: Following the release of the draft environmental impact statement on November 22, 2013, a notice of availability was published in the Federal Register that initiated the formal 90-day comment period on the draft environmental impact statement and proposed forest plan, as required by Forest Service National Forest Management Act regulations at 36 CFR 219. The formal 90-day comment period was later extended to 104 days. It provided additional opportunities for public involvement in the review and plan revision processes. During the comment period, the planning team hosted public meetings in Arizona at the following locations, Douglas on December 2, 2013; Rio Rico on December 3, 2013; Sierra Vista on December 17, 2013; Safford on January 9, 2014; and Tucson on January 13, 2014. In May of 2014, Coronado personnel hosted a wilderness workshop seeking input on individuals' and organizations' priorities on specific areas under consideration for recommendation for wilderness designation.

2014 – Present: Since the release of the draft environmental impact statement, the forest supervisor and other management team members have engaged organizations and partner groups as well as local and state agencies disseminating additional information and status updates regarding the revised plan.

Public Presentations Regarding Plan Revision

In addition to public meetings, representatives of the forest plan revision team presented information about the plan revision process or the working draft revised forest plan to the following groups on one or more occasions:

- Arizona Planning Partnership
- Chiricahua Regional Council
- Coronado Planning Partnership
- Hidalgo County Public Lands Advisory Committee
- Southeastern Arizona Cattle Protection Association
- Cochise County Public Lands Advisory Committee
- Graham-Cochise Cattlegrowers Association
- Huachuca Prospectors' Association
- Arizona Access Coalition
- Arizona Game and Fish Department
- Hidalgo County Board of Supervisors
- Malpai Borderlands Group
- Sonoita Valley Planning Partnership
- Cienega Corridor Conservation Council
- Friends of Redington Pass
- Mountain Empire Action Alliance
- Four Southern Tribes Cultural Resource Working Group
- Fort Huachuca Conservation Committee
- Sonoita Valley Homeowners
- Winkleman Natural Resource Conservation District
- Tucson Chapter, Society of American Foresters

Native American Participation in Plan Revision

Also involved in the development of a revised forest plan were the following federally recognized tribes having traditional ties to natural, historical, and cultural resources of the Coronado:

- Ak-Chin Indian Community
- Fort Sill Chiricahua-Warm Springs Apache Tribe
- Gila River Indian Community
- Hopi Tribe
- Mescalero Apache Tribe
- Pascua Yaqui Tribe
- Salt River Pima-Maricopa Indian Community
- San Carlos Apache Tribe
- Tohono O'odham Nation
- White Mountain Apache Tribe
- Yavapai-Apache Nation
- Pueblo of Zuni

In meetings sponsored by the Southwestern Region, tribal representatives expressed the need for the Forest Service to:

- better accommodate their traditional ties and cultural uses in decision making and planning;
- integrate the role of cultural and other noneconomic values in decision making, particularly, the traditional cultural property of Mount Graham;
- incorporate traditional knowledge in forest management and planning; protect the privacy of cultural sites when managing cultural resources; and
- cooperate in the management of resources of mutual interest to tribes and the Forest Service (Russell and Adams-Russell 2006).

In meetings and field trips subsequent to the Southwestern Region meetings, tribal representatives contributed to the development of desired conditions, objectives, and management approaches for the revised forest plan and reviewed working draft revised plan components.

National Environmental Policy Act Review Scoping Process

Notice of Intent to Prepare an Environmental Impact Statement

Since inception of the plan revision process in 2005, the Coronado has received 3,673 comments and suggestions. Many of them (2,950) were received in response to either a notice of intent to prepare an environmental impact statement, which was published on January 27, 2010, in the Federal Register (75 FR 4340); an environmental impact statement scoping notice that was publicly distributed concurrently with the notice of intent; or the release of a working draft revised forest plan in March 2010. All comments are filed in the administrative record of the plan revision process and National Environmental Policy Act review.

The notice of intent provided a general description of the proposed action and asked for public comment about the scope of the National Environmental Policy Act analysis, such as identifying potential issues and concerns and recommending alternatives to the proposed action. The notice of intent presented the public with the following details about the revised forest plan:

- a list of the five "need for change" topics
- a description of changes in direction necessary to address each revision topic
- a general description of revised plan content that would address each need for change topic

Neither the notice of intent nor the scoping notice provided a complete working draft of the revised forest plan or a summary of the desired conditions developed with the public prior to release of the notice of intent, although the latter was available on the Coronado website at the time of scoping.

Leaders of 12 Native American tribes having traditional ties to southeastern Arizona and southwestern New Mexico were notified of the National Environmental Policy Act scoping period in a government-to-government letter from the forest supervisor. Letters were also sent to the Governors of Arizona and New Mexico. Concurrent with publication of the notice of intent, the project was listed on the Coronado's schedule of proposed actions on its public website.

Among the comments received during public scoping were 2,567 identical form letters. Each addressed multiple topics that were not specific to the National Environmental Policy Act review or the content of the working draft revised forest plan. Generally, the form letter expressed advocacy for climate change mitigation and aquatic-habitat conservation; increased protection for wildlife, including population monitoring at the programmatic and project levels; a plan alternative that comprises the gradual elimination of livestock grazing on the Coronado; and restoration of natural fire regimes.

In addition, the Coronado received 222 comments related to one or more potential wilderness area evaluation reports prepared by the forest plan revision team. These expressed advocacy or opposition to specific recommendations for wilderness areas, a general increase in additional wilderness acreage on the Coronado, and/or the restriction on mountain bike access that would result from a wilderness designation.

The remaining 161 comments were submitted by individuals or organizations and included 2 responses from tribal entities. Each of these submittals was unique in content and addressed many topics, including some relevant to potential wilderness areas or additional wilderness acreage. Several of the unique comments were site specific in nature or beyond the scope of the forest plan revision effort.

On November 22, 2013, the Coronado made the draft revised plan and draft environmental impact statement available for a 104-day comment period ending on March 6, 2014. During the extended 104-day comment period for the draft revised plan and draft environmental impact statement, comments were received from 2,274 individuals, organizations, agencies, and tribes. Eligibility to

appeal the regional forester's decision regarding the proposed action is limited to individuals and organizations that commented on the draft environmental impact statement or otherwise expressed an interest in the project during the formal comment period. Appendix A summarizes comments received during the 104-day comment period and provides the Coronado National Forest's response to these comments. Appendix I provides copies of comment letters received from governmental entities.

Issues Resulting From the Scoping Process

Many public comments and concerns received during the plan revision process contributed to the development of the proposed action (the revised forest plan). Of those comments and concerns, we identified three unresolved public conflicts, or "issues," regarding the proposed action. These issues reflect similar comments received about the content of the 2010 working draft revised plan:

1. Allocation of additional acreage to wilderness
2. Allocation of additional acreage to motorized recreation
3. Management of resources during climate change

During an environmental analysis, issues arising from unresolved conflicts may be addressed by proposing reasonable alternatives to the proposed action, or by modifying the proposed action. To be responsive to issues 1 and 2, the Forest Service proposed two different alternatives, alternative 1 and alternative 2, the impacts of which are evaluated in this environmental impact statement along with those of the proposed action and no action. Alternatives 1 and 2, respectively, allocate acreage for wilderness and motorized recreation differently than the proposed action.

To address issue 3, the proposed action was revised to include new direction to move the Coronado toward achieving the desired conditions of resilience and adaption to the effects of climate change for each resource potentially affected. In addition, alternative 1 includes the same direction as the revised forest plan regarding climate change. For the purpose of providing different options to the decision maker, alternative 2 does not include specific desired conditions and management approaches regarding climate change. It does, however, incorporate the strategies for climate change management on the Coronado, which are described in appendix A of the revised forest plan.

Some public comments requested that the forest plan recommend substantially larger parcels than the proposed action for wilderness designation. In response, the Forest Service revisited its potential wilderness inventory and evaluated 31 parcels that met the criteria in Forest Service Handbook 1909.12, chapter 70 (Land Management Planning, Wilderness Evaluation). Evaluation of this new inventory generated alternative 1, which recommends 16 parcels for recommendation as designated wilderness, in comparison to only 2 parcels recommended by the proposed action.

Other comments requested that the forest plan allocate parcels for specific multiple uses, with an emphasis on motorized recreation. Hence, the establishment of Motorized Recreation Land Use Zones of larger acreage than the proposed action, which were originally proposed in the March 2010 working draft plan, formed the basis for alternative 2. In addition, alternative 2 constrains designations of special areas in these zones and does not call for new wilderness to be recommended for designation, aside from what is stated in the 1986 plan. As mentioned earlier, alternative 2 also does not include plan components for forest management in light of climate change. It does, however, incorporate the strategies for climate change management on the Coronado, which are described in appendix A of the revised forest plan.

Comments beyond the scope of these National Environmental Policy Act review issues, which include those that are not significant or have been covered by prior environmental review (see 40 CFR 1501.7(a)(3) and 1506.3) are documented in the administrative record of this environmental impact statement.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes the revised forest plan (proposed action), no action, and other alternatives that satisfy the purpose of and need for plan revision. It also briefly discusses alternatives dismissed from further evaluation. At the end of the chapter is a tabular comparison of the consequences of implementing each alternative.

Alternatives Considered in Detail

Four alternatives are analyzed in detail in this environmental impact statement: no action, the proposed action, alternative 1 (identical to the proposed action but with the addition of acreage proposed to be managed as wilderness), and alternative 2 (similar to the proposed action but with the addition of acreage proposed for motorized recreation and other differences, as noted below). The following sections briefly describe the content of each alternative and, as applicable, how each was developed.

No Action

The no-action alternative is included in this environmental impact statement in accordance with the Council on Environmental Quality regulation at 40 CFR 1501 Section 1502.14(d), which requires the alternatives analysis "include the alternative of no action."

The Council on Environmental Quality interprets no action depending on the nature of the proposal being evaluated. In the case of an action such as this one (updating a land management plan), for which ongoing programs initiated under existing legislation and regulations will continue even as new plans are developed, the Council on Environmental Quality equates no action with no change from current management direction or level of management intensity. In its responses to 40 frequently asked questions about National Environmental Policy Act reviews,[5] the Council on Environmental Quality states:

> To construct an alternative that is based on no management at all would be a useless academic exercise. Therefore, the "no action" alternative may be thought of in terms of continuing with the present course of action until that action is changed. Consequently, in the environmental impact statement, the results of an analysis of the impacts of alternative management scenarios would be compared in the environmental impact statement to those impacts associated with the existing plan.

[5] http://ceq.hss.doe.gov/nepa/regs/40/1-10.HTM

Proposed Action

The proposed action encompasses the total content of the revised forest plan (a companion document to this environmental impact statement) which was developed using an iterative process (i.e., this alternative was modified and offered for public review several times) based on guidance and recommendations from the public, tribes, other agencies, and government officials. The basic steps in this process were as follows:

1. Between 2005 and 2008, a series of public forums were held, each of which generated discussion and ideas concerning direction for forest management, priorities for management, and goals of management in the1986 plan. Between each forum was a period of analysis by a Forest Service team of resource specialists. Results of each analysis period were reported to the public at the next engagement.
2. In January 2010, a notice of intent to prepare an environmental impact statement was published in the Federal Register, accompanied by a summary of the proposed action and process to date. A 30-day period was provided for public comment about the scope of the National Environmental Policy Act analysis, including the identification of potential issues, concerns, and recommendations for alternatives to the proposed action.
3. In March 2010, a working draft revised forest plan, which was developed after consideration of all comments received to date, was released to the public. Another comment period followed, and changes to the working draft revised forest plan were made based on public comments, resulting in the draft revised forest plan (i.e., the proposed action).
4. In November 2013, the draft revised forest plan and draft environmental impact statement were released for public comment through March 6, 2014. Changes to the draft revised forest plan were made based on public comments, resulting in the revised forest plan and final environmental impact statement.

Several scoping comments received regarding the National Environmental Policy Act review were mirrored or augmented by comments submitted about the content of the working draft plan and draft plan. Together, scoping comments, working draft plan comments, and draft plan comments recommended changes or refinement of plan components which led to the proposed action evaluated in this environmental impact statement.

Alternatives 1 and 2

As reported in chapter 1, the revised forest plan addresses five needs for change that dominated the public dialogue. Based on comments submitted during scoping of this National Environmental Policy Act review and in response to the release of the working draft plan, other unresolved conflicts became evident. These included contrasting user perspectives about the acreage that should be allocated to specific quiet recreation and motorized recreation areas; additional special area designations, including the addition of acreage in two parcels recommended for management as wilderness; and management direction to ensure sustainability of forest ecosystems, including adaptation to climate change.

To address the unresolved conflicts, the Coronado National Forest personnel developed two alternatives. Under alternative 1, more acreage would be managed for wilderness character than the proposed action; in all other plan direction, alternative 1 would be the same as the proposed action. In effect, alternative 1 would increase the opportunity for quiet recreation on the Coronado.

The content of direction under alternative 1 would be the same as that of the proposed action with regard to plan components. It would differ only in that it recommends much more additional acreage for designation as wilderness.

Alternative 2 differs from the proposed action and alternative 1 primarily because of its allocation of more acreage to be managed for motorized recreation (Motorized Recreation Land Use Zone). In addition, alternative 2 does not propose the new wilderness and research natural areas that the proposed action and alternative 1 recommend. Further, it does not include the plan components related to climate change that are contained in the revised forest plan under the proposed action and alternative 1. It does, however, incorporate the strategies for climate change management on the Coronado, which are described in appendix A of the revised forest plan.

Description of Alternatives

For each of the alternatives, the following sections:

1. provide a general description of what is proposed;
2. describe existing management areas, proposed management areas (MAs), or both; the acres of land and percentage of Coronado National Forest in each, and the concepts that led to their identification, by alternative; and
3. assess the manner in which each alternative meets the "needs for change" defined in collaboration with the public during the process of plan revision.

Revised Plan Content Common to All Alternatives

The plan components established by the four alternatives evaluated in this environmental impact statement have the following objectives in common. All of the alternatives:

- comply with laws, regulations, and policies;
- conserve soil and water resources;
- cause no significant or permanent loss of productivity of the land;
- maintain air quality that meets or exceeds applicable Federal, State, and/or local standards or regulations;
- provide for and maintain a diversity of plant and animal communities to meet multiple-use objectives;
- provide suitable, well-distributed habitat across the Coronado to ensure species viability;
- include measures for preventing the destruction or adverse modification of critical habitat for threatened and endangered species;
- protect heritage resources;
- recognize and respect the unique status of Native American tribes and their rights conveyed by trust and treaty with the United States;
- require consultation with tribes about traditional resources, ties, and interests about site-specific proposed actions;
- sustain environmentally acceptable multiple uses of, products from, and services on the Coronado, which include special uses for various purposes, including the right to access and develop leasable and locatable minerals; harvest fuelwood and other forest products, graze livestock and produce forage; and engage in various recreational activities, such as hunting, hiking, camping, and fishing;

- recommend the current Mount Graham Wilderness Study Area for congressional wilderness designation;[6]
- continue to protect specially designated areas (e.g., wilderness, eligible wild and scenic rivers, research natural areas); and
- recommend a boundary change for the Santa Catalina Research Natural Area.

In addition to the above, each alternative land management plan must respond to and incorporate program objectives from the Renewable Resource Planning Act, in accordance with 1982 Planning Rule regulations at 219.12(f)(6). The last Renewable Resource Planning Act program was developed in 1995. In lieu of the program, the Forest Service Strategic Plan 2015-2020 provides broad, overarching national guidance for forest planning and national objectives for the Agency as required by the Government Performance Results Act. All of the alternatives in this environmental impact statement address these broad strategic objectives.

The proposed action, alternative 1, and alternative 2 each include management direction that preserves the undeveloped character of inventoried roadless areas on the Coronado. The no-action alternative does not, because the 1986 forest plan became effective prior to the designation of inventoried roadless areas.

No Action

General Overview – No Action

In an environmental impact statement, the no-action alternative generally serves as a baseline to which the effects of the proposed action and other alternatives can be compared. In this environmental impact statement, the definition of the no-action alternative is the management direction provided in the 1986 forest plan. No action is interchangeably referred to as the 1986 forest plan and the 1986 plan in this document. An electronic copy of the 1986 forest plan is provided in its entirety on the Coronado National Forest website at: http://www.fs.usda.gov/detail/coronado/landmanagement/planning/?cid=fswdev7_018702.

Direction in the 1986 forest plan lists management goals for the following eight "resource elements": (A) recreation, (B) wilderness, (C) wildlife and fish, (D) range, (E) timber, (F) water, (G) minerals, and (H) human and community development. It also provides goals for four support elements: (J) lands, (K) soils, (L) facilities, and (P) protection. The plan describes objectives, standards, and guidelines, the latter of which are collectively referred to as "plan components" for each element.

The 1986 forest plan allocates and designates 15 geographically specific parcels of forest land (management areas or MAs), each of which is to be managed according to its intended use(s). It also recommends the Mount Graham Wilderness Study Area be designated as a wilderness and that several other special areas be designated (table 1). The locations of these areas are shown on figures 12 through 23 in appendix L.

Management Areas – No Action

In the 1986 forest plan, as amended, National Forest System lands are categorized as the following management areas: 1, 2, 3, 3A, 3B, 4, 7A, 7B, 8, 8A, 9, 14, and 15. These designations are primarily based on physical and biological characteristics of each area. Numeric designators 5, 6, and 10

[6] The Mount Graham Wilderness Study Area was formally established by Congress in 1984. The same area was recommended for wilderness designation in the 1986 plan, but that recommendation was never acted on by Congress. All alternatives for plan revision carry forward the recommendation to designate this wilderness study area as a formal wilderness area. The area will continue to be managed as a wilderness study area until Congress takes action on this recommendation.

through 13 were never assigned to National Forest System lands but rather retained as placeholders for future designation as needed.

Management Area 1

Management Area 1 provides direction for management of visual resources and semiprimitive dispersed recreation. Forest lands designated as Management Area 1 comprise 111,284 acres of steep, rugged terrain (7 percent of the national forest) that has slopes greater than 40 percent. These lands may be highly visible from primary motorized travel routes. All vegetation communities are represented in Management Area 1 except for major riparian. This management area is unsuitable for timber production and livestock grazing.

Management Area 2

Management Area 2 provides direction related to management of dispersed recreation; special uses such as electronic communication sites and observatories; and sawtimber or fuelwood gathering, if these activities enhance recreation, visual quality, and wildlife values. Forest lands designated as Management Area 2 comprise 32,430 acres (2 percent of the Coronado National Forest) of coniferous forest that has slopes less than 40 percent. These areas are located in the Chiricahua, Pinaleño, Santa Rita, and Santa Catalina Mountain ranges and are suitable for a wide variety of recreational and special uses. About 5,000 acres are suitable for timber production in the Chiricahua and Santa Catalina Mountains combined; all other acres in Management Area 2 are unsuitable for this use.

Management Area 2A

Management Area 2A provides direction for management of old-growth forest dependent species such as the Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*), and operation and maintenance of Mount Graham astrophysical facilities (a special use). These lands in the Pinaleño Mountains comprise 3,071 acres (less than 1 percent of the Coronado National Forest) of coniferous forest, in which slopes are generally less than 40 percent in the spruce-fir community and greater than 40 percent in the mixed-conifer community.

Table 1. Wilderness and wilderness study areas included in the no-action alternative

Management Area	Acres Allocated by No Action**
Wilderness	338,318
Recommended Wilderness: Mount Graham Wilderness Study Area*	61,315
Bunk Robinson Wilderness Study Area	19,062
Whitmire Canyon Wilderness Study Area	12,163

* Hereafter to be referred to as Mount Graham Recommended Wilderness Area (see page 21 for more information)

** Not all acres shown are consistent with estimates from the 1986 plan; however, the acres were generated using more advanced mapping and analysis (GIS) and are, therefore, considered more accurate.

Table 2. Specially designated areas included in the no-action alternative

Management Area	Acres Allocated by No Action**
Butterfly Peak Research Natural Area	1,058
Elgin Research Natural Area	245
Pole Bridge Research Natural Area	460
Gooding Research Natural Area	540
Appleton-Whittell Research Ranch	1,746

Management Area	Acres Allocated by No Action**
Goudy Canyon Research Natural Area	558
Santa Catalina Research Natural Area	4,040
Wet Canyon Talus Snail Zoological Area	1,218
Mount Graham Astrophysical and Biological Research Area	2,937
Wild Chile Botanical Area	2,836
Sabino Canyon Recreation Area	1,423
Bighorn Sheep Management Area	21,184
Guadalupe Canyon Zoological-Botanical Area	3,436
South Fork of Cave Creek Zoological-Botanical Area	786

** Not all acres shown are consistent with estimates from the 1986 plan; however, the acres were generated using more advanced mapping and analysis (GIS) and are, therefore, considered more accurate.

Management Area 2B

Management Area 2B provides direction for management of unique plant and animal species found on these designated lands, especially the Wet Canyon talussnail (*Sonorella macrophallus*). Direction allows for dispersed and developed recreation and special uses of Management Area 2B as long as measures are taken to protect the area's unique resource values. Management Area 2B comprises 220 acres (less than 1 percent of the Coronado) in the Pinaleño Mountains, including the Wet Canyon watershed downstream to the mouth of Twilight Creek but not Twilight Creek or its watershed. All acres are unsuitable for timber production.

Management Area 3

Management Area 3 provides direction related to management of a wide range of recreational activities, including measures to conserve each parcel's unique physical, biological, and cultural resources. This management area comprises 14,772 acres (less than 1 percent of the Coronado) of undeveloped grasslands, woodlands, coniferous forest, and riparian areas, none of which is suitable for timber production. Lands designated as Management Area 3 have a wide range of slopes and provide essential habitat for threatened and endangered plants and animals.

Management Areas 3A and 3B

Management Areas 3A and 3B provide management direction for a variety of developed recreation activities, including preservation of each area's unique physical, biological, and cultural resources. These management areas are suitable for, and capable of, supporting developed recreation sites. They comprise 4,165 acres (less than 1 percent of the national forest) of lands that have an average slope of less than 15 percent.

Management Area 4

Lands designated as Management Area 4, which are predominantly desertscrub, grassland, and chaparral on slopes up to 40 percent, make up 1,128,269 acres (63 percent of the Coronado National Forest). Management Area 4 follows direction regarding the sustained harvest of livestock forage and fuelwood as well as maintenance and improvement of wildlife habitat. None of the land in this management area is suitable for timber production. Dispersed recreation is allowed on these lands.

Management Area 7, Prescription A

Management Area 7, Prescription A, provides management direction intended to ensure the sustainability of unique plants and wildlife in the management area, and to improve and manage

riparian areas for the benefit of riparian-dependent resources. Dispersed recreation activities and other specific uses are allowed in this management area, including facilities that protect and conserve each parcel's unique resources.

This management area comprises 24,423 acres (1 percent of the Coronado) of undeveloped lands that support flora and fauna associations in various riparian ecotypes and deciduous and coniferous forest types, and habitat for threatened and endangered species, each of which is sufficiently unique to require special management. None of the land in this management area is suitable for timber production.

Management Area 7, Prescription B

Management Area 7, Prescription B, provides management direction intended to ensure the sustainability of unique plant and animal species and habitat in the management area concurrent with its use for livestock foraging and fuelwood harvest. Management allows recreation activities and other specific uses in this management area, including facilities that protect and conserve each parcel's unique resources.

This management area comprises 17,124 acres (1 percent of the Coronado National Forest) of undeveloped lands that support flora and fauna associations in nonriparian drainages, such as oak and mesquite bottoms, and habitat for threatened and endangered species, each of which is sufficiently unique so as to require special management. None of the land in this management area is suitable for timber production.

Management Area 8

Management Area 8 is designated for nondisturbing research and education on parcels that have been evaluated and either designated, proposed, or determined to be suitable for designation as a research natural area. This management area comprises 3,805 acres (less than 1 percent of the Coronado); none of the parcels in this management area is suitable for timber production. No harvest of forest products or grazing by livestock is allowed in Management Area 8.

Management Area 8A

Management Area 8A follows management direction to ensure that wilderness character and uses are maintained and that nondisturbing research and education can occur on parcels determined to be suitable for either wilderness or research natural area designation. Management direction does not allow the harvest of forest products (including fuelwood) and livestock grazing in Management Area 8A. This management area comprises 3,805 acres (less than 1 percent of the Coronado National Forest) of designated and proposed research natural areas within wilderness areas, none of which are suitable for timber production. It includes lands determined to be suitable for both wilderness and research natural area designation.

Management Area 9

Management Area 9 provides management direction on lands intended to preserve wilderness character concurrently with compatible livestock grazing and recreation uses. This management area comprises 397,505 acres (22 percent of the Coronado) of designated and recommended wilderness areas, none of which is suitable for timber production. The management area includes all vegetation and landform types that have been determined to be suitable for wilderness area designation.

Management Area 14

Management Area 14 provides management direction intended to ensure the sustainability of unique plant and animal species and habitat, including riparian areas, in and along the South Fork of Cave Creek (Chiricahua Mountains) and Guadalupe Canyon (Peloncillo Mountains). Special conservation practices, such as formal designation as a zoological or botanical area, are an option in Management

Area 14. Management direction allows recreation activities and other specific uses, including facilities that protect and conserve each parcel's unique resources. This management area comprises 4,240 acres (less than 1 percent of the Coronado), none of which are suitable for timber production.

Management Area 15

Management Area 15 is designated as the Wild Chile Botanical Area. Direction in the forest plan for Management Area 15 is intended to protect and conserve wild relatives of the economically important chile (i.e., chiltepin, *Capsicum annuum* var. *glabriusculum*). Management Area 15 comprises 2,836 acres (less than 1 percent of the Coronado National Forest) of lands within the Rock Corral Canyon subwatershed that have unique vegetation and wildlife requiring special management practices. Vegetation consists of 2,344 acres of oak woodland, 421 acres of desert grassland, and 71 acres of deciduous riparian habitat. Slopes are less than 15 percent on 74 acres; from 15 to 40 percent on 814 acres; and greater than 40 percent on 1,948 acres. The Wild Chile Botanical Area has about 3.5 miles of unpaved roads. About 1,125 acres of the management area is suitable for livestock grazing, and none are suitable for timber production.

Meeting the Needs for Change – No Action

How well the 1986 plan meets the five needs for change is dependent on the type of management direction it contains and the degree of success that the Forest Service has had to date in implementing that direction. The following sections discuss 1986 plan direction as it relates to each of the current need for change. Full details about the goals, objectives, standards, and guidelines discussed below can be found in the 1986 plan, which is available on the Coronado National Forest website at: http://www.fs.usda.gov/detail/coronado/landmanagement/planning/?cid=fswdev7_018702.

Ecosystem Restoration and Resiliency

An ecosystem is a community of living organisms (plants and animals) and the nonliving components of their environment (air, water, and mineral soil) with which they interact. The organisms and nonliving components are linked by nutrient cycles and energy flows. Various types of ecosystems are defined by their uniqueness in geographic location and components.

The plan revision process identified a need for specific integrated direction regarding "ecosystem restoration and suitability." The focus of such direction is habitat conservation and restoration, species and habitat conservation, management of vegetative fuels, management, and ecological responses to the wildfire, management of invasive species, and planning for resiliency to the effects of climate change.

In 1986, plan components were established to manage ecosystems toward achieving desired conditions that maintain and/or improve species composition, habitat, and function. Direction reflected the best scientific data and information available at that time. Since then, certain aspects of this direction have been updated by amendment or change notice. However, much of the 1986 plan direction was developed to manage specific elements of specific ecosystems that have evolved markedly over the past 26 years.

Today, because of changes in ecosystems and newly arisen issues that affect them, 1986 plan direction does not ensure future ecosystem restoration and sustainability. For example, it has no components that address how to manage resources to ensure ecosystem resilience and adaptation to climate change.

General goals were set in the 1986 plan for ecosystem maintenance and improvement for the resource elements of range, wildlife and fish, timber, soil, and water. Management emphasis for Management Areas 1, 2, 3, 7, 8, 14, and 15 is listed as ecosystem protection or improvement. A 2006 amendment to the plan specifically references the goal of restoring an important ecosystem function, the natural fire cycle, under the support element of "protection."

Specific references to ecosystem restoration are made in the 1986 plan under the "range" element as well as under "wildlife and fish." The wildlife and fish element specifies forestwide standards and guidelines for management of the Mexican spotted owl (*Strix occidentalis lucida*), which is listed as threatened under the Endangered Species Act, and the northern goshawk (*Accipiter gentilis*), a migratory raptor that is listed as a Forest Service sensitive species in the Southwestern Region. Adherence to the plan's Mexican spotted owl and goshawk standards and guidelines has contributed to the conservation of the two species on the Coronado.

To manage unique species, special status species, or both for sustainability in various ecosystems on the Coronado, the 1986 plan designates specific areas where special management practices are required. These include Management Areas 2A, 2B, 7 (prescriptions A and B), 8, 8A, 14, and 15 (see discussion above). The special designation of these management areas has been relatively successful in protecting populations of unique species as well as providing opportunities for field research for the same.

In addition to the conservation afforded special-status species in individual management areas, the 1986 plan provides direction for general management of species across the Coronado by requiring that each site-specific proposal be evaluated for potential adverse effects on what are designated as "management indicator species." A management indicator species is selected because its welfare is presumed to be an indicator of the welfare of other species in the same habitat, and its condition can be used to assess the impacts of management actions on a particular habitat. On the Coronado, 33 management indicator species were designated for this purpose.

Implementation of 1986 plan direction for species management has not been fully successful because the management indicator species list itself was flawed in that it listed species as management indicators despite the fact that there was no habitat for them on the Coronado or the species no longer existed there (nonextant). The management indicator species list also included guilds[7] of species. However, the grouping of certain species in the guilds was inaccurate in some cases, because many of those co-listed in a guild do not have the same habitat requirements.

With regard to the 1986 plan goals of restoration and sustainability of vegetation, the Coronado has managed ecosystem components across all vegetation communities by annually treating 2,000 acres using mechanical thinning and mastication and 16,400 acres using prescribed fire. In addition, invasive (nonnative) species eradication efforts have, on average, treated 625 acres annually.

Management of watersheds (water and soil) is governed by 1986 plan direction that requires proposals for vegetation manipulation, range management, and habitat improvement at the project (site-specific) level; and adherence to best management practices defined in Forest Service directives. The plan sets goals for restoration of degraded watersheds, including hydrologic function; however, few projects have been implemented to date toward achieving this goal.

Visitor Experiences

The plan revision process identified a need for direction to balance competing uses (supporting quiet recreation areas and areas that accommodate noisy or other incompatible uses and activities) as well as direction to address public safety issues related to illegal activities across the Coronado.

Management goals in the 1986 plan related to visitor experiences include:

1. maintaining a wide spectrum of recreational activities;
2. improving communication with the public about recreational opportunities and their impacts;

[7] A guild is a group of organisms that exhibit similar habitat requirements and that respond in a similar way to changes in their environment.

3. increasing understanding of the adverse impacts of recreational use; and
4. nurturing partnerships.

The plan lists standards and guidelines toward achieving these goals. However, it does not provide direction regarding illegal activities on the Coronado. At the time the plan was developed, illegal activities on the Coronado were not nearly as great a public and occupational safety concern as they are today.

With regard to the need to balance competing recreational uses, the 1986 plan established Management Area 2 and 3, in which developed recreation is emphasized, and Management Areas 1 and 9, in which nonmotorized, nonmechanized activities are emphasized. The 1986 plan recommends the Mount Graham Wilderness Study Area for wilderness designation within Management Area 9. The majority of the Coronado comprises Management Area 4, where dispersed recreation is permitted. However, the 1986 plan does not recommend any new developed recreation sites. There is little direction in the 1986 plan regarding management of dispersed recreation.

Access to National Forest System Lands

The plan revision process identified a need for direction on how to foster cooperation and collaboration with private and other agency land managers so that user access can be restored in areas where it is currently unavailable or compromised.

The 1986 plan includes a goal for establishing public access for recreation under the resource element "recreation." In addition, the support element "lands" sets a goal for obtaining rights-of-way for resource management activities, with a focus on existing access points.

Preservation of Open Space

The 1986 plan includes a low-priority guideline that recommends attempted acquisitions of land from willing private owners to provide open space for recreation. It also emphasizes consolidation of small, private landholdings into economically viable units, therefore, encouraging development, rather than preservation of open space, within the Coronado National Forest boundary.

The 1986 plan does not address open space in terms of its ecological and social values; however, it does acknowledge that undeveloped lands provide a high degree of visual quality and to preserve that, the plan establishes a goal to maintain or enhance visual resources provided by open space.

In addition, the plan requires the application of a visual management system for assessing project-level effects.

Communities, Collaboration, and Partnerships

The 1986 plan identified a need for direction that emphasizes collaboration and partnerships as tools for attaining both forest management and community goals. This is presumed to infer continuing and future social and working relationships among forest staff and leaders in the communities it serves, including Native American nations.

The 1986 plan identifies several goals and objectives for collaboration, partnerships, and service to communities. Under the resource element "recreation," the 1986 plan establishes goals for working in partnership with others for recreation access and cave protection. In terms of service to communities, the plan allocates 5,000 acres for timber production. All land in Management Areas 4 and 7 and portions of Management Areas 2, 3, 9, 14, and 15 are available for livestock use.

Proposed Action: Revised Forest Plan

General Overview – Proposed Action

The revised forest plan (a companion document to this environmental impact statement) is the proposed action and is referred to in this draft environmental impact statement environmental impact statement as the "revised forest plan" or "revised plan." Plan components include goals (expressed as "desired conditions"), objectives, standards, and guidelines.

Like the 1986 plan, the proposed action establishes forestwide management goals (desired conditions); however, they differ from the 12 elements (8 resource and 4 support elements) specified in the 1986 plan. Instead, the revised forest plan sets goals for 25 natural resource and social elements: (1) climate, (2) vegetation, wildland-urban interface, (3) montane meadows, (4) wetlands, (5) riparian areas, (6) biophysical features, (7) watershed (8) natural water sources, (9) constructed waters, (10) soils, (11) air quality, (12) wildlife, (13) fish and rare plants, (14) invasive species management, (15) forest products, (16) minerals, (17) public access, (18) motorized transportation system, (19) recreation, (20) scenic quality, (21) special use management, (22) heritage resources, (23) tribal relations, (24) range management, and (25) land ownership and boundary management. For each resource element, the revised plan describes general conditions necessary to support sustainable ecosystems, biodiversity, and sustainable social and economic interactions between the Coronado and surrounding communities. It also describes desired outcomes for anticipated tradeoffs or conflicts among resources. In addition to resource and social elements, the revised plan defines desired conditions for specific places (i.e., management areas).

Also established in the revised plan are objectives, standards, and guidelines for management activities related to many (but not all) specific elements, management areas, or both. There are suggested management approaches for achieving desired conditions. This combination of direction is intended to give a complete picture of desired outcomes and the tools to attain them. It provides direction for ways to address threats such as invasive species, excessive fuel loading, and climate change, within the authority of the Forest Service.

Certain direction in the 1986 plan is reiterated in the revised plan under the proposed action, with the intent to: (1) protect special-status species, including northern goshawks and Mexican spotted owls; (2) protect caves and cultural resources; (3) recognize fire as a beneficial natural disturbance; and (4) provide for a full range of recreational opportunities. While the intent of the 1986 goals is the same in the revised plan, its components may not be identical because they are also intended to respond to the needs for change.

Management Areas – Proposed Action

In the revised forest plan, the following management areas are assigned based on administrative and user needs and comments received during the planning process. Table 3 through table 5 show the allocations of land by the proposed action and figures 24 through 35 in appendix L show the locations of land use zones and special areas in each ecosystem management area. Detailed descriptions of each ecosystem management area are provided in the revised forest plan.

Table 3. Land use zones allocated by the proposed action

Management Area	Allocated by Proposed Action
Roaded Backcountry	595,497
Wild Backcountry	596,127
Developed Recreation	37,264
Motorized Recreation	4,862

Table 4. Wilderness, Recommended Wilderness, and Wilderness Study Areas allocated by the proposed action

Management Area	Allocated by Proposed Action
Wilderness	338,318
Recommended Wilderness (includes Ku Chish, Mount Graham, Whetstone and Chiricahua Addition North)	108,890
Bunk Robinson Wilderness Study Area	19,062
Whitmire Canyon Wilderness Study Area	12,163

Table 5. Special management areas* allocated by the proposed action

Management Area	Allocated by Proposed Action
Proposed Cave Creek Canyon Birds of Prey	25,764
South Fork of Cave Creek Zoological-Botanical Area	786
Pole Bridge Research Natural Area	460
Pole Bridge Research Natural Area Extension	123
Guadalupe Canyon	3,436
Wild Chile Botanical Area	2,836
Gooding Research Natural Area	540
Gooding Research Natural Area Extension North	201
Gooding Research Natural Area Extension South	1,472
Elgin Research Natural Area	245
Proposed Canelo Research Natural Area	386
Appleton-Whittell Research Ranch	1,746
Goudy Canyon	558
Wet Canyon Talus Snail Area	1,218
Mount Graham Astrophysical & Biological Research Area	2,937
Bighorn Sheep Management Area	21,184
Butterfly Peak Research Natural Area	1,058
Proposed Finger Rock Canyon Research Natural Area	1,103
Santa Catalina Research Natural Area (proposed reduction from original 4,040 acres)	634

*Acres do not include private inholdings or lands of other ownerships

Land Use Zones

Wild Backcountry

The proposed action would designate a Wild Backcountry Land Use Zone of 596,127 acres (35 percent of the national forest) to accommodate various nonmotorized uses while concurrently providing for limited motorized access to the area on National Forest System roads designated as maintenance level 2.[8] The zone comprises inventoried roadless areas, areas adjacent to designated

[8] The service level of a road is determined by its maintenance level. See glossary for a list of maintenance levels. Refer to http://www.fs.fed.us/eng/pubs/pdf/05771205.pdf for more information.

wilderness areas, and other relatively pristine areas. Desired conditions are described, and guidelines are established to maintain desired conditions and visitor experiences.

Suitable uses specified for the Wild Backcountry Land Use Zone are livestock grazing, harvesting of timber for restoration purposes, mountain biking, and collection of forest products and fuelwood. Developed recreational facilities, and timber production are not suitable uses.

Roaded Backcountry

A proposed 595,497acre (35 percent of the Coronado National Forest) Roaded Backcountry Land Use Zone would accommodate a range of dispersed uses and motorized access, with an emphasis on quiet recreation. This area would be managed to retain its natural character and to limit the degree and type of development. Desired conditions are described, and guidelines are established to maintain conditions and visitor experiences.

Suitable uses specified for the Roaded Backcountry Land Use Zone include livestock grazing, motorized access on designated roads, motorized dispersed camping, mountain biking, recreation facilities, harvesting of timber in conjunction with restoration projects, and collection of forest products and fuelwood. This zone is not suitable for timber production.

Developed Recreation

A proposed 37,264-acre (2 percent of the Coronado) Developed Recreation Land Use Zone would serve major public access corridors into the national forest. Roads in this zone would typically be paved (maintenance level 3 to 5; see footnote 8 and glossary) and used as popular sightseeing routes. In some cases, main roads are designated as scenic byways. Primarily day use activities occur in these areas, with visitor destinations such as campgrounds, picnic areas, vista points, visitor centers, and lakes. Organization camps and recreational residences are located in the Developed Recreation Land Use Zone. Many trailheads and hiking trails provide access to Wild Backcountry Land Use Zones, Roaded Backcountry Land Use Zones, and wilderness areas. Desired conditions are described, and guidelines are established to maintain conditions and visitor experiences.

The Developed Recreation Land Use Zone is designated as suitable for motorized access, dispersed motorized camping, recreation facilities, and harvesting of timber in conjunction with restoration projects, and the collection of forest products and fuelwood. Activities for which it is not suitable include off-highway vehicle recreation, timber production, harvesting of commercial forest products, and livestock grazing (except for vegetation management, where appropriate).

Motorized Recreation

Approximately 4,862 acres of the Coronado (less than 1 percent) are designated for management as a Motorized Recreation Land Use Zone. This zone includes areas that currently experience heavy use by motorized recreational vehicles. Management direction is focused on providing a wide variety of recreational experiences, including off-highway vehicle use and vehicular sightseeing, while mitigating effects of motorized use and minimizing conflicts with other users. Desired conditions are described, and guidelines are established to maintain conditions and visitor experiences. Most forest uses, except for timber production, are suitable in this management area.

Special Areas

Existing Wilderness Areas

Eight designated wilderness areas, which add up to 338,318 acres (20 percent of the Coronado National Forest), are included in the revised plan. Generic desired conditions (goals), objectives, standards, and guidelines are defined for the following resource and social elements of designated wilderness areas: wilderness character, scenic quality, vegetation, wildlife, soil and water, recreation and education, trails and signage, fire, insects and disease, and research. In addition, the revised forest

plan defines desired conditions, objective, guidelines, standards, and suggested management approaches that are specific to individual wilderness areas.

In the revised plan, wilderness areas are suitable for livestock grazing, nonmechanical harvesting of traditional forest products, and outfitter and guide services compatible with wilderness character. Selected activities not suitable in wilderness areas include motorized and mechanized use, recreation facilities, timber harvest, fuelwood harvest, and commercial uses that are not wilderness dependent (see chapter 4 of revised forest plan).

Recommended Wilderness Areas

Recommended wilderness areas are comprised of lands recommended for wilderness designation as a result of the potential wilderness area evaluation process. The purpose of this evaluation was to identify all areas within the Coronado National Forest not yet designated as wilderness that satisfy the definition of wilderness found in the 1964 Wilderness Act. The Coronado National Forest followed a 3-step process for identifying potential wilderness areas that included inventory and evaluation of potential areas and a determination of which areas would be included in this plan. The intent of this management area is to provide direction that would retain or improve the wilderness values of these areas if and until they are established by Congress.

The Coronado National Forest is recommending four potential wilderness areas for wilderness designation: Ku Chish, Mount Graham Wilderness Study Area, Whetstone, and Chiricahua Addition North. This includes a total of 108,890 acres, or 6 percent of the national forest. Two potential wilderness areas are located on the Douglas Ranger District: Ku Chish and Chiricahua Addition North (totaling approximately 26,245 and 5,013 acres, respectively). Ku Chish, named for the Apache word meaning Cochise, has a boundary of high ridgelines and natural features. This potential wilderness area shares a boundary with the existing Chiricahua National Monument to the south. The Chiricahua Addition North, an extension of the designated Chiricahua Wilderness, is comprised of six irregularly shaped areas that are each approximately one to four miles wide in an east-west direction and one to two miles wide in a north-south direction. The Whetstone Potential Wilderness Area, located in the Whetstone Mountains, is part of the Sierra Vista Ranger District. The Whetstone Potential Wilderness Area encompasses approximately 16,317 acres and is known for limestone outcrops in a band covering approximately 20 square miles. The fourth recommended wilderness area is Mount Graham, currently an established wilderness study area located on the Safford Ranger District. This potential wilderness area is approximately 61,315 acres and has been consistently managed to maintain its wilderness characteristics since it was designated as a wilderness study area in the Arizona Wilderness Act of 1984.

The proposed recommended wilderness areas have stimulated a high degree of public interest because of their wilderness characteristics, the refugia they provide for threatened and endangered species, and their outstanding opportunities for recreational use. Each would be managed to maintain wilderness character (i.e., no motorized vehicle use and no use of mechanized equipment) preserving the area as “untrammeled, natural, and undeveloped, with outstanding opportunities for solitude or a primitive and unconfined type of recreation” (Wilderness Act of 1964).

Wilderness Study Areas

In 1984, Congress established three wilderness study areas on the Coronado National Forest: Mount Graham, Bunk Robinson, and Whitmire Canyon. The proposed action carries forward the 1986 forest plan recommendation for Mount Graham (61,315 acres) to be designated as a wilderness area. Bunk Robinson (19,062 acres) and Whitmire Canyon Wilderness Study Areas (12,163 acres) would continue to be managed to preserve wilderness characteristics. The revised forest plan describes desired conditions for these areas as well as guidelines to protect wilderness character.

Suitable uses of these areas are livestock grazing, nonmechanical harvesting of traditional forest products, and compatible outfitter and guide and other uses. Activities that are not suitable in

wilderness study areas include construction of new roads, mechanized and motorized uses, vehicle trails, recreation facilities, timber harvest, fuelwood harvest, and any commercial uses that would have a long-term impact on wilderness character.

Research Natural Areas

The Coronado National Forest has six research natural areas designated in the 1986 plan that will continue to be managed as such with the revised plan. The 1986 plan also recommends extending the boundaries of the Goodding and Pole Bridge Research Natural Areas, decreasing the size of the Santa Catalina Research Natural Area, and establishing the Canelo Research Natural Area. These recommendations are reiterated in the revised plan. In addition, the revised plan under the proposed action recommends designation of the Finger Rock Canyon Research Natural Area on the Santa Catalina Ranger District. Desired conditions, objectives, standards, and guidelines are stated for management of all. Until decisions are made by the Rocky Mountain Research Station director and the regional forester to decrease the size of the Santa Catalina Research Natural Area, it will continue to be managed at its current size.

Other Special Areas

Special areas designated and recommended in the 1986 forest plan as Management Areas 8 and 8A would be managed as such. These include the Wet Canyon Talussnail Area, Wild Chile Botanical Area, Mount Graham Astrophysical and Biological Area (formally the Mount Graham Red Squirrel Refugium), and proposed Guadalupe Canyon Zoological Area from the 1986 plan. A new special area is recommended by the revised plan: the Cave Creek Canyon Birds of Prey Zoological-Botanical Area in the Chiricahua Ecosystem Management Area (see figure 2). This area encompasses the South Fork Cave Creek Zoological-Botanical Area that was recommended in the 1986 plan. For each of these designated and recommended special areas, the revised plan establishes a unique set of plan components to meet management needs.

In addition, the revised plan recognizes two national natural landmark sites within the Coronado National Forest: Onyx Cave and Barfoot Park. National natural landmark sites are designated by the Secretary of the Interior in recognition of the site's nationally significant natural features. In 1974, within the Santa Rita Ecosystem Management Area, roughly 50 acres surrounding Onyx Cave were designated in recognition of the cave's numerous and beautifully-developed shield formations. It is considered one of the finest caves in Arizona. Similarly, designated in 2011, Barfoot Park is located in the Chiricahua Ecosystem Management Area and provides one of the best Madrean-influenced ponderosa pine forests in the United States, and it includes high plant diversity. Within the 680 designated acres is also one of the largest concentrations of well-developed talus slopes, supporting plants and animals not found elsewhere at this site.

The plan also recognizes the Bighorn Sheep Management Area, a special area in the Santa Catalina Ecosystem Management Area established in coordination with the Arizona Game and Fish Department. The latter area differs from other special areas designated by the Coronado because it establishes rules for public behavior, rather than national forest management actions.

Eligible Wild, Scenic, and Recreational Rivers

This management area is newly added in the revised forest plan. It was not included in the 1986 plan, because eligibility of forest streams for designation as wild, scenic, or recreational rivers had not yet been determined. It comprises 16 river segments that meet eligibility criteria for future designation as wild, scenic, or recreational rivers (table 6). Wild, scenic, and recreational rivers management areas are depicted in the revised plan on the ecosystem management area maps as an overlay across areas in which they occur (see figures 5, 9, 12, 13, and 16 in the revised plan). For example, if a wild, scenic, or recreational river is located in a Wild Backcountry Land Use Zone, it is shown on the map as an overlay on the Wild Backcountry Land Use Zone.

Table 6. List of streams on the Coronado National Forest that are eligible for wild, scenic, and recreational river designation. These are common to the proposed action, alternative 1 and alternative 2.

Eligible River Segment	Classification	Outstandingly Remarkable Values	Area (acres)	Length (miles)	Ecosystem Management Area
Ash Creek	Recreation	Scenic, recreation, wildlife, fish, historic, cultural, and ecological	2,019	6.2	Pinaleño
Grant Creek	Recreation	Scenic, recreation, wildlife, fish, historic, cultural, and ecological	1,800	5.0	Pinaleño
Lower Cañada del Oro	Recreation	Scenic, wildlife, fish, and historic	1,329	3.4	Santa Catalina
Lower Cave Creek	Recreation	Scenic, recreation, geologic, fish, wildlife, historic, cultural, ecological, and riparian	2,329	7.0	Chiricahua
Lower Romero Canyon	Recreation	Recreation, wildlife, fish, historic, and cultural	728	2.2	Santa Catalina
Lower Sabino Canyon	Recreation	Scenic, recreation, wildlife, fish, historic, and cultural	1,094	3.2	Santa Catalina
Cima (Winn Falls) Creek	Wild	Scenic, recreation, wildlife, historic, cultural, and riparian	844	2.5	Chiricahua
Upper Cañada del Oro	Wild	Scenic, wildlife, and fish	2,060	6.0	Santa Catalina
Upper Romero Canyon	Wild	Scenic, recreation, wildlife, fish, and cultural	2,163	6.1	Santa Catalina
Upper Sabino Canyon	Wild	Scenic, recreation, wildlife, historic, and cultural	2,629	8.0	Santa Catalina
Upper South Fork Cave Creek	Wild	Scenic, recreation, wildlife, fish, historic, and riparian	2,227	6.2	Chiricahua
Rucker Creek	Wild	Scenic, recreation, wildlife, fish, and geologic	2,048	5.9	Chiricahua
Lower South Fork Cave Creek	Scenic	Scenic, recreation, wildlife, fish, geologic, cultural, riparian, and ecological	439	1.4	Chiricahua
Post Creek	Scenic	Scenic, recreation, wildlife, fish, and cultural	785	2.2	Pinaleño
Redfield Canyon	Scenic	Scenic and wildlife	2,159	9.1	Galiuro
Sycamore River	Scenic	Scenic, recreation, wildlife, fish, historic, cultural, and ecological	1,759	5.0	Tumacacori
Total Acres			**26,412**	**79.4**	

Desired conditions are given for each classification (wild, scenic, or recreational) to guide their management. The revised forest plan incorporates a standard requiring that conditions and outstanding remarkable values be preserved in those segments that qualify for wild, scenic, or recreational river classification. All other plan direction for specific land use zones or special areas in which these eligible rivers occur applies in addition to direction related to wild, scenic, or recreational eligibility.

Geographic Areas

Each of the 12 mountain ranges on the Coronado is designated as a specific ecosystem management area. The revised plan lists the same ecosystem management areas as the 1986 plan. Forest plan components for each ecosystem management area are included in the revised plan to direct management toward achieving desired conditions.

Meeting the Needs for Change – Proposed Action

The following sections discuss revised plan direction under the proposed action as it relates to the needs for change.

Ecosystem Restoration and Resiliency

In general, the revised plan includes components to facilitate the restoration and/or remediation of degraded resources and sustain healthy ecosystems into the future. These were developed based on the best available scientific information to date.

The forest plan includes various components that address the resource threats posed by invasive, nonnative plants and animals and emphasizes the need for management to reduce threats to aquatic species. It recommends additional wilderness and other special management areas that would prohibit the use of motor vehicles and mechanized equipment, except in special circumstances, thereby decreasing the potential for adverse effects on resources from such activities. In addition, facilities that support off-highway vehicle recreation (loading ramps and trails limited to off-highway vehicle use) or other activities that inherently have a high potential to disrupt ecosystem structure and function are deemed unacceptable across all but 4,857 acres (the Motorized Recreation Land Use Zone) of the national forest. No areas are identified as suitable for commercial timber production.

Specifically, the revised plan includes the following content for meeting the need for ecosystem restoration and resiliency.

Vegetation: Detailed desired conditions are established for 10 communities, based on a thorough review of literature and the current scientific understanding of the historic range of variation in composition, structure, and ecological processes represented in these communities. The desired conditions are reckoned to be sustainable over time and resilient to disturbances.

Objectives are identified by ecosystem management area for situations where management action is needed to attain desired conditions, especially for landscapes at risk from uncharacteristic wildfire. Standards and guidelines are established to guide future site-specific project design so that vegetation will be protected from the potential effects of future site-specific management actions.**Wildlife, Fish and Rare Plants:** Detailed desired conditions are identified and objectives are stated for achieving them when management action is needed to sustain and/or improve (restore) resource conditions. Standards and guidelines are defined to protect species from the potential effects of future site-specific management actions.

Physical Resources: Desired conditions are specified for air, water, and soil resources, and objectives are stated for achieving them when management action is needed to sustain and/or improve conditions. Standards and guidelines are established to protect physical resources from the potential effects of future site-specific management actions.

Biophysical Habitat: Detailed desired conditions are identified for biophysical habitats, including caves, abandoned mines, and adits[9], and objectives are stated for attaining them when management action is needed to sustain and/or improve conditions. Standards and guidelines are defined to protect them from the potential effects of future site-specific management actions.

Climate Change: The revised plan specifies desired conditions for resources vulnerable to the effects of climate change and recommends specific management approaches toward their developing adapting and becoming resilient. Current scientific information regarding the effects of climate change was used to develop guidance in the revised plan. It is presented as a general description of anticipated changes in conditions as they are known to a reasonable level of certainty. In addition, desired conditions are identified for affected resources toward improving their resiliency and increasing their capacity to adapt to changing biological, chemical, and physical conditions, including, but not limited to, drought and atmospheric warming.

Visitor Experiences

The revised forest plan provides detailed desired condition statements for forestwide recreation, motorized transportation, and scenery. Management areas that satisfy visitor expectations and provide a wide range of visitor experiences are designated across the Coronado.

Quiet recreation is emphasized on about 60 percent of forest lands, motorized access on 38 percent, and less than 1 percent for developed facilities that support off-highway vehicle recreation, such as loading ramps and loop trails. The proposed action provides less area emphasized for motorized recreation than alternative 2.

The Coronado National Forest would continue to manage eight areas as designated wilderness. The revised plan recommends congressional designation of four areas as wilderness: Mount Graham (61,315 acres), Ku Chish (26,245 acres), Chiricahua Addition North (5,013 acres), and Whetstone (16,317 acres) Recommended Wilderness Areas. The need for quiet recreation experiences is addressed by the plan's recommended wilderness areas, wilderness study areas, and other special management areas, as these areas emphasize naturalness and solitude.

Unique management challenges presented by illegal activities that occur on forest lands along the international border with Mexico are addressed by the revised plan. A desired condition is expressed regarding visitor safety across the Coronado, with emphasis on management of high-traffic smuggling areas. An objective is established in the plan for the removal of trash that accumulates on the national forest from illegal activities.

Access to National Forest System Lands

The proposed action includes detailed desired condition statements for the establishment and maintenance of reasonable motorized and nonmotorized access to the Coronado. Objectives, guidelines, standards, and management approaches are established to facilitate progress toward achieving desired conditions. The plan also identifies geographic areas where improved access is necessary, but currently very limited or nonexistent. In this regard, it specifies plan components for land ownership adjustments and boundary management in support of increasing acquisition of rights-of-way for establishing and maintaining permanent legal access.

Those wilderness areas recommended by the proposed action would not interfere with legal motorized access to the Coronado.

[9] An adit is an entrance to an underground mine which is horizontal or nearly horizontal.

Preservation of Open Space

The proposed action emphasizes preservation of open space in components that address range management, wildlife, and scenery. A desired condition statement for range management is dedicated to managing "working landscapes" (e.g., grazing allotments) as open space. Plan components for wildlife management emphasize wildlife habitat linkages that extend across land ownership boundaries. Scenic quality components emphasize the aesthetic and recreational benefits of vast, open natural landscapes. The proposed action also recognizes the interconnected nature of recreation activities on National Forest System lands and adjacent open space, such as trails.

The revised plan asserts that private lands within and adjacent to the Coronado are valuable as natural open space, toward the goal of encouraging adjacent land owners to consider managing their land for this purpose, rather than developing it. Direction in this regard also recommends that management of open space by Coronado National Forest staff be compatible with, and complementary to, the context of the surrounding landscape in order to preserve open space and ecosystem functions. The plan identifies key wildlife corridors that benefit from the preservation of open space in specific areas. The plan addresses the complications posed by attempting to manage wildfire in developed settings by encouraging such management in natural settings that are resilient to all disturbances.

Communities, Collaboration, and Partnerships

The revised forest plan emphasizes collaboration as an effective management strategy for most resource and social elements. In terms of service to communities, the proposed action includes plan components specific to tribal relations, special use management, collection of forest products, range management, recreation, and tourism, with emphasis on productive and positive partnerships with communities that depend on the Coronado for cultural or economic well-being.

The emphasis on collaboration is designed to address the need for more effective management and for accomplishing work with the help of others through improved relationships. The well-defined goals, objectives, standards, guidelines, and suitability determinations will serve as management direction for the mutual benefit of partners and the Forest Service.

Alternative 1: Emphasis on Wilderness

General Overview – Alternative 1

Alternative 1 contains the same components as the proposed action with one exception: in response to public interest, alternative 1 recommends that 255,908 acres be designated as wilderness under the heading "Wilderness Study Areas and Recommended Wilderness" (see table 7 and figures 36 through 47 in appendix L). Additional wilderness parcels under alternative 1 were chosen after they and several other parcels were screened against Forest Service wilderness criteria and the results documented in the "Potential Wilderness Evaluation Report" (USDA FS 2013).

Important criteria for selection include, but are not limited to, the following:

- identified currently as a wilderness study area
- an area of high public interest for wilderness designation
- a manageable addition of land to a current wilderness
- an area currently managed for wilderness character because of its relative inaccessibility
- an area that rated highly for both capability and need in the Potential Wilderness Evaluation Report

The Coronado National Forest leadership team approved parcels listed in table 7 to be recommended by alternative 1 for congressional designation as wilderness.

Table 7. Areas recommended for wilderness designation in alternative 1

Parcel Name	Alternative 1 Acres
Dragoon	14,211
Ku Chish*	26,245
Bunk Robinson WSA	19,062
Whitmire Canyon WSA	12,163
Chiricahua Addition West	2,731
Chiricahua Addition North*	5,013
Jhus Canyon	10,219
Tumacacori	37,330
Mount Wrightson Addition	14,395
Mount Fagan	6,256
Whetstone*	16,317
Winchester	7,207
Galiuro Addition	16,891
Mount Graham WSA*	61,315
Santa Teresa Addition North	3,415
Santa Teresa Addition South	3,138
Total	255,908

* Areas also recommended by the proposed action

Meeting the Needs for Change – Alternative 1

Alternative 1 responds to the five needs for change topics in the same manner as reported for the proposed action and, further, it better addresses the need for management direction regarding **ecosystem restoration and resiliency** by proposing 147,018 acres of wilderness more than the proposed action, and 194,593 more than alternative 2. Under alternative 1, management of these lands would be dominated by natural processes. Mechanized and motorized uses would be permitted on a limited case-by-case basis to serve management purposes only and would not be permitted to alter the landscape permanently.

Alternative 1 would better address the need for change regarding **visitor experiences** by increasing opportunities for quiet recreation and other nonmotorized uses of the Coronado. However, this alternative would provide fewer areas for motorized recreation than alternative 2. The needs for change related to **access to National Forest System lands, preservation of open space, and communities, collaboration, and partnerships** would be the same as described above for the proposed action.

Alternative 2: Emphasis on Motorized Recreation

General Overview – Alternative 2

Alternative 2 emphasizes motorized recreation beyond what is specified in the plan under the proposed action and alternative 1. Alternative 2 proposes a Motorized Recreation Land Use Zone of 45,117 acres—that is 40,255 more than the proposed action and alternative 1 (see table 8 and figures 48 through 59 in appendix L). Alternative 2 does not recommend any additional wilderness or research natural areas, but carries forward the 1986 plan recommendations. Unlike the proposed action and alternative 1, this alternative does not contain plan components (desired conditions and

management approaches) for managing resources in response to climate change. Alternative 2 does, however, incorporate potential strategies for response to climate change on the Coronado (see appendix A, revised forest plan).

Table 8. Acres allocated to Motorized Recreation Land Use Zone in each ecosystem management area, by alternative

Ecosystem Management Area	No Action (Acres)	Proposed Action (Acres)	Alternative 1 (Acres)	Alternative 2 (Acres)
Chiricahua	0	0	0	0
Dragoon	0	0	0	0
Peloncillo	0	0	0	0
Santa Rita	0	824	824	23,478
Tumacacori	0	0	0	0
Huachuca	0	619	619	677
Whetstone	0	0	0	0
Galiuro	0	0	0	0
Pinaleño	0	883	883	4,821
Santa Teresa	0	0	0	0
Winchester	0	0	0	0
Santa Catalina	0	2,537	2,537	16,141
Total*	0	4,863	4,863	45,117

*Acres are approximate and may not sum the exact total due to rounding.

In proposing alternative 2, the Forest Service is being responsive to input provided during the plan revision public involvement process that requested increased motorized recreation opportunities. With a dedicated and sizeable Motorized Recreation Land Use Zone, motorized recreational facilities, such as off-loading ramps, courses for different skill levels, and trails, could be concentrated in areas where such use is already prevalent and where sensitive resources are minimal.

Alternative 2 recognizes the eight previously designated wilderness areas on the Coronado and three previously designated wilderness study areas (Mount Graham, Bunk Robinson, and Whitmire) (see “Proposed Action” section). It carries forward only one additional area from the 1986 plan recommendation for designation, the Mount Graham Recommended Wilderness Area (61,315 acres), identified in the proposed action and alternative 1.

Like the proposed action and alternative 1, alternative 2 carries forward the 1986 plan recommendations for the six existing research natural areas (including reduction of the Santa Catalina Research Natural Area); one new research natural area (Canelo Hills); and two extensions (Goodding and Pole Bridge). Unlike the proposed action, alternative 2 does not recommend designation of the Finger Rock Canyon Research Natural Area and the Cave Creek Canyon Birds of Prey Zoological-Botanical Area.

Meeting the Needs for Change - Alternative 2

Alternative 2 responds to the five needs for change topics in the same manner as reported for the proposed action. In addition, it responds to the need for management direction regarding **ecosystem restoration and resiliency** by localizing the impacts of motorized recreation in previously developed settings designated for such use. Increasing the size of the Motorized Recreation Land Use Zone will allow areas to recover where resource damage has occurred because of irresponsible vehicle use. In these areas, alternative 2 encourages infrastructure to channel recreational uses to support both

motorized and quiet recreation. While alternative 2 would **enhance visitor experiences** by increasing forestwide motorized recreational use areas and minimizing the number of recommended wilderness designations it provides fewer areas for quiet and nonmotorized recreation compared to the proposed action and alternative 1. The needs for change related to **access to National Forest System lands, preservation of open space, and communities, collaboration, and partnerships** would be the same as described above for the proposed action and alternative 1.

Alternatives Eliminated from Detailed Consideration

Federal agencies are required by Council of Environmental Quality regulations to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received up until the release of this environmental impact statement suggested several alternative options for satisfying the purpose of and need for agency action. The following alternatives were considered but dismissed from further evaluation in this environmental impact statement for the reasons summarized below.

No Grazing

A “no grazing” alternative was recommended as an alternative based on concerns about conservation, the recovery of native biological diversity, and the need for restoration of natural processes that shape forest ecosystems and allow them to adjust to climate change. This alternative would eliminate all livestock grazing on the Coronado. Currently, grazing is permitted on approximately 82 percent of the national forest and managed in accordance with individual allotment management plans. This alternative was dropped from further consideration because, given that the range resource is already actively used on the Coronado, this alternative would violate the Multiple Use-Sustained Yield Act and the National Forest Management Act.

Thirty-one Areas Recommended for Wilderness

In the Potential Wilderness Area Evaluation Report, 33 parcels were evaluated against Forest Service criteria for recommendation as wilderness. Sixteen of these were recommended as wilderness under alternative 1. Although all areas met the evaluation criteria, 17 of them did not fully meet the Coronado’s needs for change; therefore, they were excluded from detailed consideration in this environmental impact statement.

Potential Wilderness Areas Requested for Consideration

During planning for the plan revision, the Coronado staff received various maps from members of the public with requests that specific areas be considered for recommendation as wilderness. Although portions of some mapped areas met Forest Service criteria for potential wilderness, none of them in their entirety was considered viable. Where feasible, portions of mapped areas were incorporated into wilderness recommendations under alternative 1.

Maximize Certain Resources

Comments supported developing an alternative that maximizes ecological systems for protection of wildlife, vegetation, riparian areas, watershed, soils, and range while also incorporating the effects of climate change on ecosystems. Focusing an alternative on ecological climatic changes it would not meet the legal requirements of the National Forest Management Act or Multiple Use-Sustained Yield Act, which require forests to be managed using multiple use, sustained yield principles. Further, given that the purpose of this analysis is to revise a current forest plan that is designed to continue to meet the multiple use mandate, maximization of ecological systems at the expense of other resources does not meet the purpose and need.

Minimal or No Management

Some comments favored an alternative that involves minimal or no management on the Coronado National Forest; to let natural processes dominate without human intervention. Active management is needed to maintain or move toward desired conditions of restoring forest ecosystems; maintaining recreation opportunities; reducing the threat of uncharacteristic wildfires to communities, and maintaining the availability of forest products. This alternative was not considered in detail because it would not meet the purpose and need identified in chapter 1 nor would it meet legal requirements of the National Forest Management Act of 1976, the Multiple Use-Sustained Yield Act of 1960, and the Endangered Species Act of 1973. Taking a "hands-off approach" would not meet our current needs for change and did not meet the needs for change in the development of the 1986 plan (see "Purpose and Need," chapter 1) therefore, this topic did not drive alternative development.

Reduced Grazing

There was a request that two alternatives be developed in which a 25 and 50 percent reduction in actual stock numbers would be analyzed. The forest plan does not specify stock numbers or stocking rates, so these alternatives were not analyzed in detail. Further, in response to the issue that "Livestock grazing by cattle causes watershed, stream, and grassland degradation," the forest considered a reduced grazing alternative, but concluded that the livestock grazing program has multiple mechanisms to evaluate, review, and adapt management as needed to effectively protect resources and respond to changing conditions. The effects from grazing in each range allotment are evaluated and adjusted (1) throughout the season, particularly when pasture rotation is being determined; (2) in detail at the beginning of the season when the annual operating instructions are determined; and (3) comprehensively on 10- to 15-year intervals, or more frequently when needed, as grazing is periodically reauthorized through the environmental analysis process. This allows for any needed adjustments to be made on a site-specific basis to maintain and move toward desired conditions for watersheds, wildlife habitat, and other resources. For these reasons, an alternative that would have a reduced level of grazing across the forest was not studied in detail.

No New Road Construction

Some public comments requested that, during the plan revision process, no new roads or unauthorized routes be added to the transportation system. The land management plan provides a framework to guide new road construction to reduce impacts to sensitive resources. Potential changes or additions to the forests' transportation system are not plan level decisions and would be evaluated in separate analysis through implementation of the Travel Management Rule (73 Federal Register 74689). As a result, this alternative was dropped from detailed consideration.

Comparison of Alternatives

Table 9. Primary differences in various elements of the revised forest plan among the four alternatives

Distinguishing Elements of Draft Revised Plan	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Developed Recreation Land Use Zone	NONE[1]	37,264 acres	35,986 acres	36,784 acres
Motorized Recreation Land Use Zone	NONE	4,862 acres	4,862 acres	45,117 acres
Roaded Backcountry Land Use Zone	NONE	595,497 acres	582,172 acres	557,039 acres
Wild Backcountry Land Use Zone	NONE	596,127 acres	489,975 acres	594,810 acres
Potential Natural Vegetation Types[2]	Desert: 175,452 Grasslands: 407,477 Interior chaparral: 151,181 Madrean encinal woodland: 738,693 Madrean pine-oak woodland: 142,047 Ponderosa pine-evergreen shrub: 39,477 Mixed-conifer (wet and dry): 55,451 Spruce-fir: 3,014 Montane meadows, wetlands and riparian areas: 5,142	All potential natural vegetation types same as no action	All potential natural vegetation types same as no action	All potential natural vegetation types same as no action
Suitable Timber	5,000 acres	0	0	0
Allowable Sale Quantity	Unknown	0	0	0
Long-term Sustained Yield	Unknown	0	0	0
Total Wilderness[3]	430,858 acres[4]	478,433 acres[4]	599,189 acres[4]	539,748 acres[4]
Designated Wilderness Areas	(8 areas) 338,318 acres	338,318 acres	338,318 acres	338,318 acres
Designated Wilderness Study Areas	(3 areas) 92,540 acres	92,540 acres	92,540 acres	92,540 acres
Recommended Wilderness Areas	(1 area) 61,315 acres	(4 areas) 108,890 acres	(16 areas) 255,908 acres	(1 area) 61,315 acres [5]
Total Research Natural Areas	9,082 acres[6]	10,184 acres[7]	10,184 acres[7]	9,082 acres[6]
Designated Research Natural Areas[8]	(6 areas) 6,900 acres	6,900 acres	6,900 acres	6,900 acres

Distinguishing Elements of Draft Revised Plan	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Recommended Research Natural Areas[9]	(3 areas) 2,182 acres	(4 areas) 3,284 acres[10]	(4 areas) 3,284 acres[10]	(3 areas) 2,182 acres
Total Zoological-Botanical Areas	9,062 acres	34,040 acres	34,040 acres	9,062 acres
Designated Zoological-Botanical Areas	(3 areas) 4,840 acres	4,840 acres	4,840 acres	4,840 acres
Recommended Zoological-Botanical Areas	(2 areas) 4,222 acres	(3 areas) 29,200 acres[11]	(3 areas) 29,200 acres	(2 areas) 4,222 acres
Eligible Wild, Scenic, and Recreational Rivers	NONE	79.4 miles (26,412 acres)	79.4 miles (26,412 acres)	79.4 miles (26,412 acres)
Resource Direction Regarding Response to Climate Change[12]	NO DIRECTION	FULL DIRECTION (Includes Plan Components)	FULL DIRECTION (Includes Plan Components)	LIMITED DIRECTION (No Plan Components)
Present Net Value[13]	- $46,144,923	Same as no action	Same as no action	Same as no action

1. The 1986 forest plan did not have land use zones
2. See table 29 in chapter 3
3. Includes Coronado National Forest designated wilderness, designated wilderness study areas, and recommended wilderness areas
4. Mount Graham Wilderness Study Area is also recommended wilderness across alternatives, therefore it is only counted once for total wilderness acres
5. Proposes no new wilderness, but carried forward 1986 plan recommendation to designate the designated Mount Graham Wilderness Study Area as a wilderness area
6. Proposed reduction of Santa Catalina Research Natural Area to 634 acres would change this total to 5,676 acres
7. Proposed reduction of Santa Catalina Research Natural Area to 634 acres would change this total to 6,778 acres
8. Butterfly Peak, Elgin, Gooding, Goudy, Pole, and Santa Catalina (includes 4,040 acres for the Santa Catalina Research Natural Area since this area was never reduced following the 1986 plan)
9. Carried forward from the 1986 plan are recommendations for the Goodding and Pole Bridge Research Natural Area Extensions (Douglas Ranger District) and the new Canelo Research Natural Area (Sierra Vista Ranger District)
10. These include the three proposed research natural areas in footnote 9 and a proposed new research natural area, Finger Rock Canyon, on the Santa Catalina Ranger District
11. Guadalupe Canyon, South Fork Cave Creek Zoological-Botanical Area, and South Fork Cave Creek Birds of Prey (which encompasses the South Fork Cave Creek Zoological Botanical Area)
12. See table footnote 1 on page 56
13. Expenditures exceed revenues

The following tables provide a comparison of the potential effects of alternatives on various forest resources under Need for Change Topic 1: Ecosystem Restoration and Resiliency. This topic is focused on the need for updated direction, improved direction, or both regarding habitat conservation and restoration, species conservation, management of vegetative fuels, management of and ecological responses to wildfire, management of invasive species, and responding to the effects of climate change.

Table 10. Comparison of potential effects of alternatives on vegetation communities

Vegetation Communities	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Desert (9.6% of Coronado National Forest)	No treatments • No plan components for management of desert vegetation. • No buffelgrass management direction. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area: reduction in direct damage, less vectors for invasive plants, less adverse effects from exhaust. • Least successful alternative in developing resource adaptation and resiliency to conditions that result from climate change. Results in decreased health and vigor of vegetation, increased plant susceptibility to insects and disease; and lower overall productivity as available water and soil nutrients decline, among other negative effects.	Treatment = 10,000 to 15,000 acres every 10 years. • Includes plan components to manage desert vegetation. • Specifies targets for buffelgrass treatments (see acres above). • Potential positive effects (see "No Action" heading) from restriction on motorized and mechanized uses in four recommended wilderness areas. • Includes desired conditions and management approaches for climate change. • Includes plan components for other resources to develop adaptation and resiliency to climate change. Positive benefit on desert vegetation.	Treatment = 10,000 to 15,000 acres every 10 years. • Same plan components and effects as reported for the proposed action, but recommends 16 wilderness areas. • Greatest potential positive effects (see "No Action" heading) because of restriction on motorized and mechanized uses in 16 recommended wilderness areas.	Treatment = 10,000 to 15,000 acres every 10 years. • Same plan components as the proposed action, but larger Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Greatest negative impact on desert vegetation from potential increased motorized recreation • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area include reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1 but better than no action.

Vegetation Communities	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Grasslands (24.7% of Coronado National Forest)	Treatment = 36,000 acres • No plan components for management of grassland • Manages grassland for range (i.e., forage) purposes. • Treatments focus on invasive species, not structure, composition, and function of grasslands. • Resulting shrub encroachment and loss of herbaceous cover adversely affects water infiltration and increases erosion and runoff. • Effects of designating one recommended wilderness area and lack of climate change direction would be the same as described for "No Action" under "Desert."	Treatment = 72,500 acres every 10 years • Includes plan components to manage grasslands. • Manages grasslands to create an open community and restore historic low-intensity fire to the ecosystem. • Fire improves nutrient cycling. Growth of herbaceous cover (i.e., forage) results. • Results in improved water infiltration and resiliency to natural disturbances. • Same effects of new recommended wilderness and climate change direction same as described under "Proposed Action" for "Desert."	Treatment = 72,500 acres every 10 years • Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects because of restrictions on motorized and mechanized uses in recommended wilderness are reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust.	Treatment = 72,500 acres every 10 years • Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Greatest negative impact on grasslands from increased motorized recreation in the Motorized Recreation Land Use Zone. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area include reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1 but better than no action.

Vegetation Communities	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Interior Chaparral (8.7% of Coronado National Forest)	Treatment = 0 acres • No plan components for management of chaparral • Manages chaparral for range (i.e., forage) purposes. • Direction encourages conversion of interior chaparral to grassland for range purposes. • Negative result is decreased short-term water yield and availability to plants. • Effects of designating one recommended wilderness area and lack of climate change direction would be the same as described for "No Action" under "Desert."	Treatment = 5,000 acres every 10 years • Includes plan components to manage interior chaparral • Manages chaparral for canopy closure to increase cover for wildlife. • Decreased water yield in the long term because of canopy closure • Effects of new recommended wilderness areas and climate change direction same as those described under "Proposed Action" for "Desert."	Treatment = 5,000 acres every 10 years • Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects because of restrictions on motorized and mechanized uses in recommended wilderness are reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust.	Treatment = 5,000 acres every 10 years • Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Greatest negative impact on chaparral from increased motorized recreation in the Motorized Recreation Land Use Zone. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area include reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1 but better than no action but better than no action.

Vegetation Communities	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Madrean Encinal Woodland (42.9% of Coronado National Forest)	Treatment = 67,000 acres • No plan components for management of Madrean encinal woodland. • Treatments with mechanical and planned ignitions insufficient to reduce overabundant late-seral and very low mid-seral stages. • Results in dense mid-story that decreases wildlife forage and browse; and crowding, which degrades plant health and vigor, including response to climate change. • Effects of designating one recommended wilderness area and lack of climate change direction same as those described for "No Action" under "Desert."	Treatment = 367,000 acres every 10 years • Includes plan components to manage Madrean encinal woodland. • Treatments promote growth of understory grasses and forbs, increasing browse and forage. • Positive benefit is return of historic low-intensity fire. • Shrub encroachment declines as fire treatments progress, which improved habitat quality and availability for certain species. • Decreased mid-story density increased growing space and promoted health and vigor. • Effects of new recommended wilderness areas and climate change direction same as those described under "Proposed Action" for "Desert."	Treatment = 367,000 acres every 10 years • Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects because of restrictions on motorized and mechanized uses in recommended wilderness are reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust.	Treatment = 367,000 acres every 10 years • Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Greatest negative impact on Madrean encinal woodland from increased motorized recreation in the Motorized Recreation Land Use Zone. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area include reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1, but better than no action.

Vegetation Communities	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Madrean Pine-Oak Woodland (8.0% of Coronado National Forest)	Treatment = 21,000 acres • Current departure from desired conditions is significant (74%). • Less treatment in this community compared to the proposed action continues dense overstory with closed canopy and decreased grass and forbs in understory. • Results in decreased forage, limited nutrient cycling, and increased threat of uncharacteristic wildfire. • Plant crowding from density that decreases plant health and vigor. • Effects of designating one recommended wilderness area and lack of climate change direction same as those described for "No Action" under "Desert."	Treatment = 25,000 acres every 10 years • Includes plan components to manage Madrean pine-oak woodland. • Includes desired conditions for coarse-woody-debris, snag, and large tree components important to wildlife habitat. • Proposes mechanical and fire treatments to reduce current departure from 74 to 55%. • Results in decreased tree density and increased structural classes with understory cover. • Increased understory cover improves forage and promotes the return of historic fire. • Decreased overstory density decreases plant crowding and promotes plant health and vigor. • Effects of new recommended wilderness areas and climate change direction same as described under "Proposed Action" for "Desert."	Treatment = 25,000 acres every 10 years • Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects because of restrictions on motorized and mechanized uses in recommended wilderness are reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust.	Treatment = 25,000 acres every 10 years • Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Greatest negative impact on Madrean pine-oak woodland from increased motorized recreation in the Motorized Recreation Land Use Zone. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area include reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1 but better than no action.

Vegetation Communities	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Ponderosa Pine-Evergreen Shrub (2.2% of Coronado National Forest)	Treatment = 10,000 acres • Non-specific plan direction based on habitat needs of Mexican spotted owl and northern goshawk. • Desired condition for habitat are unattainable. • Proposes treatments to reduce departure from 77% to 60%. • Shrub component would decrease with increased canopy closure, as would understory cover that supports northern goshawk habitat. • Continued dense overstory would increase the threat of uncharacteristic wildfire, proliferation of invasive southwest dwarf mistletoe, and crowding. • Recommended wilderness contains 58% of ponderosa pine-evergreen shrub on the Forest. Restrictions on mechanized and motorized uses may slow treatments, but would not prevent them from occurring. • Effects of designating one recommended wilderness area and lack of climate change direction same as those described for “No Action” under “Desert.”	Treatment = 12,500 acres every 10 years • Plan components for ponderosa pine-evergreen shrub include desired conditions at wildland-urban interface. • Mechanical treatments and unplanned and planned ignitions open the canopy and decrease departure from 77% to 46%. • Open canopy improves growing conditions of understory and herbaceous cover. • Supports development and maintenance of large trees, multi-storied structure, snags, and downed woody debris as integrated components of an uneven-aged forest. • Effects of new recommended wilderness areas and climate change direction same as those described under “Proposed Action” for “Desert.” • .Recommended wilderness contains 58% of ponderosa pine-evergreen shrub on the Forest. Restrictions on mechanized and motorized uses may slow treatments, but would not prevent them from occurring.	Treatment = 12,500 acres every 10 years • Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects because of restrictions on motorized and mechanized uses in recommended wilderness are reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust.	Treatment = 12,500 acres every 10 years • Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction • Ponderosa pine-evergreen shrub is not present in the Motorized Recreation Land Use Zone; therefore, adverse effects from vehicle use would not occur. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area include reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1 but better than no action.

Vegetation Communities	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Mixed-Conifer, Wet and Dry (3.1% of Coronado National Forest)	Treatment = 16,200 acres • Non-specific plan direction and unattainable desired conditions based on habitat needs for Mexican spotted owl and northern goshawk. • Direction is not specific to dry and wet mixed conifer. • Effects of designating one recommended wilderness area and lack of climate change direction same as those described for "No Action" under "Desert."	Treatment = 16,200 acres every 10 years • Plan components established for both wet and dry mixed conifer. • Dry mixed conifer • Treat by prescribed thinning and planned and unplanned ignitions. Reduces crowding, which improves plant health and vigor, resiliency, and resistance to insects and disease. Results in increased and higher quality Mexican spotted owl and northern goshawk habitat. • Increased understory improves forage. • Recommended wilderness has 10% of dry mixed conifer on Forest. Restrictions may impede progress of pheromone treatments of insect infestation. • Wet mixed conifer • Plan components support development and maintenance of integrated old growth and large trees, multi-storied structure, snags and downed woody debris. • Recommended wilderness has 9% of wet mixed conifer on Forest. Use restrictions may impede progress of treatments. • Effects of climate change direction same as those described under "Proposed Action" for "Desert."	Treatment = 16,200 acres every 10 years • Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects because of restrictions on motorized and mechanized uses in recommended wilderness are reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust.	Treatment = 16,200 acres every 10 years • Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Mixed conifer is not present in the Motorized Recreation Land Use Zone; therefore, adverse effects from vehicle use would not occur. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area include reduction in direct damage, less introduction of invasive plants, less adverse effects from vehicle exhaust. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1 but better than no action.

Vegetation Communities	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Spruce-Fir Forest (0.2% of Coronado National Forest)	Treatment = 0 acres • Non-specific plan direction and unattainable desired conditions based on habitat needs of Mount Graham red squirrel and northern goshawk. • Completed fuel treatments have only been near facilities and structures. • Effects of designating one recommended wilderness area and lack of climate change direction same as those described for "No Action" under "Desert." • One recommended wilderness area has 7% of spruce-fir forest on the Forest.	Treatment = 0 acres • Plan components support development and maintenance of old growth and large trees, multi-stored structure, snags and downed woody debris. • Direction for old growth is updated to follow current forestry practices • More open conditions at WUI are desired conditions that will moderate fire behavior and protect high-value sites. • Effects of new recommended wilderness areas and climate change direction same as those described under "Proposed Action" for "Desert."	Treatment = 0 acres • Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects because of restrictions on motorized and mechanized uses in recommended wilderness are reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust.	Treatment = 0 acres • Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Spruce-fir is not present in the Motorized Recreation Land Use Zone; therefore, adverse effects from vehicle use would not occur. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area include reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1, but better than no action.

Vegetation Communities	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Riparian Areas[2] (0.2% of Coronado National Forest)	Treatment = 0 acres • Recommends no treatments of upland vegetation, soils, or watersheds. This slows progress toward reference conditions. • Uses an outdated riparian vegetation classification system; this affects how well areas are managed for riparian values and prioritized for protection, restoration, and treatment. • Effects of designating one recommended wilderness area and lack of climate change direction same as those described for "No Action" under "Desert."	Treatment = 2,500 to 10,000 acres every 10 years • Plan components for riparian areas management include desired conditions for channels, flood plains, vegetation, soils, water resources, aquatic biota, and fire. • Proposes a range of treatments and guidelines that address effects of road construction, other vegetation treatments, and livestock grazing. • As recommended by Region 3, the RMAP riparian classification system would be adopted. • Effects of new recommended wilderness areas and climate change direction same as those described under "Proposed Action" for "Desert." • Four recommended wilderness areas; includes 107 acres of riparian vegetation.	Treatment = 2,500 to 10,000 acres every 10 years • Same plan components and effects as reported for the proposed action but recommends more wilderness. • Management for wilderness values would move resources toward attainment of desired conditions for riparian areas. • Greatest potential positive effects because of restrictions on motorized and mechanized uses in recommended wilderness are reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust. There are 346 acres of riparian areas among the recommended wilderness.	Treatment = 2,500 to 10,000 acres every 10 years • Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate change direction. • Development of trails and facilities in Motorized Recreation Land Use Zones, which may include vegetation removal, soil compaction, erosion, sediment runoff to streams, alteration of channel morphology, and introduction and spread of invasive plant species, has the potential to adversely affect 65 riparian acres. • On the other hand, motorized recreation in a Motorized Recreation Land Use Zone may reduce damage and destruction of riparian resources elsewhere on the Coronado. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area include reduction in direct damage, less introduction of invasive plants, and less adverse effects from vehicle exhaust. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1, but better than no action.

Table 11. Comparison of potential effects of alternatives on soils

Soils	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Plan direction and effects to soils	• Plan components for managing disturbances and improving soil conditions where unsatisfactory. • Sets targets for soil treatments. • No direction related to managing motorized recreation to minimize effects of ground disturbances. • Restrictions in one recommended wilderness would protect soils from the effects of ground-disturbing vehicles and equipment. • Effects from the lack of climate change direction are the same as those described for "No Action" under "Desert."	• Desired conditions for soils are linked to desired conditions for vegetation types they support to ensure optimum soil function and productivity. • Desired conditions for ground cover and coarse woody debris to ensure optimum soil function. • Desired conditions address uses and activities that impact soils, such as grazing. • Potential positive effects on soils from restrictions on mechanized and motorized uses in four recommended wilderness areas because of reduction in ground-disturbing activities. • Progress of soil, watershed, and vegetation treatments may be hindered by wilderness restrictions. • Direction to manage responses to climate change would decrease potential effects on soil structure and productivity.	• Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects on soils because of restrictions on mechanized and motorized uses in recommended wilderness because of reduction in ground-disturbing activities. • Progress of proposed treatments of soils, vegetation, and watersheds may be hindered by restrictions on motorized uses and equipment in wilderness.	• Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Greatest potential negative effects on soils in Motorized Recreation Land Use Zones include increased compaction and erosion and runoff resulting from vehicle use and ground disturbance. • Potential positive effect on soil, watershed, and vegetation treatments in areas of Motorized Recreation Land Use Zones only accessible by off-highway vehicles. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1, but better than no action.

Table 12. Comparison of potential effects of alternatives on water

Water	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Plan direction and effects to water	• Plan direction does not reflect current water resource management objectives and practices. • Plan lists no objectives for treating water resources to improve water quality. • Plan has no desired conditions for future watershed quality and function. • Direction applies to improving individual water resources rather than each entire watershed. • Watershed function is static. • Wilderness restrictions would increase protection of water resources from ground-disturbing effects. • Least effective at managing effects on water resources from atypical temperatures and rainfall patterns associated with climate change. Water quality could be degraded by increased erosion, runoff, and sedimentation and water yield and availability may decrease with warmer, drier conditions.	• Desired conditions for attainment of all state and federal water quality standards, retention of wetlands and floodplains, and meeting Forest and public needs. • Desired conditions for both individual waters and entire watersheds are basis for treatments. • Goals for acquiring in-stream-flow water rights, improving springs, and restoring streams for riparian habitat and recreational uses. • Recommends total maximum daily loads for streams. • Management direction regarding climate change would decrease potential effects on water resources and help develop their resiliency to specific stressors.	• Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects on water resources because of wilderness restrictions that decrease ground-disturbing activities. • Proposed treatments of soils, vegetation, and watersheds may be slowed by wilderness restrictions.	• Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Greatest potential negative effects on water resources within and downstream of Motorized Recreation Land Use Zones from erosion and runoff resulting from vehicle use and ground disturbance. • Potential positive effect on watershed treatments in areas of Motorized Recreation Land Use Zones only accessible by off-highway vehicles. • Potential positive effects from restrictions on motorized and mechanized uses in one recommended wilderness area. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1 but better than no action.

Table 13. Comparison of potential effects of alternatives on air quality

Air Quality	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Plan direction and effects to air quality	• Direction tiered to Clean Air Act and amendments. • Does not manage air-quality-related values class I areas. • Use restrictions in one recommended wilderness would reduce vehicle exhaust and fugitive dust emissions. • Least successful at managing responses to climate change. Sources of air pollutants that contribute to climate change are not managed.	• Establishes desired conditions for both air quality and air-quality-related values, including public health and visibility. • Recommends approaches for managing emissions from wildfire and planned fire ignitions. • Use restrictions in four recommended wilderness areas would reduce vehicle exhaust and fugitive dust emissions. • Manages sources of emissions that contribute to global warming.	• Same plan components and effects as reported for the proposed action, but recommends more wilderness. • Greatest potential positive effects on air quality because of wilderness restrictions that decrease ground-disturbing activities and exhaust emissions, but may impede progress of soil, vegetation, and watershed projects.	• Same plan components as the proposed action, but largest Motorized Recreation Land Use Zone, no new wilderness and special area designations, and limited climate-change direction. • Air quality degradation would be greatest in Motorized Recreation Land Use Zones where vehicle use would be concentrated. • Wilderness restrictions in one recommended wilderness reduce vehicle exhaust and fugitive dust emissions. • Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1 but better than no action.

Table 14. Comparison of potential effects of alternatives on climate change

Climate Change[1]	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Plan direction and effects from climate change	• Plan does not provide direction for managing resources to develop adaptation and resiliency to the effects of climate change. Least effective alternative in addressing the potential negative effects of climate change on Forest resources. • Does not recommend Finger Rock Canyon Research Natural Area, where climate change research could occur.	• Establishes desired conditions and management approaches for individual resources and uses or activities. • Resources benefit from acquired adaptation and resiliency to stressors created by climate change, e.g., decreased water availability, susceptibility to insect and disease, increased temperatures, atypical rainfall, flooding, wildfire. • Recommends the Finger Rock Canyon Research Natural Area, where climate change research could occur.	• Same plan direction and effects as the proposed action, but would benefit the most recommended wilderness.	• Less successful at fostering adaptation and resiliency to the effects of climate change than the proposed action and alternative 1 but better than no action.

1. The 1986 plan (no action) contains "no direction" regarding the management of Coronado National Forest resources to develop resiliency and adaptation to the potential effects of climate change, which was much less well defined in 1986 than today.

The proposed action and alternative 1 include both (1) "plan components" in the body of the revised forest plan and (2) an overarching strategy for responding to disturbances resulting from climate change in appendix A of the plan. Plan components include "desired conditions" for developing resiliency and adaptation in resources to anticipated warmer and drier conditions in the Southwest and "management approaches" to move resources toward attaining desired conditions.

Alternative 2 does not include "plan components" in the revised plan. It does incorporate the overarching strategy for responding to disturbances resulting from climate change in appendix A of the revised plan.

Table 15. Comparison of potential effects of alternatives on species diversity and viability[10] with a focus on federally listed species[11]

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Jaguar (endangered)	• Population trend = Negative • Habitat trend = Negative • Endangered Species Act (ESA) determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • No plan components for this species • Proposed vegetation and watershed management project may reduce available cover • Treatments would improve prey base because of increased plant vigor • Restriction on motorized uses in new recommended wilderness area would reduce the potential for jaguar mortality from vehicle collisions in recommended wilderness	• Population trend = Negative • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Plan components integrate current science and the strategy for jaguar recovery plan • Proposed treatments and new recommended wilderness area recommendations would have the same effects as no action • Proposed action has three more recommended wilderness areas than no action, therefore, the area where motorized uses would be restricted would be larger, and jaguar-vehicle collisions would likely decrease proportionately	• Population trend = Negative • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Same components and effects as proposed action • The decrease in jaguar mortality from vehicle collisions would be greater than the other alternatives because of the increased acreage of wilderness recommended by alternative 1	• Population trend = Negative • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Same components and effects as proposed action • The increased allocation of land for motorized recreation zones by alternative 2 would temporarily displace animals in the vicinity of these activities • The effect of new recommended wilderness would be the same as no action
Ocelot (endangered)	Same as reported for Jaguar (except there is no designated critical habitat)	Same as reported for Jaguar (except there is no designated critical habitat)	Same as reported for Jaguar (except there is no designated critical habitat)	Same as reported for Jaguar (except there is no designated critical habitat)

[10] The effects of climate change on wildlife are dependent on individual resource health within suitable habitat, by species. See the discussions under each resource in this table.

[11] Species listed under the Endangered Species Act

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Mexican gray wolf (endangered, experimental population)	• Population trend = Negative • Habitat trend = Negative • ESA determination = not likely to jeopardize in proposed 10(j) area • Critical habitat = not applicable • No plan components for this species • Proposed vegetation and watershed management project may reduce available cover • Treatments would improve prey base because of increased plant vigor • Restriction on motorized uses in new recommended wilderness area would reduce the potential for wolf mortality from vehicle collisions in recommended wilderness	• Population trend = Negative • Habitat trend = Positive • ESA determination = not likely to jeopardize in proposed 10(j) area • Critical habitat = not applicable • Plan components integrate current science and the strategy for wolf recovery program • Proposed treatments and new recommended wilderness area recommendations would have the same effects as no action • Proposed action has three more recommended wilderness areas than no action, therefore, the area where motorized uses would be restricted would be larger, and wolf-vehicle collisions would likely decrease proportionately	• Population trend = Negative • Habitat trend = Positive • ESA determination = not likely to jeopardize in proposed 10(j) area • Critical habitat = not applicable • Same components and effects as proposed action • The decrease in wolf mortality from vehicle collisions would be greater than the other alternatives because of the increased acreage of wilderness recommended by alternative 1	• Population trend = Negative • Habitat trend = Positive • ESA determination = not likely to jeopardize in proposed 10(j) area • Critical habitat = not applicable • Same components and effects as proposed action • The increased allocation of land for motorized recreation zones by alternative 2 would temporarily displace animals in the vicinity of these activities • The effect of new recommended wilderness would be the same as no action

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Mount Graham red squirrel (endangered)	• Population trend = Positive • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Numerous standards and guidelines specific to management of mixed conifer and spruce fir as squirrel habitat • Does not overly limit restoration activities within Mount Graham red squirrel habitat so as to increase the risk of uncharacteristic fire or impede habitat improvement necessary to sustain the Mount Graham red squirrel population	• Population trend = Positive • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Plan components integrate current science and Mount Graham red squirrel recovery plans • Direction includes a hierarchy among species for site-specific decision-making, with Mount Graham red squirrel needs above all others • Other direction relates to mitigating effects of recreation and protecting middens • No new recommended wilderness area in Mount Graham red squirrel habitat	• Population trend = Positive • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Plan direction is same as proposed action • No new recommended wilderness area in Mount Graham red squirrel habitat	• Population trend = Positive • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Plan direction is same as proposed action • Proposed motorized recreation zone in Stockton Pass is far enough from Mount Graham red squirrel habitat to not be a threat to the population or habitat

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Lesser long-nosed bat (endangered, proposed for delisting)	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Provides direction regarding management of caves and roosts and protection of food sources (agaves and saguaros), such as excluding grazing in foraging habitat • Does not provide desired conditions for lesser long-nosed bat foraging habitat • Vegetation in lesser long-nosed bat habitat would remain similar to current conditions because grasslands and other types would continue to be managed for range purposes that also suit the lesser long-nosed bat • Bat habitat in new recommended wilderness area would benefit from use restrictions	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Direction based on current science would result in vegetation trends toward desired conditions, improving lesser long-nosed bat habitat quality, decreasing threats, and protecting food sources (e.g., agave, saguaro) • Addresses bat habitat more fully than no action by including both roosting and foraging areas • Bat habitat in new recommended wilderness areas would benefit from use restrictions.	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Plan direction is same as proposed action • Additional areas recommended as wilderness support lesser long-nosed bat habitat. Positive effects on bat habitat would be greatest under alternative 1.	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Plan direction is same as proposed action • Bat disturbance would increase over the other alternatives because foraging habitat is within the additional land allocated to a motorized recreation zone. Because bats are nocturnal, foraging would not be disturbed significantly. • Bat habitat in new recommended wilderness area would benefit from use restrictions

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Mexican long-nosed bat (endangered)	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, not likely to adversely affect • Critical habitat = not applicable • Provides direction regarding management of caves and roosts and protection of food sources (agaves and saguaros), such as excluding grazing in foraging habitat • Does not provide desired conditions for Mexican long-nosed bat foraging habitat • Vegetation in Mexican long-nosed bat habitat would remain similar to current conditions because grasslands and other types would continue to be managed for range purposes that also suit the Mexican long-nosed bat • Bat habitat in new recommended wilderness area would benefit from use restrictions	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, not likely to adversely affect • Critical habitat = not applicable • Direction based on current science would result in vegetation trends toward desired conditions, improving Mexican long-nosed bat habitat quality, decreasing threats, and protecting food sources (e.g., agave, saguaro) • Addresses bat habitat more fully than no action by including both roosting and foraging areas • Bat habitat in new recommended wilderness areas would benefit from use restrictions	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, not likely to adversely affect • Critical habitat = not applicable • Plan direction is same as proposed action • Additional areas recommended as wilderness support Mexican long-nosed bat habitat. Positive effects on bat habitat would be greatest under alternative 1	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, not likely to adversely affect • Critical habitat = not applicable • Plan direction is same as proposed action • Bat disturbance would increase over the other alternatives because foraging habitat is within the additional land allocated to a motorized recreation zone. Because bats are nocturnal, foraging would not be disturbed significantly. • Bat habitat in new recommended wilderness area would benefit from use restrictions.

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Mexican spotted owl (threatened)	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Direction for Mexican spotted owl mixed-conifer habitat originates in the Mexican spotted owl recovery plan • Plan components are problematic because they apply equally to areas of very divergent topography and forest form and structure • Habitat in one new recommended wilderness would benefit from use restrictions	• Population trend = Unknown • Habitat trend = Positive[12] • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Like no action, direction tiers to current recovery plan conservation measures • Habitat in four new recommended wilderness areas would benefit from use restrictions because of decreased vehicle damage and emissions • Use restrictions would impede vegetation management in four new recommended wilderness areas, which would increase stand density, canopy closure, and basal area. This buildup may result in uncharacteristic wildfire in the Mount Graham Recommended Wilderness Area.	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as proposed action • Among the 16 new recommended wilderness areas, some would provide excellent refugia for Mexican spotted owl. Other are poor candidates because of their moderate to high viability risk associated with relatively high fuel loads and limited ability of the Forest to move vegetation toward desired conditions.	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as proposed action • Only 227 acres of the Motorized Recreation Land Use Zone has primary constituent elements of Mexican spotted owl habitat. These are randomly scattered in relatively small non-contiguous parcels, with the closest Mexican spotted owl protected activity center at least one mile away. • Noise from motorized recreation may disturb Mexican spotted owl in nearby areas, but would not at significant levels • Habitat in one new recommended wilderness would benefit from use restrictions

[12] This is positive relative to the other alternatives. Alternative 1 is negative because several poor selections of potential wilderness areas trump the general benefits of wilderness areas that do not need active management.

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Western yellow-billed cuckoo (threatened)	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = not likely to result in destruction or adverse modification • No desired conditions that support foraging habitat. • Would continue treatments of grasslands for forage and control of shrub invasion. • One new recommended wilderness may provide some cuckoo habitat.	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not likely to result in destruction or adverse modification • Standards and guidelines for southwestern willow flycatchers are based on current science and relate to management of natural waters and riparian habitat. • New recommended wilderness areas may provide additional riparian habitat for the cuckoos.	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not likely to result in destruction or adverse modification • Direction is the same as proposed action. • New recommended wilderness may provide the greatest amount of protected habitat for the cuckoo among the alternatives.	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not likely to result in destruction or adverse modification • Direction is the same as proposed action. • There are 31 acres of riparian habitat in the motorized recreation zone allocated by alternative 2. The cuckoo may use this habitat. • One new recommended wilderness may provide cuckoo habitat. The cuckoo may use the riparian acreage in the Motorized Recreation Land Use Zone
Northern Aplomado falcon (experimental population)	• Population trend = Unknown • Habitat trend = Negative • ESA Determination = not likely to jeopardize • Critical habitat = not applicable • Effects same as reported for western yellow-billed cuckoo	• Population trend = Unknown • Habitat trend = Positive • ESA Determination = not likely to jeopardize • Critical habitat = not applicable • Effects same as reported for western yellow-billed cuckoo	• Population trend = Unknown • Habitat trend = Positive • ESA Determination = not likely to jeopardize • Critical habitat = not applicable • Effects same as reported for western yellow-billed cuckoo	• Population trend = Unknown • Habitat trend = Positive • ESA Determination = not likely to jeopardize • Critical habitat = not applicable • Effects same as reported for western yellow-billed cuckoo • The falcon may use the riparian acreage in the Motorized Recreation Land Use Zone

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Sonora tiger salamander (endangered)	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect13 • Critical habitat = not applicable • Riparian habitat would decline because of lack of management direction • Effects of recreational use, runoff and sedimentation in Sonora tiger salamander habitat are not addressed • Little direction on management of Sonora tiger salamander in plan • Upland watershed projects would occur only as opportunities arise • Sonora tiger salamander does not occur within the new recommended wilderness area	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Direction regarding management of natural waters (quality and quantity), vegetation, riparian areas, and rangeland are related to the Sonora tiger salamander and its habitat • Includes new guidelines for management of upland grassland habitats to reduce the threat of severe wildfire and its effects • Standards and guidelines address the threats related to availability of high quality water and loss of habitat quality that could further imperil the Sonora tiger salamander • Sonora tiger salamander does not occur within the new recommended wilderness areas	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for proposed action • Sonora tiger salamander does not occur within the 16 new recommended wilderness areas proposed for designated under alternative 1	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for proposed action • There are 31 acres of riparian habitat in the motorized recreation zone allocated by alternative 2 • The Sonora tiger salamander does not occur in this habitat

[13] The no-action alternative is "likely to adversely affect" because there are no components in the 1986 forest plan addressing this species or its habitat and threats.

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Chiricahua leopard frog (threatened)	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Sonora tiger salamander • In addition, bank vegetation is also addressed in new standards and guidelines for provision of shade and hibernacula for frogs • Direction restricts activities In designated Chiricahua leopard frog critical habitat to conserve primary constituent elements	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Sonora tiger salamander • An additional 346 acres (total) of habitat would be available to the Chiricahua leopard frog within nine potential wilderness areas; however, the Tumacacori and Galiuro Addition Recommended Wilderness Areas are not in a condition that would sustain natural processes, particularly fire, and so their recommendations would not benefit the Chiricahua leopard frog, if any are present	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Sonora tiger salamander • There are 31 acres of riparian habitat among the Motorized Recreation Land Use Zones allocated by alternative 2 • The Chiricahua leopard frog occurs near the zones in the northern Santa Rita Mountains • Adverse effects on the Chiricahua leopard frog and its habitat are unlikely if recreation is restricted to non-riparian areas within the zones	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Sonora tiger salamander • In addition, bank vegetation is also addressed in new standards and guidelines for provision of shade and hibernacula for frogs • Direction restricts activities In designated Chiricahua leopard frog critical habitat to conserve primary constituent elements

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
New Mexico ridge-nosed rattlesnake (threatened)	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Grazing within the Peloncillo Mountains, where the New Mexico ridged-nosed rattlesnake is currently known to occur, is primarily managed at forage use levels and requires higher density water developments and interior fencing. Loss of ground cover may cause snakes to move less during foraging or mating, as well as increasing their risk of predation.	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Desired conditions are based on the current science for desert communities and provide management objectives and guidelines for designing site-specific projects to conserve the New Mexico ridge-nosed rattlesnake and their habitat • It is unknown if any rattlesnake habitat is available in the Ku Chish Recommended Wilderness Area	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Same plan direction as proposed action • There are 20,576 acres, or 12% of Forest desert communities, within the new recommended wilderness areas, but it is unknown how many acres of suitable habitat exists for the rattlesnake	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Same plan direction as the proposed action • None of the land proposed to be allocated to motorized recreation land use zone is within rattlesnake habitat
Northern Mexican gartersnake (threatened)	• Population trend = Negative (Downward trend a result of surface water loss through diversion and pumping, loss in prey, and an increase in predators, particularly American bullfrog) • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = not likely to result in destruction or adverse modification • Effects same as reported for New Mexico ridge-nosed rattlesnake	• Population trend = Negative • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = not likely to result in destruction or adverse modification • Effects same as reported for New Mexico ridge-nosed rattlesnake	• Population trend = Negative • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = not likely to result in destruction or adverse modification • Effects same as reported for New Mexico ridge-nosed rattlesnake	• Population trend = Negative • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = not likely to result in destruction or adverse modification • Effects same as reported for New Mexico ridge-nosed rattlesnake

Species Diversity and Viability Federally Listed Species	**No Action**	**Proposed Action (Preferred Alternative)**	**Alternative 1 (Wilderness Emphasis)**	**Alternative 2 (Motorized Recreation Emphasis)**
Gila chub (endangered)	• Population trend = Stable • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Plan direction regarding stream habitat conditions does not distinguish between native fish and sports fish habitat • Direction for management of riparian resources is adequate to support habitat for a diversity of species and not result in the loss of riparian habitat extent • Plan would maintain species viability but would not increase trends in individual populations of Gila, Yaqui and Sonora chub	• Population trend = Stable • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • All species are addressed by new standards and guidelines, which are important for the control of invasive species that could decimate population • New standards and guidelines address retention of high water quality and protection of pools from the threat of uncharacteristic wildfire • Many plan components address upland habitat management to reduce the threat of uncharacteristic wildfire • Proposed development of springs and stream restoration projects would provide or improve aquatic habitat and restore proper functioning of the ecosystem	• Population trend = Stable • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Plan direction same as the proposed action • Habitat would benefit in unaltered landscapes provided by many new recommended wilderness areas, but not in those where vegetation conditions elevate the threat of uncharacteristic fire, which adversely affects aquatic habitat and species because of increased runoff and sedimentation	• Population trend = Stable • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Plan direction same as the proposed action • There are 31 acres of riparian habitat in the acreage allocated for Motorized Recreation Land Use Zones. • The Gila chub and all other aquatic species listed here do not occur in these areas.
Yaqui chub (endangered)	• Population trend = Dynamic • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Dynamic • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Dynamic • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Dynamic • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Yaqui catfish (endangered)	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub
Gila topminnow (endangered)	• Population trend = Positive • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Positive • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Positive • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Positive • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub
Sonora chub (threatened)	• Population trend = Stable • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub	• Population trend = Stable • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub	• Population trend = Stable • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub	• Population trend = Stable • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub
Desert pupfish (endangered)	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect Critical habitat = not applicable • Effects same as reported for Gila chub
Gila trout (threatened)	• Population trend = Stable • Habitat trend = Positive	• Population trend = Stable • Habitat trend = Positive	• Population trend = Stable • Habitat trend = Positive	• Population trend = Stable • Habitat trend = Positive

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
	• ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub
Apache trout (threatened)	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Effects same as reported for Gila chub
Spikedace (endangered)	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub
Loach minnow (endangered)	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Effects same as reported for Gila chub

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Roundtail chub (proposed threatened)	• Population trend = Unknown • Habitat trend = Positive • ESA determination = not likely to jeopardize • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = not likely to jeopardize • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = not likely to jeopardize • Critical habitat = not applicable • Effects same as reported for Gila chub	• Population trend = Unknown • Habitat trend = Positive • ESA determination = not likely to jeopardize • Critical habitat = not applicable • Effects same as reported for Gila chub
Pima pineapple cactus (endangered)	• Population trend = Negative • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Lacks direction on managing invasive species that encroach in Pima pineapple cactus habitat • Plan recommends fire for management of grasslands, but does not mitigate for effects to Pima pineapple cactus in these areas	• Population trend = Negative • Habitat trend = Unknown • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • New plan components apply to management of vegetation that comprises Pima pineapple cactus habitat • Proposes specific acres for treatment of invasive species, including buffelgrass	• Population trend = Negative • Habitat trend = Unknown • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Plan direction same as proposed action • There are 20,576 acres, or 12% of Forest desert communities, within the new recommended wilderness areas, but it is unknown how many acres support Pima pineapple cactus	• Population trend = Negative • Habitat trend = Unknown • ESA determination = may affect, likely to adversely affect • Critical habitat = not applicable • Plan direction same as proposed action • Pima pineapple cactus does not occur in any of the proposed Motorized Recreation Land Use Zones

Species Diversity and Viability Federally Listed Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Huachuca water umbel (endangered)	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Not addressed in plan • Direction regarding riparian habitat is applicable • Specific management areas address the sensitivity of important riparian areas, including perennial streams that comprise umbel habitat	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • New plan components are provided to guide management activities involving ground disturbance and/or vegetation management to incorporate, site-specific design features to benefit habitat for, or mitigate impacts to, rare plant populations	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Plan direction same as proposed action • None of the new recommended wilderness areas support water umbel habitat	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, likely to adversely affect • Critical habitat = may affect, likely to adversely affect • Plan direction same as proposed action • No water umbel habitat occurs in the proposed Motorized Recreation Land Use Zones
Canelo Hills ladies' tresses (endangered)	• Population trend = Unknown • Habitat trend = Negative • ESA determination = may affect, not likely to adversely affect • Critical habitat = not applicable • Ladies' tresses are not specifically addressed, but riparian habitat is protected from activities in several plan components • Management areas in the plan also address the sensitivity of important riparian areas	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, not likely to adversely affect • Critical habitat = not applicable • Several new plan components provide management direction for ladies' tresses habitat in cienegas	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, not likely to adversely affect • Critical habitat = not applicable • Plan direction same as proposed action • None of the recommended wilderness areas occur within the range of the Canelo Hills ladies' tresses	• Population trend = Unknown • Habitat trend = Positive • ESA determination = may affect, not likely to adversely affect • Critical habitat = not applicable • Plan direction same as proposed action • No ladies tresses occur in proposed Motorized Recreation Land Use Zones

Table 16. Comparison of potential effects of alternatives on species diversity and viability with a focus on regionally designated sensitive species[14]

Species Diversity and Viability	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Forest Service, Southwestern Region, sensitive species	• Direction is not based on updated scientific information and knowledge of species and does not specifically address threats associated with their viability and habitat needs. • One new recommended wilderness area would not have active management and/or human interference, which would decrease threats to species viability.	• Plan components emphasize objectives (actions), many of which were designed to achieve long-term restoration goals (desired conditions), so that population viability requirements are met for all species. • New recommended wilderness areas would not have active management or human interference, which would decrease threats to species viability.	• Plan direction same as proposed action • New recommended wilderness areas would not have active management and/or human interference, which would decrease threats to species viability more than any of the other alternatives.	• Plan direction same as proposed action • The increased Motorized Recreation Land Use Zones would not change effects on population viability. • One new recommended wilderness area would not have active management and/or human interference, which would decrease threats to species viability.

[14] Coronado National Forest Regional Forester, Southwestern Region (Region 3), October 2013

Table 17. Comparison of potential effects of alternatives on species diversity and viability with a focus on management indicator species

Species Diversity and Viability Management Indicator Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Acorn woodpecker	• Species is not specifically addressed. • Direction addresses wood structure (standing, prostrate, and live trees) used by the species. • No objectives for restoration of the woodpecker's Madrean pine-oak woodland habitat, which is very much departed from reference conditions, increasing the threat of uncharacteristic wildfire. • One new recommended wilderness area would increase the conservation of woodpecker habitat.	• Plan components are not specific to the species, but rather to its Madrean pine-oak woodland habitat. • Plan objective is to treat 25,000 acres in the next 10 years, which would benefit acorn woodpecker populations by increasing the herbaceous understory in young and old pine-oak. • Four new recommended wilderness areas would benefit the species and habitat because of restrictions on motorized and mechanized uses.	• Same plan direction as proposed action. • Proposal for 16 new recommended wilderness areas would most benefit the acorn woodpecker populations among the other alternatives because of use restrictions.	• Same plan direction as proposed action. • There are 625 acres of Madrean pine-oak woodland habitat in new Motorized Recreation Land Use Zones, the use of which would add to the disturbance of woodpeckers by noise and human presence and the potential for damage to vegetation. • One new recommended wilderness area would benefit the species and habitat because of restrictions on motorized and mechanized uses.
Mexican spotted owl	• Plan components based regionally standardized guidance not Forest topographic and vegetation features • Plan guidance for silvicultural treatments is too restrictive and hinders restoration • No objectives for restoration of mixed-conifer forests • One new recommended wilderness area has 9% of Forest mixed-conifer, which would benefit from use restrictions on motorized use.	• Same plan direction as reported for Mexican spotted owl above under "Federally Listed Species."	• Same plan direction as reported for Mexican spotted owl above under "Federally Listed Species."	• Same plan direction as reported for Mexican spotted owl above under "Federally Listed Species."

Species Diversity and Viability Management Indicator Species	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Sonoran mud turtle	• Plan provides little guidance for management of native aquatic species. • Frequent references to making water available for livestock and that the presence of stock ponds benefits Sonoran mud turtles. • No objectives for making waters available to native species such as the Sonoran mud turtle, which can tolerate limited drying, but cannot use developed waters (concrete or metal drinkers). • No specific desired conditions or objectives for improving watersheds. • This alternative would not focus treatments to improve watershed functions where they are most needed, resulting in reduced watershed function than may otherwise occur. These factors combined would result in lower quality of habitat for, and lower populations of Sonoran mud turtles. • One new recommended wilderness area may impede the progress of upland watershed projects as well as maintenance of stock ponds, but it would also conserve turtle habitat because of use restrictions that prevent damage and effects caused by vehicles.	• Objectives and guidelines directly benefit the mud turtle. • Specific plan components for improving overall conditions of watershed, moving watersheds toward proper function and prioritizing treatments where needed would benefit Sonoran mud turtle habitat and populations. • Four new recommended wilderness areas may impede the progress of upland watershed projects as well as maintenance of stock ponds.	• Same plan direction as proposed action. • Sixteen new recommended wilderness areas would most limit the implementation of upland watershed improvement projects among the alternatives because of use restrictions. • The ability to maintain stock ponds would also be impeded by wilderness restrictions. • Therefore, alternative 1 would be the least beneficial alternative for Sonoran mud turtle and its habitat.	• Same plan direction as proposed action. • Stock ponds in desert grassland and Madrean oak woodland areas within the expanded Motorized Recreation Land Use Zones may experience increased sedimentation as a result of increased development and recreational traffic on roads and trails. • This would result in a lower capacity for water storage in stock ponds and higher probabilities of stock ponds completely drying up, with consequent effects on the turtle. • One new recommended wilderness area may impede the progress of upland watershed projects as well as maintenance of stock ponds, but it would also conserve turtle habitat because of use restrictions that prevent damage and effects of motor vehicles.

Table 18. Comparison of potential effects of alternatives on species diversity and viability with a focus on migratory birds and eagles

Species Diversity and Viability	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Migratory birds	• Direction is provided for managing habitats of migratory birds in all but desert and grassland communities. • One new recommended wilderness area would improve conservation of migratory bird habitat.	• Plan components address all vegetation types that provides migratory bird habitat and follow the requirements of the Migratory Bird Treaty Act, Executive Order 13186, and actions agreed upon in a Memorandum of Understanding between the Forest Service and the U.S. Fish and Wildlife Service regarding migratory birds.	• Plan direction is same as proposed action. • Among the alternatives, the new recommended wilderness areas under alternative 1 would best conserve migratory bird habitat and protect birds from effects of motorized and mechanized uses.	• Plan direction is same as proposed action. • Additional Motorized Recreation Land Use Zones would add to the disturbance of migratory birds by noise and human presence. • One new recommended wilderness area would improve conservation of migratory bird habitat.
Bald and golden eagles	• Guidance for compliance with the Bald and Golden Eagle Act is applied at the project level for minimization of disturbance. • Individual projects require a take permit from the U.S. Fish and Wildlife Service if it is expected to occur. • Management of a new recommended wilderness area would decrease the likelihood of take.	• Guidance for compliance with the Bald and Golden Eagle Act is applied at the project level for minimization of disturbance. • Management of new recommended wilderness areas would decrease the likelihood of take.	• Guidance for compliance with the Bald and Golden Eagle Act is applied at the project level for minimization of disturbance. • Management of 16 new wilderness areas would provide the greatest decrease in the likelihood of take of eagles as compared to the other alternatives.	• Guidance for compliance with the Bald and Golden Eagle Act is applied at the project level for minimization of disturbance. • Additional use of Motorized Recreation Land Use Zones would slightly increase the potential for take in these areas, but it is likely that noise and human presence would keep birds from using the areas and thus, out of harm's way. • Management of a new recommended wilderness area would decrease the likelihood of take.

Table 19. Summary of how well alternatives meet Need for Change Topic 1: Ecosystem Restoration and Resiliency

Alternative Comparison Summary	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
How well alternative meets Topic 1 Need for Change	Poor	Very good	Very good	Good

The following tables provide a comparison of the potential effects of alternatives on various forest uses under Need for Change Topic 2: Visitor Experiences. This topic focuses on direction needed to balance competing uses (e.g., supporting both quiet recreation areas and motorized recreation) and to address public safety compromised by U.S.-Mexico border issues.

Table 20. Comparison of potential effects of alternatives on various forest uses and resources under Need for Change Topic 2: Visitor Experiences

Forest Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Recreation	• No desired conditions for recreation settings and features. • Unnecessary or unrealistic standards and guidelines. • Outdated strategies for assessing and meeting visitor needs, managing funding, and improving recreation settings and visitor satisfaction • Limited guidance for resolution of unmanaged recreation and user conflicts. • Recommends one wilderness designation, which would conserve resources and offer quiet recreation opportunities. • Least effective alternative with regard to managing climate change. No direction to guide development of adaptation and resiliency to effects of changes in temperature and rainfall patterns. Adverse effects on natural resources could affect the recreational experience (e.g., water resources may no longer support popular uses).	• Desired conditions based on a long-term vision for recreational settings and uses. • Establishes recreational land use zones to reflect contemporary public use patterns and activities. • Provides direction for trails management and use, including the Arizona National Scenic Trail. • Conserves resources and offers quiet recreation opportunities through four recommended wilderness areas. • Defines locations suitable for specific special uses, which decreases conflicts between recreation and special uses, such as siting of utility infrastructure. • Proposed vegetation treatments would reduce the threat of uncharacteristic wildfire and its effects on recreational settings. • Direction on achieving adaptation and resiliency to climate change would conserve Forest resources and natural settings, which maintain the quality of the recreational visitor experience.	• Same plan components and effects as the proposed action, but more recommended wilderness. • Greatest positive effects on quiet recreational experience because of wilderness use restrictions (see discussion under “Proposed Action”).	• Same plan components as the proposed action, but recommends bigger Motorized Recreation Land Use Zone and provides limited climate-change direction. • Positive effect on motorized recreation because it increases acreage areas where facilities and trails may be developed. • Use restrictions in one new wilderness would conserve resources and offer quiet recreation opportunities. • Less successful than the proposed action and alternative 1 in fostering adaptation and resiliency to the effects of climate change, which maintain the quality of the recreational user experience, but better than no action.

Forest Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Scenery	• No desired conditions for management of scenery. • Includes standards and guidelines for mitigating effects of disturbances on landscape. • Direction does not reflect current use patterns. • No direction regarding management of visually intrusive special uses, such as power lines. • Uses outdated visual quality objectives to assess site-specific effects of projects. • Recommends one wilderness designation, which enhances protection of scenic quality because of restrictions on uses. • Least effective alternative with regard to managing climate change. No direction to guide development of adaptation and resiliency to effects of changes in temperature and rainfall patterns. Adverse effects on natural resources could degrade scenic quality.	• Plan components address scenic quality issues such as off-highway vehicle use, illegal border activities, and visually intrusive special uses, such as power lines. • Scenic integrity objectives, would replace visual quality objectives for effects assessments. These reflect current use patterns, landscape conditions, and vegetation mapping. • Restrictions on uses in four recommended wilderness areas would conserve resources that contribute to scenic quality (e.g., vegetation, riparian areas). • Proposed vegetation treatments would improve Forest health and mitigate disturbances, improving long-term scenic quality. • Defines areas suitable for specific special uses, locating visually intrusive uses to sites where there would be fewer impacts to scenic quality. • Direction on achieving adaptation and resiliency to climate change would conserve Forest resources and natural settings, which would improve scenic integrity and augment visitor experiences.	• Same plan components and effects as the proposed action, but more recommended wilderness. • Greatest positive effects on scenic quality because of wilderness use restrictions (see discussion under “Proposed Action”).	• Same plan components as the proposed action, but recommends bigger Motorized Recreation Land Use Zone and provides limited climate-change direction. • Greatest potential for negative effects on scenic quality (vegetation damage, exposure of bare soils) due to motorized recreation emphasis. • Siting of recommended Motorized Recreation Land Use Zones mitigates this potential by choosing areas where scenic quality would not be compromised as much as in other areas. • Use restrictions in one new wilderness would enhance protection of scenic quality. • Less successful than the proposed action and alternative 1 in fostering adaptation and resiliency to the effects of climate change, which maintain the quality of the resources that contribute to scenic quality and the visitor experience, but better than no action.

Forest Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Public safety and illegal activities	• Establishes a goal to cooperate with law enforcement. • Establishes standards and guidelines for protecting caves and cultural resources from vandalism and other human disturbances. • No management approaches are recommended for border issues. • Except for pursuit of a crime, use restrictions in one recommended wilderness would constrain law enforcement actions.	• Establishes plan components to ensure Forest public and occupational safety, especially in border areas. • Recommends four wilderness areas in which restrictions on motorized and mechanized uses would constrain law enforcement more than no action and alternative 2, but less than alternative 1.	• Same plan components as the proposed action, but recommends additional wilderness. • Greatest potential for constraining law enforcement activities because of use restrictions in 16 recommended wilderness areas.	• Same plan components as the proposed action, but recommends bigger Motorized Recreation Land Use Zone, designates no new wilderness and special area, and provides limited climate-change direction. • Motorized Recreation Land Use Zones could enhance the opportunity for law enforcement to use off-highway vehicles in patrolling areas inaccessible to vehicles, except for wilderness.
Motorized activities	• Plan was amended to follow direction in the 2005 Travel Management Rule. • No management of motorized activities with regard to fragmentation of habitat, noise, erosion and sedimentation, risk of vandalism and looting of artifacts and pottery. • No direction for resolving issues related to incompatibility of motorized recreation with other uses. • No direction for managing off-road motorized travel and creation and repeated use of non-Forest System roads. • Recommends one new wilderness where use restrictions on motorized activities would apply. This would improve opportunities for quiet recreational experience and mitigate effects of motorized use on natural resources.	• Plan components specific to road construction, realignment, decommissioning, closure, and resolution of issues related to unauthorized off-road travel. • Objectives for removing specific miles of non-Forest System roads annually and realigning or removing Forest System roads in areas having sensitive resources (e.g., wetlands). • Permanent road development would be prohibited in all wilderness areas, which would enhance quiet recreation opportunities, protect resources from vehicle-related damage, and allow resources to recover. • Recommends four new wilderness areas. Benefits the same as those under “No Action” heading.	• Same direction and effects as the proposed action, but more recommended wilderness. • Greatest benefit to resources from prohibition on permanent road development in wilderness areas. • Access to remote recreation sites in wilderness would require non-motorized means, which could be problematic for users with mobility issues.	• Same plan components as the proposed action, except for those related to Motorized Recreation Land Use Zones, special area designations, and climate change. • Alternative 2 increases the allocation of land for motorized uses, which would increase the potential for ecosystem impacts and reduces the degree of quiet recreation available. • Effects of a new recommended wilderness area recommendation are the same as those described for “No Action.”

Table 21. Comparison of potential effects of alternatives on various forest uses and resources under Need for Change Topic 2: Visitor Experiences, with a focus on wilderness, other special areas, and climate change [15]

Forest Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Designated wilderness	• Maintains direction in outdated Wilderness Management Plans for each of 8 previously designated wilderness areas. • No plan components related to management of designated wilderness	• Establishes plan components for management of 8 previously designated wilderness areas. • Natural and recreational resources and settings better conserved than no action and alternative 2, especially habitat connectivity, scenery, and visitor experiences.	• Same components and benefits as proposed action.	• Same components and benefits as proposed action.
Areas recommended for wilderness designation	• Recommends one area for wilderness designation • No plan components related to management of recommended wilderness	• Recommends four areas for wilderness designation (one carried forward from 1986 forest plan). • Plan components for previously designated wilderness would apply to recommended wilderness • Same benefits as described for previously designated wilderness	• Recommends 16 areas for wilderness designation (one carried forward from 1986 forest plan, and 15 others) • Same plan components as proposed action. • Greatest benefit to resource conservation and user opportunities in wilderness	• Recommends one wilderness area (carried forward from 1986 forest plan). • Same plan components and benefits as proposed action
Wilderness study areas	• Maintains direction for 3 designated wilderness study areas • No plan components related to management of wilderness study areas	• Plan components for management of previously designated wilderness would apply to 3 designated wilderness study areas. • Same benefits as described for previously designated wilderness.	• Same plan components and benefits as proposed action.	• Same plan components and benefits as proposed action.

[15] The Wilderness Act requires that designated wilderness, areas recommended for designation, and wilderness study areas be managed to conserve natural resources and wilderness values. Recommended wilderness areas would add resource protection from effects of motorized and mechanized uses and increase opportunities for quiet recreation. Motorized recreation emphasis has no effects on wilderness because of restrictions on motorized and mechanized uses.

Forest Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Research Natural Areas	• Carries forward 1986 plan recommendation for 1 new research natural area and two extensions of research natural areas. • Recommends no new research natural areas.	• Same recommendations carried forward as no action. • Recommends one new research natural area (Finger Rock Canyon), which could be used for research into the effects and response to climate change. Studies would benefit resources and resource management across the Coronado.	• Same recommendations carried forward as no action. • Recommends one new research natural area (Finger Rock Canyon). Same benefit as proposed action.	• Same recommendations carried forward as no action. • Recommends no new research natural areas.
Zoological-Botanical Areas	• Recommends designation of South Fork Cave Creek Zoological-Botanical area	• Recommends designation of South Fork Cave Creek Birds of Prey Zoological-Botanical area	• Same as proposed action.	• No recommended Zoological-Botanical areas.
Climate change	• No direction regarding developing resource adaptation and resiliency to climate change. Least effective in managing resource responses and effects on uses in wilderness and other special areas.	• Direction on climate change is provided to develop adaptation and resiliency of resources in wilderness and other special areas.	• Same climate-change direction as proposed action. • Greatest positive effects because of additional wilderness areas recommended by alternative 1.	• Less effective in managing resource responses to effects of climate change than proposed action and alternative 1 but more effective than no action.

Table 22. Summary of how well alternatives meet Need for Change Topic 2: Visitor Experiences

Alternative Comparison Summary	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
How well alternative meets Need for Change Topic 2	Poor	Very good	Very good	Good

The following tables provide a comparison of the potential effects of alternatives on various forest uses under Need for Change Topic 3: Access to National Forest System Lands. This topic focuses on the need for updated direction that will guide national forest managers' cooperation and collaboration with other land managers and private owners toward acquiring or restore public and administrative vehicular access to areas where it is currently unavailable or compromised and to maintain future access.

Table 23. Comparison of potential effects of alternatives on Need for Change Topic 3: Access to National Forest System Lands

Issue	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Access to National Forest System lands	• No desired conditions for acquiring access in areas where lacking. • Plan standards and guidelines are no longer relevant because of changes in user demand, public interest, and Forest use patterns. • Plan contains outdated information about access needs, including locations. • Conflicting uses not considered when planning to acquire access. Access issues affect public uses, such as grazing, exploration for mineral deposits, recreation, and special; and administrative uses, such as fire suppression and resource management. • Developing access to one recommended wilderness area is complicated by restrictions on motorized and motorized uses.	• Establishes desired conditions for achieving a level of access that will accommodate all essential administrative uses and most public uses. • Provides a strategic vision for permanent legal vehicular access at up to 200 locations where it is presently lacking. • Access to new recommended wilderness areas would be nonmotorized and nonmechanized, which would favor quiet recreation users and present access problems for those with mobility issues. • Resolution of access issues would benefit ranchers, mining claimants, recreational users and administrative staff, the latter for the purpose of fire and resource management.	• Same direction and effects as the proposed action, but more recommended wilderness. • Greatest benefits to quiet recreation because of use restrictions • Greatest negative effects on access to quiet recreation by users who have mobility issues.	• Same plan components and effects as the proposed action, except for those related to Motorized Recreation Land Use Zones, special area designations, and climate change.

Table 24. Summary of how well alternatives meet Need for Change Topic 3: Access to National Forest System Lands

Alternative Comparison Summary	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
How well alternative meets Need for Change Topic 3	Poor	Very good	Very good	Very good

The following tables provide a comparison of the potential effects of alternatives on various forest uses under Need for Change Topic 4: Preservation of Open Space. This topic focuses on the need for new direction to support the retention of the "rural" character of southeastern Arizona and southwestern New Mexico, while at the same time accommodating rapidly growing populations and municipalities.

Table 25. Comparison of alternatives potential effects on various forest resources related to Need for Change Topic 4: Preservation of Open Space

Issue	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Land ownership patterns and land uses	• Outdated maps do not show land ownership adjustments over time. • Changed priorities for land acquisitions are not reflected • Values of open space are not recognized.	• Plan identifies open space as a desired condition. • Plan supports livestock production on working landscapes where low-impact land use helps preserve large areas of unfragmented open space. • Offers a management approach for working with landowners, communities, local governments, and partners to promote voluntary open space conservation, consistent with the Forest Service Open Space Conservation Strategy. • Plan components emphasize habitat linkages (i.e., reduced fragmentation) beyond Forest boundary. • Scenic quality plan components emphasize the aesthetic and recreational values of vast, open natural landscapes. • Plan is proactive in conserving open space using explicit goals and management approaches.	• Same direction and effects as the proposed action, but more recommended wilderness. • Additional wilderness would have no effect on land ownership patterns and land uses.	• Same plan components and effects as the proposed action, except for those related to Motorized Recreation Land Use Zone, special area designations, and climate change. • Additional Motorized Recreation Land Use Zone would have no effect on land ownership patterns and land uses.

Issue	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Land ownership adjustments and boundary management	• Plan does not address open space values. • Provides a low-priority guideline recommending private land acquisitions to provide recreational open space. • Plan has outdated land classification system and land availability list. • Boundary and landline direction is not reflective of Forest budget and priorities. • Increase potential for damage or destruction of Forest resources where illegal encroachment by vehicles and road and trail building is happening because of boundary and ownership inaccuracies.	• Plan specifies explicit goals, guidelines, and management approaches related to open space. • Guidelines describe characteristics of lands that need to be acquired or conveyed, based on specific resources they offer. • Plan provides flexibility in considering opportunities for land exchanges as they arise, by allowing this without plan amendment. • Plan identifies open space values to be retained as a desired condition of acquisition and conveyance. • Plan does not restrict resource management activities on parcels identified for conveyance. • Plan encourages fuel treatments and other management actions on parcels near communities to achieve vegetation and/or community wildfire protection plan objectives. • Plan allows for conveyance of lands to meet community and public needs, e.g., allowing loss of wildland character as acceptable for conveyances.	• Same direction and effects as the proposed action, but more recommended wilderness. • Additional wilderness would have no effect.	• Same plan components and effects as the proposed action, except for those related to Motorized Recreation Land Use Zone, special area designations, and climate change. • Motorized recreation emphasis would have no effect.

Table 26. Summary of how well alternatives meet Need for Change Topic 4: Preservation of Open Space

Alternative Comparison Summary	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
How well alternative meets Need for Change Topic 4	Poor	Very good	Very good	Very good

The following tables provide a comparison of the potential effects of alternatives on various forest uses under Need for Change Topic 5: Communities, Collaboration and Partnerships. This topic focuses on the need for direction regarding the use of collaboration and partnerships as tools for attaining both Forest Service and community goals, existing and future social and working relationships among the Forest Service and leaders in the communities it serves, including Native American nations.

Table 27. Comparison of potential effects of alternatives on various forest resources or uses under "Need for Change" Topic 5: Communities, Collaboration, and Partnerships

Resource or Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Communities				
Economy	• No significant change in jobs and income.	• Same as no action.	• Same as no action.	• Same as no action
Financial efficiency (cost-benefit analysis)	• Will not alter expenditure stream. • Type of expenditures may change but the amount will not.	• Same as no action.	• Same as no action.	• Same as no action
Social impact	• Lowest non-market value with regard to additional primitive recreation opportunities and/or the protection of forest resources.	• Second highest non-market value with regard to additional primitive recreation opportunities and/or the protection of forest resources.	• Greatest non-market value with regard to additional primitive recreation opportunities and/or the protection of forest resources.	• Third highest non-market value additional primitive recreation opportunities and/or the protection of forest resources
Environmental justice impact	• Will not exacerbate the poverty rate or disproportionately worsen the economic well-being of low-income or racial and/or ethnic minority individuals.	• Same as no action.	• Same as no action.	• Same as no action.

Resource or Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Special uses	• Lacks plan components for managing special uses. • Accepts special uses without capacity limits. Overuse could increasingly stress resources, especially wildlife, recreation, scenic integrity. • In recommended new wilderness area, special uses would be constrained to non-motorized, non-mechanized uses.	• Establishes plan components for managing special uses. • Limits special uses in new recommended wilderness areas to nonmotorized, nonmechanized uses. • Decreases potential for adverse effects from special uses because of restrictions in four recommended wilderness areas. • Includes determinations of areas suitable for specific special uses to avoid user conflicts and avoid adverse effects on sensitive resources.	• Same direction and effects as the proposed action, but with more recommended wilderness areas. • Greatest effect on special uses because of motorized and mechanized use restrictions in 16 new recommended wilderness areas. • Natural and recreation settings in wilderness would be better conserved by their designation than all other alternatives.	• Same plan components and effects as the proposed action, except for those related to Motorized Recreation Land Use Zone, special area designations, and climate change. • Additional land allocated for motorized recreation increases the potential intensity of effects of motorized special uses, including outfitter guide transport of clients and motorized recreation, on natural resources.

Resource or Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Forest products	• Lacks plan components regarding forest products. • Encourages forest product availability and harvest during timber management activities. • Recommends designation of one wilderness area, where motorized and mechanized uses are restricted. This may constrain collection of forest products, but on the other hand, may increase their availability because the adverse resource effects of prohibited uses would not occur. • Least effective in managing resources to develop adaptation and resiliency to the effects of climate change. This would negatively affect the availability of forest products more than the other alternatives.	• Establishes plan components for managing forest products. • Proposes vegetation treatments to restore forest health and return natural fire cycle on the landscape, which would reduce the threat of uncharacteristic wildfire and improve the sustainability of certain forest products. • Access to forest products may decrease proportionately with management of four recommended wilderness areas where motorized and mechanized will ultimately be restricted. Sustainability of products may improve because these restrictions would decrease in effects from motorized and mechanized uses. • Direction regarding management of resources in regard to climate change would help maintain their availability.	• Same direction and effects as the proposed action, but with more recommended wilderness areas. • Access to forest products would decrease proportionately with management of 16 recommended wilderness areas, where motorized and mechanized uses will ultimately be restricted. • Restrictions in wilderness, however, would enhance the protection of vegetation and other forest products and allow for an increase in their availability.	• Same plan components and effects as the proposed action, except for those related to Motorized Recreation Land Use Zone, special area designations, and climate change. • Additional land allocated for motorized recreational use increases the potential intensity of adverse effects on resources from which forest products are obtained. • Conversely, the availability of increased areas for motorized recreation may improve visitor access to forest products in areas inaccessible without off-road vehicles. • Effects of a new recommended wilderness area would be the same as those described for “No Action.” • Less effective than the proposed action and alternative 1 in managing resources during climate change, but more effective than no action. Availability of Forest products may decline as a result.

Resource or Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Minerals, general	• Plan direction replicates mining laws and regulations. • Manages mineral-related activities using operating plans, bonds, and reclamation. • Recommends one new wilderness area where restrictions on motorized and mechanized uses would constrain mineral development. • No restrictions on development of mineral potential on "scenic" and "recreational"-eligible streams and segments, but not allowed on "wild"-eligible streams or segments.	• Establishes desired conditions that support administration of mineral activities in accordance with current laws and regulations. • Establishes desired conditions to protect unique or limited resources in specially designated areas that are not protected by law or policy. • Recommends four new wilderness areas. This constrains mineral resource development more than no action and alternative 2 and less than alternative 1. • Same management of mineral potential in eligible wild, scenic, and recreational rivers as no action.	• Same direction and effects as the proposed action, but with more recommended wilderness. • New recommended wilderness areas account for the greatest acreage among all alternatives. Restrictions on motorized and mechanized uses would have the greatest negative impact on mineral resource development than the other alternatives, • Same management of mineral potential in eligible wild, scenic, and recreational rivers as "No Action."	• Same plan components as the proposed action, but recommends bigger Motorized Recreation Land Use Zone, designates no new wilderness and special area, and provides limited climate-change direction. • This alternative increases the acreage available for motorized recreation. Areas that have mineral potential but are not accessible by conventional vehicles may be accessible by off-road vehicles. • Effects of new recommended wilderness would be the same as those described for "No Action." • Same management of mineral potential in eligible wild, scenic, and recreational rivers as "No Action."
Locatable minerals	• Plan recommends withdrawal of Mount Graham Wilderness if and when it is congressionally designated.	• Locatable minerals development in proximity to recommended wilderness could be constrained by access issues related to restrictions on motorized and mechanized uses.	• Alternative 1 would have the greatest negative impact on locatable minerals resource development because there is high mineral potential in some of the 16 recommended wilderness areas.	• The emphasis of alternative 2 on providing zones for motorized recreation would open more acreage to locatable minerals entry than the other alternatives. These areas would not be subject to mineral withdrawal.

Resource or Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Salable minerals	• No salable minerals may be removed from 3 designated management areas (2A, 8, 8A, 14). • Economic effects of this restriction would depend on the resource potential in area.	• Salable minerals extraction will not be allowed in recommended wilderness, but may be allowed in RNAs if site-specific resource protection is provided. Four new recommended wilderness areas would be affected.	• Salable minerals extraction will not be allowed in recommended wilderness, but may be allowed in research natural areas if site-specific resource protection is provided. • Greatest potential among the alternatives to prohibit salable mineral development because of its recommended wilderness areas.	• Salable minerals extraction will not be allowed in recommended wilderness, but may be allowed in research natural areas if site-specific resource protection is provided. • Motorized recreation emphasis would open additional acreage in areas that may be accessed only by off-highway vehicles.
Leasable minerals	• Plan direction is outdated. • Standards and guidelines prohibit structures and facilities serving leasable mineral resources (i.e., surface occupancy) in MA 8 and recommend no surface occupancy in MA 14 and MA 15 (Wild Chile Botanical Area).	• Potential loss of leasable mineral resources potential because leasing in recommended wilderness is discretionary. • Discourages leasable mineral resource development in research natural areas because of management restrictions that protect the special area's unique resources.	• Alternative 1 could result in the greatest loss of leasable mineral potential because of its 16 recommended wilderness areas, where development of leasable minerals is discretionary.	• Loss of leasable minerals resource potential because of the legislative prohibition on leasing in wilderness. • The emphasis of alternative 2 on providing zones for motorized recreation may facilitate access to some areas for mineral entry if they are inaccessible by conventional vehicles.
Abandoned mines	• Plan direction has no effect on proposed remediation activities.	• Plan establishes management objectives and guidelines for reclamation of abandoned mines. • Emphasizes public safety and opportunities to benefit wildlife habitat.	• Same direction and effects as the proposed action, but with more recommended wilderness areas. • Abandoned mines are less accessible because of restrictions on motorized and mechanized uses in the 16 recommended wilderness areas.	• Same plan components and effects as the proposed action, except for those related to Motorized Recreation Land Use Zone, special area designations, and climate change. • Improved access to some abandoned mine sites in areas where off-highway vehicles are needed.

Resource or Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Cultural resources	• Provides direction regarding project clearance procedures; site protection; and enhancement and interpretation, research, and curation of collections. • Outdated direction regarding issues and mandates for cultural resource preservation and management. • Plan pre-dates recent laws regarding management of cultural artifacts, traditional cultural properties, and repatriation of burials. • Recommendation for one wilderness area would provide protective benefits to cultural sites and resources as a result of use restrictions. Sites would be less accessible, therefore, less prone to defacement, littering, and illegal collection of artifacts. • Least effective alternative in managing resources for adaptation and resiliency to the effects of climate change. Greatest negative effect on resources that are sacred natural places and traditional cultural properties that are vulnerable to effects on vegetation and forest products.	• Plan components for management of cultural resources. • Direction emphasizes restoration of vegetation to historic reference condition, which is responsive to sentiment expressed by tribes. • Recommends four wilderness areas, where motorized and mechanized uses are restricted. One is within a traditional cultural property, the other within the Chiricahua Apache homeland. Restrictions would have similar benefits to those listed under the "No Action" heading. • Provides direction for managing resources in response to climate change. Cultural sites are typically not vulnerable to the effects of climate change, except for natural features (waterfalls, specific vegetation types) considered by tribes as sacred places or a traditional cultural property.	• Same direction and effects as the proposed action, but with more recommended wilderness. • Greatest benefits on cultural resources (see "Proposed Action" heading) because of 16 new recommended wilderness areas, one of which is within a traditional cultural property, the other within the Chiricahua Apache homeland.	• Same plan components as the proposed action, but recommends bigger Motorized Recreation Land Use Zone, designates no new wilderness and special areas, and provides limited climate-change direction. • Increased land motorized recreation has the potential to predispose cultural sites to damage by vehicles and road maintenance equipment and make them more accessible for looting, vandalism, and illegal collection of artifacts. However, the Motorized Recreation Land Use Zones are not within areas known to have cultural sites present. • Less effective in managing resources in regard to climate change than alternative 1 and the proposed action but more effective than no action. Effects could include those listed under the "No Action" heading.

Resource or Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
Native American interests	• Lacks management direction regarding consideration of tribal interests. Instead, it defers consideration to project-specific reviews. • Plan pre-dates several laws requiring management of cultural artifacts, traditional cultural properties, and repatriation of burials. • Recommends Mount Graham wilderness area in the Western Apache traditional cultural property, which, because of restrictions on motorized and mechanized uses, will preserve natural settings, facilitate restoration of vegetation to historic reference conditions, and protect its value as a traditional cultural property. • Plan has no components for managing resources to develop adaptation and resiliency to climate change. Because of this, no action has the greatest potential to threaten the integrity of sacred natural places, availability of forest projects, and loss of areas for traditional uses because of the adverse effects of climate change.	• Provides direction regarding preservation and continued use of forest resources by tribes. • Plan components emphasize restoration of vegetation to historic reference conditions in response to sentiment expressed by tribes. • Recommends Ku Chish wilderness in the Chiricahua Apache homeland and Mount Graham wilderness in a Western Apache traditional cultural property. Use restrictions help preserve natural settings, facilitate restoration of vegetation to historic reference conditions, and protect and enhance the values of Mount Graham to the Western Apache and Ku Chish to the Chiricahua Apache. • Provides direction on climate change that will help sustain the availability of forest, minimize effects of invasive species on plants of value to Native Americans, and preserve the integrity of natural resources and settings for traditional uses.	• Same direction and effects as the proposed action, but more recommended wilderness. • Greatest benefit to Native American interests because of16 new recommended wilderness area, among which are Ku Chish in the Chiricahua Apache homeland and Mount Graham in a Western Apache traditional cultural property. • Vegetation and forest product availability would benefit more than all alternatives because of wilderness use restrictions. This will help preserve natural settings and facilitate restoration of vegetation to historic reference conditions, protecting and enhancing the values of the Ku Chish area to the Chiricahua Apache.	• Same plan components as the proposed action, but recommends bigger Motorized Recreation Land Use Zone, designates no new wilderness and special areas, and provides limited climate-change direction. • Motorized Recreation Land Use Zones are not be sited in areas of known Native American cultural interests and values. • Recommends a new recommended wilderness area in the Western Apache traditional cultural property, where use restrictions would preserve its integrity by limiting accessibility. • Less effective in managing resources in regard to climate change than alternative 1 and the proposed action but more effective than no action. Effects could include those listed under the “No Action” heading.

Resource or Use	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
International relations	• No direction or management emphasis with regard to further enhancement of Forest relations with Mexico. • Current relationship with Mexico would continue to be fostered, especially with regard to border issues and wildlife management.	• Establishes goals for managing values and resources shared with Mexico. • Sets desired conditions for clean, safe Forest recreation near border, high scenic quality viewsheds, and unimpeded movement of wildlife in non-fragmented habitats among both nations.	• Same direction and effects as the proposed action, but more recommended wilderness.	• Same direction and effects as the proposed action.
Partnerships	• No direction provided. • Current positive relationships would continue to be fostered.	• Recognizes the value of partnerships and collaboration. • Encourages continued partnerships that improve and maintain the integrity and condition of each forest resource. Effects would be positive.	• Greatest benefit because of its recommendation for more wilderness than the other alternatives. This may foster new partnerships with wilderness advocacy, quiet recreation, and other environmental organizations. Effects would be positive.	• Emphasis on more land allocated to motorized recreation may increase opportunities for partnerships with user groups. • Positive outcome may be realized in cooperative efforts to restore areas where resource damage has occurred.

Table 28. Summary of how well alternatives meet Need for Change Topic 5: Communities, Collaboration, and Partnerships

Alternative Comparison Summary	No Action	Proposed Action (Preferred Alternative)	Alternative 1 (Wilderness Emphasis)	Alternative 2 (Motorized Recreation Emphasis)
How well alternative meets Need for Change Topic 5	Poor	Very good	Very good	Good

Chapter 3. Affected Environment and Environmental Consequences

Introduction

This chapter summarizes the physical, biological, social, and economic environments of the planning area and the environmental consequences that may occur by implementing each alternative in that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in chapter 2. More detailed information, including methodology, assumptions, and effects analyses, are available in appendix F and in resource specialists' reports in the administrative records of the plan revision process and the National Environmental Policy Act review.

Plan Decisions and Site-specific Projects and Activities

Direction under each of the action alternatives does not authorize implementation of management activities described in each resource analysis. Rather, the plan provides a programmatic framework that guides the design of site-specific actions but does not authorize, fund, or carryout any project or activity.

Because the revised forest plan does not authorize or mandate any site-specific projects or activities (including ground-disturbing actions), there can be no direct effects. However, there may be implications, or longer-term environmental consequences, of managing the Coronado under this programmatic framework.

The revised forest plan sets the stage for future management actions needed to achieve desired outcomes (desired conditions, objectives, special areas), and provides the sideboards (suitability, standards, guidelines) under which future activities may occur in order to manage risks to ecological, social, and economic environments. Before site-specific projects may be implemented, project- and activity-level planning, environmental analysis, and decisions must occur. For example, the revised plan contains direction to treat vegetation by mechanical means or with fire to achieve desired conditions; however, a future site-specific analysis and decision must be made for each proposal that involves every future site-specific vegetation treatment.

Environmental Analyses

The environmental analyses of each alternative, which are disclosed in the following sections, focus on effects related to need for change topics and conflict-based issues raised in public comments during the plan revision process and preparation of this environmental impact statement. The best available scientific and commercial data and information were used to estimate potential indirect and cumulative effects of the forest plan specified by each alternative. More detailed information, including methodology, assumptions, and effects analyses, are available in appendix F and in resource specialists' reports in the administrative records of the plan revision process and the National Environmental Policy Act review.

To estimate the consequences of alternatives for a programmatic action like plan revision, the assumption is made that resource management activities will occur as necessary to achieve the objectives and move toward or achieve the desired conditions for each resource. Such an analysis is useful in comparing and evaluating revised plan alternatives on a forestwide basis, but is not appropriate for evaluating and comparing site-specific actions on the Coronado.

Several assumptions were made in the analyses of alternatives, including:

- Plan components (desired conditions, objectives, standards, guidelines, special areas, suitability, and monitoring) would be followed as site-specific projects and activities are designed and implemented.
- Implementation of the land management plan would facilitate progress toward the attainment of desired conditions for each resource.
- Law, policy, regulations, and applicable best management practices would be followed when planning or implementing site-specific projects and activities.
- Monitoring will occur to measure the effectiveness of plan direction, and the land management plan will be amended, as needed, if changes in plan direction are needed.
- The planning period is 10 to 20 years; other timeframes may only be used to compare expected future trends.

Environmental Consequences of Each Alternative

All relevant resources were analyzed for anticipated environmental consequences from implementing each alternative. Specialist reports containing further documentation of the analyses and resulting consequences are filed in the administrative record at the Coronado National Forest Supervisor's Office in Tucson, Arizona. This section examines, in detail, three alternatives for revising the 1986 forest plan, the latter of which serves as the no-action alternative.

Revision Topic 1: Ecosystem Restoration and Resiliency

Vegetation Communities, Fuels and Fire – Affected Environment

The vegetation of the Coronado is unique in both diversity and arrangement. It occupies 12 mountain ranges at the intersection of the Rocky Mountains and the Sierra Madre Occidental of Mexico. The convergence of both temperate and subtropical influences combined with an elevation change of about 7,720 feet and changes in aspect create an impressive diversity of vegetation communities with a wide variety of plant species.

The highly diverse topographic nature of the sky islands impacts the spatial arrangement of vegetation of the Coronado. Vegetation communities exist as discontinuous bands along elevation gradients on each mountain range. Almost no vegetation community is monotypic at a coarse scale. Instead, vegetation communities intergrade with communities at lower and higher elevations. For example, interior chaparral intermixes with the Madrean encinal woodlands above and the grasslands and deserts below, creating an environment where natural and human disturbances are impacted by the overlap of vegetation communities. This distinctive spatial arrangement often responds to management differently than the same vegetation communities in other locations in the Southwest. (See the "Environmental Consequences" section below.)

Nine major vegetation communities are represented in different proportions across the Coronado (table 29). Madrean encinal woodland covers the most land area, while spruce-fir forest, montane meadows, wetlands, and riparian areas each represent the least area. Montane meadows and wetlands occur as fine-scale patches within much larger vegetation communities. Because of this, mapping used to define vegetation communities does not recognize the fine-scale montane meadows or wetlands. For the purpose of analysis, descriptions of montane meadows and wetlands are included with the vegetation communities in which they occur, piñon-juniper woodlands are discussed with Madrean encinal woodland, and riparian areas are discussed separately.

Table 29. Major vegetation communities within the Coronado National Forest boundary*

Vegetation Community	Percent Composition	Acres**
Desert communities	10.2%	175,452
Grasslands	23.7%	407,477
Interior chaparral	8.8%	151,181
Madrean encinal woodland	43.0%	738,693
Madrean pine-oak woodland	8.3%	142,047
Ponderosa pine-evergreen shrub	2.3%	39,477
Mixed-conifer (dry and wet)	3.2%	55,451
Spruce-fir forest	0.2%	3,014
Montane meadows, wetlands, and riparian areas	0.2%	5,142
Total	100.0%	1,717,934

** This table reflects the Coronado National Forest boundary acres instead of the Potential Natural Vegetation Type acres. When Potential Natural Vegetation Type was developed, the boundaries were different and it caused some errors in acreages.

The Coronado manages just 8 percent of total National Forest System lands in Arizona and New Mexico, but larger percentages of specific vegetation communities than all other national forests in both states. The largest percentage of all Madrean encinal woodlands (approximately 26 percent) in Southwestern Region national forests is found on the Coronado. In addition, the Coronado manages 25 percent of grasslands, 17 percent of deserts and Madrean pine-oak woodlands, and 11 percent of interior chaparral on National Forest System lands in both states. Although riparian communities are much less than 1 percent of the Coronado, the montane willow and cottonwood willow riparian forests on the Coronado account for 12 and 27 percent, respectively, of those on National Forest System lands in Arizona and New Mexico (see the “Riparian Areas” section on page 148 for more information).

The Coronado also manages larger percentages of certain vegetation communities when compared with other land ownership entities in Arizona and New Mexico. The Coronado manages the second largest portion (11 percent) of Madrean encinal woodlands relative to other land managers throughout Arizona and New Mexico. Conversely, the Coronado manages only a tiny fraction of desert plant communities compared to surrounding land ownership entities (USDA FS 2009b).

Table 30 reports the vegetation condition class for each community on the Coronado and the degree to which they differ from reference conditions (departure). Most vegetation communities on the Coronado have experienced widespread change in composition and structure since the Euro-American settlement of the Southwest. Livestock grazing, fire suppression, selective logging, fuelwood harvest, nonnative species introduction, and fragmentation have altered vegetation communities from their natural state to a current condition that is unlike either reference or desired conditions.

Most of the vegetation on the Coronado is adapted to wildfire—some to frequent low-intensity fire, others to high-severity crown fire. Both types are present on the Coronado and both are very different in nature. Further, humans have affected each differently and to varying degrees. Over the years, as changes in fuels and fuel connectivity, livestock grazing, wood harvest, and fragmentation have occurred, the natural role of fire in managing the landscape has diminished. Active fire suppression by early settlers, and later, by the Forest Service, further contributed to a reduction in the occurrence of natural fires. The effect of fire suppression differs by vegetation community and is discussed in more detail for each of the individual vegetation community analyses.

Table 30. Vegetation condition class (VCC) and departure for each vegetation community*

Vegetation Community	Departure	VCC	Description
Desert	59%	2	Moderate departure
Grassland	81%	3	High departure
Interior chaparral	78%	3	High departure
Madrean encinal woodland	35%	2	Low to moderate departure
Madrean pine-oak woodland	50%	2	Moderate departure
Ponderosa pine-evergreen shrub	81%	3	High departure
Dry mixed-conifer	69%	3	Moderate to high departure
Wet mixed-conifer	58%	2	Moderate departure
Spruce-fir	34%	2	Low to moderate departure
Montane meadows, wetlands, and riparian areas	60%	2	Moderate departure

* Vegetation condition class departure was calculated from a weighted-average, based on each vegetation community and the acreage represented on the ecosystem management areas.

Woody vegetation, in the form of shrub encroachment or small trees, has increased in many Coronado vegetation communities. This correlates to a corresponding increase in the probability of uncharacteristic wildfire in these areas. In some cases, woody species encroachment has been observed to be contributing to a compositional shift to shrubland in grassland communities. In most cases, the seeding in of small trees has increased structural homogeneity across the landscape, heightening the risk of uncharacteristic fires and uncharacteristic insect and disease outbreak in these communities.

Today, the Coronado contains uncharacteristically dense forests with many more young and mid-aged trees than were historically present. Forested types are deficient in grasses, forbs, and shrubs due to tree competition and shading from the denser canopy; these are at high risk for uncharacteristic wildfires because of an accumulated buildup of live and dead woody material, increased crown bulk density, and increased canopy continuity.

While shrub and tree encroachment have altered the composition and structure of grassland and woodland communities, in communities not adapted to fire (i.e., desert communities), nonnative species introduction is the driving factor for departure from reference conditions. Particularly, the pervasiveness of buffelgrass in the deserts has forced fire into a community where it historically occurred very infrequently, and where it is now threatening native vegetation.

Table 31 shows the expected treatments under the proposed action, and alternatives 1 and 2, all of which are the same. The 1986 forest plan does not state treatments specifically. Therefore, for the purpose of analysis, expected treatment type and acreage were estimated based on past and foreseeable future treatments. However, due to the complexity of these estimates, treatments under the no-action alternative were not summarized in a table, but rather discussed in the text of each vegetation community.

Table 31. Objectives for vegetation treatment specified under the proposed action and alternatives 1 and 2 (in acres)

Vegetation Community	Treatment	Acres Treated (10 years)
Desert communities	Suppress/eradicate buffelgrass	10,000–15,000
Grassland communities	Wildland fire, thinning, and mastication	72,500
Interior chaparral	Wildland fire and mechanical	5,000
Madrean encinal woodland	Wildland fire, thinning, and mastication	367,000
Madrean pine-oak woodland	Wildland fire, thinning, and mastication	25,000
Ponderosa pine-evergreen shrub	Wildland fire, thinning, and mastication	12,500
Mixed-conifer (dry and wet)	Wildland fire and thinning	16,200
Riparian	Upland restoration for watershed stability	2,500–10,000*
Spruce-fir	No treatment specified	0**

* The only vegetation type that does not have an associated treatment method is riparian. Treatment of upland areas would be used to improve riparian soils and vegetation. Treatment acreage would vary with the size of riparian areas to be improved.

** Management will allow for natural and artificial regeneration where needed.

Vegetation Communities, Fuels and Fire – Environmental Consequences

The methodology used in the vegetation analysis is explained in appendix G of this environmental impact statement.

Effects Common to All Alternatives

Direction provided by the alternatives would maintain or improve the ecological integrity of vegetation communities across the Coronado. Under all alternatives, vegetation would continue to be managed in accordance with laws and regulations. For most vegetation communities, their departure from desired condition vegetation structure would continue. Modeling results indicate that no alternative would achieve desired conditions fully during the modeling period (VDDT analysis[16]); however, varying degrees of progress are expected among alternatives in the movement toward desired conditions.

Under all alternatives, unplanned fire ignitions would continue to be managed to treat fire-adapted vegetation. The degree to which the effects of fire are positive depends largely on the seasonality, severity, and extent of the fire, and the ecology of the vegetation community. Fire can accelerate nutrient cycling, increase soil fertility, and enhance plant productivity. On the other hand, because it removes vegetation, fire often increases erosion of soils and sedimentation in the short term. It also creates hydrophobic (water repellent) soils within areas where severity is high. This, in turn, decreases water infiltration to soils, which may cause flash flooding and a public and user safety hazard downstream, and impede germination of vegetation.

The proposed action and alternatives 1 and 2 provide wildland-urban interface guidance specific to the vegetation communities. For each vegetation community, treatments in the wildland-urban interface would create vegetation structure, composition, and fuel loadings that support low-intensity surface fire to reduce the impacts of wildfire on communities. Although the no-action alternative does not contain plan components that specifically address treatments at the wildland-urban interface, management would be similar to that of the proposed action, alternatives 1 and 2.

[16] VDDT is a model called the Vegetation Dynamics Development Tool

Wilderness Areas

Designated wilderness and wilderness study areas that already exist on the Coronado would be managed by all alternatives under guidelines designed to meet specific desired conditions. Because none of the action alternatives proposes to change the acres of existing designated wilderness, effects would be the same for all alternatives.

Under all alternatives, wilderness study areas and recommended wilderness would be managed as wilderness (i.e., maintenance of wilderness character). For ease of analysis, management of both recommended wilderness and wilderness study areas is discussed under the umbrella of "wilderness" management. For more specific information regarding the consequences related to wilderness, see the "Wilderness and Other Special Areas" section on page 356.

Direction under all alternatives would call for wilderness to be managed in accordance with Forest Service policy that is tiered to the Wilderness Act. This includes requirements that must be addressed before a vegetation treatment may be initiated (i.e., completion of a minimum requirements decision guide and a National Environmental Policy Act review) and restrictions on motorized and mechanized uses. An exception is made for unplanned ignitions, which require an emergency response. Actions related to these do not require a minimum requirements decision guide.

There would be no direct effects on vegetation from the administrative action of either designating or recommending designation of wilderness under any of the alternatives. However, effects on vegetation may result from vegetation treatments and disturbances that take place on the landscape within wilderness.

Planned fire ignitions may be used in wilderness to reduce unnatural buildups of fuels only if they are necessary to meet at least one of the wilderness fire-management objectives set forth in Forest Service Manual 2324.21. Other activities that are often part of vegetation management projects, such as the use of motorized equipment (chainsaws, pumps) or mechanical transport (ground-based vehicles and aircraft), must follow the minimum requirements decision guide process in order to identify the "minimum tool" (activity, method, or equipment) necessary to implement the project. If the "minimum tool" is determined to be mechanical and/or motorized, the level of approval specified in the Forest Service manual is required. Potential limitations on mechanical and/or mechanized options could constrain the feasibility of treatment and impede the movement of a community toward or attainment of desired conditions.

Past management practices have altered vegetation composition and structure on the Coronado. The potential limitations on vegetation management in wilderness may decrease the options for, and feasibility of, pre-treating departed vegetation prior to reintroduction of fire. If treatments do not occur, the result may be uncharacteristic fire behavior if a wildfire was to occur. The effects associated with uncharacteristic fire include eradication of native (nonfire adapted) vegetation, increase in nonnative invasive plants, further departure of vegetation structure and composition, and increased erosion and runoff.

Recommended Wilderness Areas

Mount Graham Wilderness Study Area is proposed as a recommended wilderness area under all alternatives. Its management for retention of wilderness character would be the same under all alternatives. Effects on the area would be the same under all alternatives.

No Action

The no-action alternative provides minimal guidance specific to the diverse vegetation communities found on the Coronado. While incomplete guidance does not hinder the movement toward, or achievement of, vegetation toward desired conditions for each community, it limits the effectiveness of management.

Although the1986 plan recognizes a need to restore natural ecological processes in fire-dependent ecosystems, it does not address vegetation communities individually nor does it provide guidance in the form of desired conditions or objectives. Instead, vegetation management guidance is given under the resource elements for range, wildlife and fish, timber, and fire and fuels. This means that the guidance is output based, that is, with success measured in game and wildlife habitat, rangeland and livestock forage, and forest products.

Because the 1986 plan addresses vegetation communities in the context of other resource elements and does not provide desired conditions for vegetation, it does not account for more holistic ecological outcomes, such as structure, composition, and function of healthy communities. This may result in different interpretations of plan direction at the project level and may limit a manager's ability to effectively move each vegetation community toward a more ecologically sustainable system, such as one defined by community-specific guidance.

Standards and guidelines are established in the 1986 plan to guide project implementation and prevent adverse impacts to vegetation communities from management activities; however, it is difficult to determine the difference between these plan components.

In terms of old-growth conditions within forested vegetation communities, the 1986 plan supports the development and maintenance of large trees, snags, and down woody debris. It does this by advocating for these components in the form of habitat for Mexican spotted owl, northern goshawk, and Mount Graham red squirrel. Additionally, the 1986 forest plan dictates at least 20 percent of the naturally forested area by vegetation type be managed for the development and retention of old growth and old-growth function. Although these plan components promote old growth across the Coronado vegetation communities, the treatment of old growth as a relatively static and discrete homogenous stand instead of considering its dynamic and integrated, fine scale attributes does not incorporate this important element of healthy forest communities and its relative success as wildlife habitat.

Old-growth conditions under the 1986 forest plan are treated as if they occur in a static system without disturbance. This is of concern because most forested acres on the Coronado are represented by uneven-aged forest structures, where old growth occurs as large and old trees, large snags, and multistoried structure throughout the vegetation community, and often at a fine scale. Current guidance on managing old growth is more appropriate when applied to forested vegetation communities that trend toward more even-aged characteristics (i.e., wet mixed-conifer and spruce-fir). In these communities, old-growth components occur in larger, more homogenous patches. However, because of the spatial arrangement of the vegetation communities on the Coronado, the trend within these forests toward even-aged characteristics is somewhat diminished when compared to other occurrences of these forest communities across the region.

Proposed Action

The proposed action addresses nine diverse vegetation communities and provides detailed desired condition statements for each community. It establishes specific objectives for achieving desired conditions where management actions are needed to attain them. Specific objectives are set for management actions needed in each forest ecosystem management area, with consideration of the large landscapes at risk of experiencing uncharacteristic wildfire. Standards and guidelines are established to guide project implementation and prevent adverse impacts to vegetation communities from management activities.

Current scientific information regarding the effects of climate change on forest resources is incorporated in the revised forest plan. It is presented as a general description of anticipated changes in conditions as they are known to a reasonable level of certainty. It also outlines desired conditions for all vegetation communities to promote their increasing resiliency and adaptation capacity to changing conditions and other stressors, such as extended drought and warmer temperatures, which are projected to occur in the Southwest.

For most vegetation communities, the objectives of the revised forest plan are to progress further toward desired conditions in terms of vegetation structure when compared to the 1986 plan. Sometimes these changes in structure are limited, and do not result in substantial positive change throughout the community.

Recommended Wilderness Areas

Four areas would be recommended for wilderness designation under the proposed action: the present Mount Graham Wilderness Study Area, and Ku Chish, Whetstone, and Chiricahua Addition North. Approximately 108,890 acres would be allocated in the recommended wilderness areas. Management in recommended wilderness is more restrictive than nonwilderness and may increase planning time and project costs and limit options for treatment.

The Mount Graham Recommended Wilderness Area contains about 61,315 acres, which are entirely within an inventoried roadless area. The impacts of recommending the Mount Graham Recommended Wilderness Area for wilderness designation are common to all alternatives and are discussed in more detail in the "Vegetation Communities, Fuels and Fire," "Effects Common to All Alternatives" section on page 98.

Portions of the Ku Chish Recommended Wilderness Area recently experienced uncharacteristic fire, which reduced fuel loading and consequent fire hazard, but left the area moderately departed from reference vegetation structure. This area is also included in current landscape planning efforts, and wilderness designation would affect these projects. About 26,245 acres would be managed as the Ku Chish Recommended Wilderness Area, of which 22,450 acres (86 percent) are in an inventoried roadless area. Future treatments to maintain desired conditions across the vegetation communities may be hindered by recommending this area. The Ku Chish area is discussed in more detail under "Alternative 1" below.

Whetstone Recommended Wilderness Area. The Whetstone Potential Wilderness Area encompasses 16,317 acres. This area is located in the Whetstone Mountain Range, which is part of the Sierra Vista Ranger District of the Coronado National Forest in southeastern Arizona. The Whetstone Potential Wilderness Area is overlapped by 13,619 acres of the Whetstone Inventoried Roadless Area, comprising 83 percent of the potential wilderness area.

Chiricahua Addition North Recommended Wilderness Area. The Chiricahua Addition North Potential Wilderness Area is 5,013 acres. The area is located adjacent to the existing Chiricahua Wilderness. This area would be an expansion of the Chiricahua Wilderness that is now 87,700 acres, bringing the overall acres to 92,712 if designated. This area is located in the Chiricahua Mountains, which is part of the Douglas Ranger District of the Coronado National Forest in southeastern Arizona. The Chiricahua Addition North Potential Wilderness Area is overlapped by 1,624 acres of the Chiricahua Inventoried Roadless Area, comprising 32 percent of the potential wilderness area.

Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to vegetation communities would be similar to the proposed action in terms of the guidance and objectives provided for each vegetation community. Alternative 1 proposes that 16 land parcels be managed for wilderness character. Approximately 255,908 acres, or 15 percent, of the vegetation communities would be recommended to wilderness designation under alternative 1. Recommendation of the Ku Chish and Mount Graham areas for wilderness designation would result in identical effects when compared to the proposed action, as each would be recommended as part of the revised forest plan.

When an area that is highly or moderately departed from the desired conditions is recommended as wilderness, the limitation on vegetation treatments due to the restricted use of mechanized and motorized equipment can increase the risk of uncharacteristic fire in the recommended wilderness and surrounding area. Because a prerequisite for becoming an inventoried potential wilderness area is a lack of recent mechanized and motorized vegetation treatments, recommended wilderness areas may

have more departed conditions than the vegetation community forestwide. Fifty-eight percent of the total wilderness acreage recommended by alternative 1 is at least moderately departed and trending away from desired conditions. As a result, vegetation conditions in these areas may be more vulnerable to uncharacteristic fire. The recommended wilderness areas with lower vegetation departure or recent wildfire activity are less likely to need treatment and, therefore, less likely to have effects in addition to those discussed under the proposed action. Recommended wilderness areas with topographic or accessibility constraints where treatments would be impractical, would also be less likely to have additional effects.

Recently burned (in 2011) recommended wilderness areas include Ku Chish, Chiricahua Additions West and North, Jhus Canyon, and Tumacacori. Portions of these areas burned with higher severities than would be expected under reference conditions, and the resulting vegetation structure may still be departed due to this. Recommending these areas would not increase the immediate risk of uncharacteristic fire because the fuel loading and associated hazard has been reduced. Future treatments to maintain desired conditions may be slower than nonwilderness treatments because of the additional management limitations and complexities associated with managing these areas as wilderness.

The Dragoon and Galiuro Recommended Wilderness Areas are moderately to highly departed from their reference vegetation composition and structure. The potential limitations associated with wilderness management could decrease the ability to conduct vegetation treatments in these areas prior to a wildfire occurring, which could result in uncharacteristic fire behavior.

The Santa Teresa Additions (north and south), Whetstone, and Winchester Recommended Wilderness Areas have moderate to high vegetation departure. The potential limitations associated with wilderness management could decrease in the ability to conduct vegetation treatments in these areas prior to a wildfire occurring, which could result in uncharacteristic fire behavior. However, due to lack of roads and steep slopes, treatments other than unplanned ignitions are not a priority or are impractical in these areas.

The Mount Fagan and Mount Wrightson Addition Recommended Wilderness Areas have low to moderate departure as a result of past fire occurrence. The potential for uncharacteristic fire behavior in these areas is reduced as a result of past wildfires. Recommendations of these areas would not increase the risk of uncharacteristic fire in these areas because the fuel loading and associated hazard has been reduced. No current or future treatments are planned for these areas.

Current wilderness study areas recommended for wilderness under alternative 1 include Bunk Robinson, Whitmire, and Mount Graham. (See “Vegetation Communities, Fuels and Fire,” “Effects Common to All Alternatives” section on page 98).

Alternative 2

Because alternative 2 incorporates the direction of the revised forest plan, effects to the vegetation communities would be similar to the proposed action in terms of the guidance and objectives provided for each vegetation community. However, approximately 45,117 acres are included in the Motorized Recreation Land Use Zone specified by alternative 2. This is an increase of approximately 40,255 acres over that of the Motorized Recreation Land Use Zone specified by the proposed action and alternative 1 (see table 32). In addition, under alternative 2, only the Mount Graham Wilderness Study Area (61,315 acres) would be recommended for wilderness. However, as the wilderness study areas and recommended wilderness area would be managed under the direction of the revised forest plan, management for wilderness characters of the Mount Graham, Whitmire, and Bunk Robinson Wilderness Study Areas would continue.

Table 32. The acreage of the Motorized Recreation Land Use Zone proposed under the proposed action, alternative 1, and alternative 2

Vegetation Community	Alternative 2	Proposed Action and Alternative 1
Desert communities	5,801	1,039
Grasslands	21,459	2,517
Interior chaparral	2,282	280
Madrean encinal woodland	14,853	953
Madrean pine-oak woodland	627	59
Ponderosa pine-evergreen shrub	0	0
Mixed-conifer (dry and wet)	0	0
Spruce-fir forest	0	0
Montane meadows, wetlands, and riparian areas	95	14
TOTAL	**45,117**	**4,862**

Additionally, alternative 2 provides no plan components related to management of vegetation resources under climate change. It does incorporate the strategies in appendix A of the revised forest plan, which provides several approaches to address key climate change factors (caused by insects, disease, and fire) that exacerbate the effects of climate change. Therefore, alternative 2 would be slightly less effective in managing the effects of climate change than the proposed action and alternative 1.

Under alternative 2, there is an increased potential for new construction of off-highway vehicle trails and other facilities for motorized recreation, which could result in a net loss of the vegetation communities on the Coronado. Construction of off-highway vehicle facilities in the Motorized Recreation Land Use Zone would result in vegetation removal, soil compaction, erosion, and sedimentation. In areas that could accommodate parking, detrimental effects to the soil resource may extend beyond the footprint of roads. Increased fragmentation may negatively affect the natural fire spread across the landscape. The additional roads may also increase the feasibility of treatment by increasing holding features for planned ignitions and improving access for mechanical treatment.

By expanding the Motorized Recreation Land Use Zone, alternative 2 better meets the need for motorized recreation and concentrates the negative impacts to vegetation associated with the activity. This may provide more effective protection to the vegetation communities across the Coronado. When considering the vegetation communities broadly, alternative 2 would result in similar impacts when compared to the proposed action. Because the additional acres of the Motorized Recreation Land Use Zone are concentrated at the lower elevations, alternative 2 would impact the vegetation communities disproportionately (see table 32). The impacts particular to each vegetation community are discussed in the community specific “Environmental Consequences” section later in the document.

Cumulative Effects

The cumulative effects are discussed collectively for all vegetation communities. This section appears on page 157 following the discussion of each vegetation community.

Desert Communities – Affected Environment

Both the Sonoran and Chihuahuan Desert are represented on the Coronado. At its lowest elevations, the desert community on the Coronado is a transition zone between the two. Desert communities comprise 9 percent of the Coronado and 17 percent of the desert communities on national forests in the Southwestern Region. The Coronado manages the fewest desert plant communities among other

land ownership entities (USDA FS 2009b) in the Southwest; the Bureau of Land Management manages the most (Schussman and Smith 2006).

Desert communities on the Coronado range in elevation from 2,600 to 3,200 feet, although they may extend beyond this range on steep southern exposures. Annual precipitation averages from 10 to 13 inches. Gravel and rock cover ranges from 5 to 65 percent in flood plains, and 35 to 85 percent on upland sites. Bedrock outcrops can be as high as 10 percent in upland areas. Active erosion and sedimentation occurs in channels on floodplains.

Vegetation types and their density in desert communities on the Coronado vary with geology, geographic location, precipitation, and topography. Some areas are barren and have an abundant surface cover of sand, rock, and gravel. Others have sparse to dense vegetation cover that includes succulent species, desert grasses, desertscrub, and some herbaceous cover (USDA FS 2009b). Seasonally, cover of annual forbs and grasses is often extensive after exceptionally wet winter or summer monsoon seasons, but it is short lived (Robinett 2010).

Predominant vegetation includes shrubs, desert trees, and succulents; the desert community has lesser amounts of grasses and forbs. Common species include catclaw acacia (*Acacia greggii*), triangleleaf bursage (*Ambrosia deltoidea*), white bursage (*Ambrosia dumosa*), mesquite (*Prosopis* spp.), desert ironwood (*Olneya tesota*), saltbush (*Atriplex* spp.), creosote (*Larrea tridentata*), iodine bush (*Allenrolfea occidentalis*), splitleaf brickellia (*Brickellia laciniata*), desert broom (*Baccharis sarothroides*), desert willow (*Chilopsis linearis*), Apache plume (*Fallugia paradoxa*), cheesebush (*Hymenoclea salsola*), barrel cactus (*Ferocactus* spp.), hedgehog cacti (*Echinocereus* spp.), cholla and prickly pear (*Opuntia* spp.), saguaro (*Carnegia gigantea*), salt grass (*Distichlis spicata*), rice grasses (*Oryzopsis* spp.), and dropseed grasses (*Sporobolus* spp.).

Wildlife species that depend on desert communities as habitat are typical of both the Chihuahuan and Sonoran Deserts. Relatively few forest planning species[17] are associated with the terrestrial habitat provided by desert communities, because the Coronado is located on the fringe of these arid habitats and they are, for the most part, managed by other agencies. Sonoran Desert species include the following special-status species: Sonoran desert tortoise (*Gopherus morafkai*), cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*), Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*), and red-backed whiptail lizard (*Aspidoscelis xanthonota*). Chihuahuan Desert special-status species include the northern Aplomado falcon (*Falco femoralis*) and Arizona striped whiptail lizard (*Aspidoscelis arizonae*).

Drought is the primary natural disturbance in the desert community that desert plants are uniquely adapted to survive. Succulents have unique water storage capabilities and opportunistic germination and flowering strategies that take advantage of moisture when it is available. Many desert species are drought deciduous, dropping their leaves when water levels are very low. One of the foremost human-caused disturbances in the desert community is livestock grazing, which reduces plant cover primarily in the spring, when good forage annuals, such as filaree (*Erodium circutarium*), Indian wheat (*Plantago* spp.), and fiddle-neck (*Amsinckia* spp.), are available.

The reference vegetation condition of the Sonoran and Chihuahuan Deserts is represented by plant communities that are typically sparse, with few grasses in the understory. Because they evolved without fire as a natural ecological occurrence, most of the plants of the desert community, including the iconic saguaro cactus, cannot survive fire. A vegetation condition class (VCC) analysis of the Coronado's desert communities indicates an overall moderate departure (vegetation condition class 2) from the reference condition. The departure of vegetation composition and structure is attributed to

[17] Forest planning species are those species identified as threatened, endangered, sensitive, or of conservation concern. Across the forest, 437 species (terrestrial, aquatic, and plant) were identified as forest planning species and include: 36 mammals, 32 birds, 8 amphibians, 19 reptiles, 73 insects, 4 other invertebrates, 16 fish, 56 mollusks, 7 fungi-lichen, 5 mosses-liverworts, and 181 plants.

increased shrub cover and effects of increasing populations of invasive plant species. Refer to table 30 for detailed information regarding the vegetation condition class analysis data for this community.

The proliferation of nonnative, invasive grasses poses the greatest threat to plants native to the desert community. Nonnative desert grasses self-perpetuate when fire reduces native vegetation and promotes grass cover. Invasive grasses that burn easily have increased in quantity in deserts, which has contributed to a corresponding increase in fire frequency.

Nonnative buffelgrass (*Pennisetum ciliare*) is a significant threat in Sonoran and Chihuahuan Desert ecosystems. It was introduced in Arizona in the 1930s by the U.S. Soil Conservation Service for erosion control and livestock forage. Buffelgrass occurs primarily on southwest-facing slopes of the Santa Catalina Mountains below 4,500 to 5,000 feet in elevation. In addition, buffelgrass is also widespread in the Tumacacori Mountains along the international border with Mexico. In Mexico, it is still widely seeded for livestock forage. Fountain grass (*P. setaceum*) has also become invasive in the Sonoran Desert, occurring with buffelgrass on slopes and especially in dry washes. Although they are not as much a threat as buffelgrass with respect to extent or ecological consequences, other nonnative species also degrade desert ecosystems and can become invasive, especially in riparian areas.

Current research indicates that buffelgrass is spreading at exponential rates in the Santa Catalina Mountains, including the Pusch Ridge Wilderness (Olsson et al. 2012, USDA FS 2009b). The invasion of buffelgrass is already so extensive in the Santa Catalina Mountains and in southeast Arizona, in general, that its full eradication from the Coronado is probably not a realistic goal. However, with a strong commitment by the Forest Service, other regional land management entities, and concerned private citizens to control of buffelgrass infestation in high-value, high-priority areas and prevent its spread, it is possible to sustain the vegetation community of the Sonoran Desert on the Coronado in the long term. High-priority areas are characterized by unique Sonoran Desert vegetation and associated wildlife, wilderness, important viewsheds and recreation opportunities, and the wildland-urban interface. Most of these areas are in large canyons that run from the Pusch Ridge Wilderness on the Santa Catalina District to the wildland-urban interface.

In addition to providing fuel for uncharacteristic wildfire, buffelgrass is successful at outcompeting native plants for moisture and nutrients and occupying their germination sites (Olsson et al. 2012, USDA FS 2009b). Buffelgrass and other nonnative grasses have the potential to change the fire regime in the desert community from one that rarely experiences fire to one that frequently burns. Wildfires are also a major hazard at the wildland-urban interface, where buffelgrass-fueled fires could endanger life and property. In addition, fires in the lower elevations may provide an ignition source and continuous fuels that carry fire into woody vegetation at higher elevations.

Invasion of buffelgrass can alter the desert ecosystem as a whole (Olsson et al. 2012), reducing native wildlife habitat quantity and quality, including that of desert bighorn sheep and the Sonoran Desert tortoise (Gray and Steidl 2012). Also, loss of the desert vegetation community may lead to conversion to an exotic grassland community, which would alter watershed dynamics, including ephemeral and perennial streamflows, riparian ecosystems, soil infiltration, and aquifer recharge.

A 2008 helicopter survey inventoried 5,000 acres of buffelgrass distributed at varying densities across 40 sections (25,600 acres) in the Pusch Ridge Wilderness. Given known exponential rates of spread in the Santa Catalina Mountains, a reasonable approximation of current infestation would be 7,500 acres. Further, a 2013 helicopter survey in a section of Sonoran Desert on the Mexican border inventoried 1,500 acres of buffelgrass distributed across 24 sections (15,360 acres).

Currently, the Coronado treats invasive species at a rate of approximately 625 acres per year. Most treatments are focused on buffelgrass removal using a combination of herbicide applications by licensed contractors and manual removal by Arizona Department of Corrections crews and volunteers. Of these, contracted herbicide treatments are the most effective and efficient for treating large acreages. It is important to note that contracted crews are paid for the number of infested acres

traversed, not just the number of acres sprayed, as they search out patches and individual plants spread across slopes and canyons.

In addition to ground-based herbicide treatments, aerial herbicide applications would enable the Coronado to address buffelgrass infestations that are on steep, rugged, inaccessible terrain that is not safe for ground crews. After an initial treatment, areas must be retreated during the subsequent 2 or 3 years in order to deplete the persistent seedbank and prevent reinfestation. After 3 years, a monitoring and maintenance schedule would become effective in managing invasive grasses on treated sites.

An increased financial investment will be needed in order to better manage and control the infestation and spread of buffelgrass on the Coronado and ameliorate the risk of conversion to an exotic grass monoculture. At least 15 percent of a jurisdiction's total weed acreage must be treated annually to keep pace with the rates of spread and reduce infestation levels (Beck 2013). For the Coronado, this would require that between 1,000 and 1,500 acres of buffelgrass be treated annually with herbicide at an annual cost of approximately $200,000 to $375,000, depending on competitive contractor rates and assuming treatment of dense infestations where acres sprayed are equal to acres traversed.

Overall, the threats and stressors described above have the potential to negatively affect the sustainability of desert communities on the Coronado. The impacts of buffelgrass on the greater desert system include the reduced health and vigor of individual native plants (Olsson et al. 2012), which, in turn, would impact the health and resiliency of the community. The diminished resiliency of the desert would inhibit the community's response to the detrimental effects of climate change, namely increases in water stress, insect and disease outbreak, and mean annual temperature. Although the desert is well adapted to hot and dry conditions, a stressed ecosystem has a limited capacity to absorb increases in stress.

On the other hand, with scientific climate change projections for the Southwest that favor hotter, drier conditions, desert communities may have an opportunity to thrive. Unfortunately, climate change may concurrently increase the susceptibility of desert vegetation to insect attack, increased colonization of invasive species, longer and more severe fire seasons, and altered frequency, intensity, timing, and spatial extent of disturbance events (droughts, fires, flash floods, landslides, and wind storms; see appendix A of the revised forest plan).

Desert Communities – Environmental Consequences

Effects Common to All Alternatives

Potential adverse effects on desert communities are attributed to natural occurrences, such as drought, wildfire, insects, and disease; and human activities, such as livestock grazing and the introduction of nonnative invasive species. Invasive species are the primary threat to the sustainability of the desert community.

Under all alternatives, manual removal of buffelgrass would continue to cause localized ground disturbances, which increase the potential for soil erosion and sedimentation on steep sites. However, the manual removal of buffelgrass would be quite localized, and adverse effects are likely to be minimal. Chemical treatments would also continue, with targeted applications on individual plants and areas and the use of low-risk herbicides.

No Action

The 1986 plan does not specifically address desert community ecosystems and, where mentioned, guidance on how to manage these communities focuses on using fire and chemicals to control native species such as amole (*Agave schottii*), burrobrush (*Hymenoclea* spp.), snakeweed (*Gutierrza sarothrae*), catclaw, and mesquite in order to improve livestock forage. Under the direction of the 1986 forest plan, over 10,000 acres of desert communities have been treated by planned fire ignitions, and over 28,000 acres have burned in wildfire. Fire is not a natural disturbance in this vegetation community and poses a threat to certain plant species unique to the Sonoran Desert.

Under the no-action alternative, there would continue to be no explicit plan guidance on how to address the effects and threats of invasive species in desert communities, including the unique problems associated with controlling the spread of buffelgrass, which also increases the likelihood of uncharacteristic fire in this vegetation community. The long-term health of the Sonoran Desert and riparian ecosystems in the lower elevations of the Santa Catalina Mountains would be negatively affected if no action is taken and buffelgrass is permitted to continue increasing at current exponential rates.

Proposed Action

The proposed action defines desired conditions based on the reference conditions for desert communities and provides management objectives and guidelines that provide a framework for implementing site-specific projects to move toward desired conditions. These desired conditions account for the diversity of soils, topography, and precipitation that occurs within the desert community. The presence of plan language specific to the desert community provides a useful guide for managers and does more to protect the ecosystem health and sustainability than the no-action alternative.

Forest plan components stated for the desert community would guide management and treat 10,000 to 15,000 acres of buffelgrass every 10 years using chemicals and manual removal to control infestations on high-priority areas and reduce the spread of this invasive species. The explicit goals and desired conditions stated in the revised forest plan would facilitate more effective project level planning compared to the 1986 plan, which lacks explicit goals and desired conditions. Forest plan components would also restrict the use of planned fire ignitions in deserts to the control of nonnative invasive vegetation in specific situations, where fire could reduce senescent biomass and stimulate new growth in preparation for herbicide treatments, and native vegetation could be protected.

Approximately 2,873 acres, or about 1.7 percent, of the desert communities would be allocated within these recommended wilderness areas. The impacts of recommending the Mount Graham Recommended Wilderness Area are common to all alternatives and are discussed in more detail on page 98. Portions of the Ku Chish and Chiricahua Addition North Recommended Wilderness Areas recently burned, which reduced fuel loading and consequent fire hazard, but left the area moderately departed from reference vegetation structure. The Whetstone Recommended Wilderness Area is largely inaccessible and would have limited impact on management of desert communities. The effects of recommending the four areas as wilderness under the proposed action would be similar to those described under alternative 1 (page 100 and below) except that fewer acres would be affected.

Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to the desert community would be similar to the proposed action in terms of the guidance and objectives provided. Alternative 1 proposes that 16 land parcels be recommended for wilderness designation, including the Mount Graham and Ku Chish areas recommended under the proposed action, and expansions of the Chiricahua Addition North and Whetstone Recommended Wilderness Areas described under the proposed action. Approximately 10,695 acres, or 12 percent, of the desert communities would be allocated within these 16 recommended wilderness areas. Less than 1 percent is included in the Mount Graham and the Ku Chish Recommended Wilderness Areas, which are also recommended under the proposed action. Therefore, effects in those areas from alternative 1 would be similar to the proposed action.

The remaining acres of desert communities that may be included under alternative 1 are represented in all but two of the recommended wilderness areas (see the “Alternative 1” section on page 100 for more detailed description of the recommended areas and page 98 for a discussion of the effects of wilderness management).

Wilderness recommendation would reduce the likelihood of invasive species detection and slow response time; however, wilderness management would also limit the introduction and spread of nonnative species. Furthermore, the limitation on activities within wilderness may impact the control and removal of other nonnative species found in the desert, such as Sahara mustard and Malta star-thistle, which are now present across the Coronado in small patches. However, the reduced human traffic and vegetation manipulation within wilderness would limit the vectors for invasive species spread. The majority of the desert community in recommended wilderness is within the Tumacacori area (just over 6 percent). Because buffelgrass has been found in the Tumacacori Mountains, designation of the recommended area may restrict needed future treatment.

Table 33 shows the desert community represented in each of the recommended wildernesses. The success of invasive species eradication is dependent on early detection and rapid response. However, the immediate impacts of designating any or all of the recommend wilderness areas would not be significant in the desert community. Alternative 1 would result in similar impacts when compared to the proposed action.

Table 33. Acreage of desert communities in each recommended wilderness

Recommended Wilderness	Acres of Desert Communities
Bunk Robinson Wilderness Study Area	844
Chiricahua Addition North	171
Chiricahua Addition West	126
Dragoon	1,204
Galiuro Addition	10
Jhus Canyon	337
Ku Chish	1,591
Mount Fagan	1,915
Mount Graham Recommended Wilderness Area	42
Mount Wrightson	967
Tumacacori	10,886
Whetstone	1,368
Whitmire Canyon Wilderness Study Area	108
Winchester	1,126

Alternative 2

Because alternative 2 incorporates the direction of the revised forest plan, effects to the desert community would be similar to the proposed action in terms of the guidance and objectives provided. See the “Desert Communities” section, “Effects Common to all Alternatives” on page 105 for a more detailed discussion of these effects. Effects specific to the expansion of the Motorized Recreation Land Use Zone for the desert community are similar, with a few differences, to those discussed under “Alternative 2” on page 101.

Approximately 5,801 acres desert communities are present in the Motorized Recreation Land Use Zone specified by alternative 2. This is an increase in around 4,762 acres over the acreage of deserts in the Motorized Recreation Land Use Zone specified by the proposed action and alternative 1 (table 32). Desert communities, because of the lower organic content of soils and lower mesic conditions, are more vulnerable to the effects of motorized and mechanized uses and take longer to recovery once impacted. Once an area has been impacted, it can become a source for invasive introduction and wind-caused detachment of soil because of loss of ground cover. However, the expanded Motorized

Recreation Land Use Zone also concentrates the negative impacts of motorized travel and potentially protects the community as a whole. Due to the limited acreage and potential for protection of the greater desert community, alternative 2 would result in similar impacts when compared to the proposed action.

Grasslands – Affected Environment

Grasslands occur throughout southeastern Arizona, southwestern New Mexico, northeastern Sonora, and northwestern Chihuahua at elevations ranging from 3,000 to 4,500 feet (Wright 1980). These grasslands are bounded by Sonoran or Chihuahuan Desert at the lowest elevations and woodlands or chaparral at the higher elevations (Schussman and Smith 2006). The grasslands on the Coronado are further described by Robbinett (2010) into semidesert grassland communities and plain and savannah communities. Combined, this is the largest extent and proportion of grasslands on any national forest in Arizona. The area comprises 25 percent of all grasslands in Southwestern Region national forests and 35 percent of all grasslands in southeastern Arizona (USDA FS 2009b).

Semidesert grasslands comprise the majority of the grassland community and occur at elevations from 3,200 to 4,600 feet. They may extend higher on steep southern exposures. Annual precipitation averages from 12 to 16 inches. Ground cover consists mainly of gravel, cobble, and rock over 15 to 65 percent of steep areas and moderate slopes, and 10 to 35 percent in bottom lands. Bedrock outcrops can be as much as 15 percent on steep and moderate slopes, with the exception of moderate slopes with limestone parent material, where bedrock outcrops range from none to 5 percent. In washes and bottom lands, bedrock outcrops are 2 percent or less. Channel areas are active with both erosion and sedimentation (Robbinett 2010).

Plains and savannah grasslands are found at elevations from 4,000 to 5,500 feet, although they may extend beyond this range on steep southern exposures. Plains and savanna grasslands occupy the ecotone between the desert and interior chaparral, representing a small percentage of the grassland communities. Annual precipitation averages from 16 to 20 inches. Ground cover by gravel, cobble, and rock ranges from 10 to 57 percent except in bottom lands with loamy soils. Bedrock outcrops can be as high as 10 percent in steeper areas (Robbinett 2010).

In the grasslands, species composition varies with soil, topography, and precipitation. Dominant grassland associations on the Coronado include mixed native perennial species and nonnative perennial species, with smaller aggregations dominated by various *Bouteloua* spp., tobossa (*Hilaria mutica*), and giant sacaton (*Sporobolus wrightii*). Shrubs also occupy grasslands; their abundance and species composition varies (USDA FS 2009b).

Grasslands provide extremely important habitat for a diverse assemblage of plants and animals, second in diversity to Madrean encinal woodlands. Comprising valley and foothill habitats, they are especially important for riparian, aquatic, and terrestrial species more typical of those found in Mexico. Terrestrial forest planning species of semidesert grasslands include Madrean Valley forms, such as pronghorn (*Antilocapra americana*), Arizona grasshopper sparrow (*Ammodramus savannarum ammolegus*), Montezuma quail (*Cyrtonyx montezumae*), insects (e.g., several grasshoppers), grasses, and numerous shrub and forb species. Riparian species include black-capped gnatcatcher (*Polioptila nigriceps*), sunrise skipper (butterfly) (*Adopaeoides prittwitzi*), and southwest monkeyflower (*Mimulus dentilobus*). Aquatic species include Sonora tiger salamander (*Ambystoma mavortium stebbinsi*), Chiricahua leopard frog (*Lithobates chiricahuensis*), and Gila topminnow (*Poeciliopsis occidentalis*) (USDA FS 2009b).

The reference conditions of the grassland communities are characterized by an open aspect, where native grasses are the primary species and low shrub cover (less than 10 percent). The desired conditions identified for the grassland communities closely follow the historic range of variation and the reference conditions described above. However, due to the high variability of the grassland communities, desired conditions reflect the diversity of topography and soils present within these communities.

Livestock grazing, fire suppression, fragmentation, and nonnative species introduction associated with Euro-American settlement of the grasslands have pushed this vegetation community from its natural state to a current condition departed from desired conditions. Both overgrazing and fragmentation have reduced the role of fire in the grassland communities by limiting fire spread. Fire suppression has led to woody species encroachment and, in some cases, a compositional shift from grassland to shrubland (Schussman and Smith 2006). Current stressors contributing to the loss of native grasslands are the invasion of nonnative grass species (primarily Lehmann lovegrass), shrub invasion, and direct loss of land and consequent fragmentation from development in rural areas. In many grassland communities, shrub and woody species invasion can be attributed to historical grazing and the decreased role of fire across the landscape. Fragmentation and past practices of heavy livestock grazing have passively suppressed fire, while active fire suppression was also used as a management tool. Development as a disturbance occurs outside of the boundaries of the Coronado; however, this activity makes it increasingly difficult for managers to sustain grassland-dependent organisms and processes within forest boundaries (Schussman and Smith 2006, USDA FS 2009b).

Livestock grazing is a historical use that predates establishment of the national forest. Livestock was first introduced to New Mexico and Arizona between the late 16th and17th centuries. Beginning in the late 19th century, overstocking of ranges caused significant detrimental ecological changes in the region. After establishment of the Coronado, livestock grazing on National Forest System land was placed under the administrative control of the Forest Service. Grazing allotments were designated, stocking rates were systematically reduced, and sound management practices were implemented. As a result, ecological conditions steadily improved. Today, grazing is managed by the Forest Service in accordance with the terms and conditions of livestock grazing permits, allotment management plans, and annual operating plans, all of which have been subject to environmental analysis since the late 1990s. Currently, stocking on the Coronado is light to moderate, which is consistent with sustaining rangeland ecosystems (Schussman and Smith 2006, USDA FS 2009b).

Fire is an important natural disturbance in the grassland communities, as it maintains open grasslands with low shrub cover. Fires in the semidesert grassland were historically stand replacing, occurring every 2.5 to 10 years between June and July (Schussman and Smith 2006). In most grassland communities, the loss of frequent fire promotes the encroachment of woody species, eventually converting grasslands to shrublands. Due to the diversity of the grassland communities, the extent to which the absence of fire has played in driving grassland conversion varies, but is considerable. Increases in woody species density and cover in grasslands have also been correlated with wet winters, as well as other factors like rodent activity, livestock grazing, and increases in atmospheric carbon dioxide (USDA FS 2009b).

On the Coronado, there are more invasive plant and animal species in the grasslands than any other vegetation community, including Lehmann lovegrass (*Eragrostis lehmanniana*), weeping lovegrass (*Eragrostis curvula*), northern crayfish (*Orconectes virilis*), and American bullfrog (*Lithobates catesbeiana*) (USDA FS 2009b). Lehmann lovegrass has been widely seeded on rangelands in the Southwest for erosion control and livestock forage for decades (Cox and Ruyle 1986). It was widely used by the Arizona Department of Transportation Highway Division in seed mixes with other grasses to minimize erosion and sediment damage to highways during construction (Brady 1991). Prior to the mid-1980s, Lehmann lovegrass was used on the Coronado for range restoration projects, but was discontinued because of concerns about spreading population and negative effects on species diversity and wildlife habitat. In many areas, Lehmann lovegrass is now naturalized and forms monocultures that likely prevent the return of native grasses (Anable et al. 1992). Eradication may be possible with repeated application of herbicides, but the cost and negative effects of large-scale herbicide treatments make eradication impractical. There would also be a high likelihood of re-invasion of treated sites, considering that large seed sources exist on adjacent ownerships. Although less desirable than native grasses for some species of wildlife, including seed-foraging rodents and birds (Bock et al. 1986), Lehmann lovegrass does fulfill the purposes for which it was initially seeded to protect soil from erosion and provide forage for livestock. Unlike situations where vegetation type conversion occurs due to the invasion of a nonnative species (conversion of a grassland to a shrubland), in areas where

Lehmann lovegrass has become dominant, grassland ecosystem function as a whole has been maintained.

Currently, 27 percent of grasslands on the Coronado exist in an open native condition, 52 percent are shrub invaded, and 21 percent are open nonnative grasslands. Of the shrub-invaded areas, 42 percent have the potential to be restored to an open native condition. Sixty-nine percent of grasslands on the Coronado are either in the open native or restorable native communities, with the remainder in nonnative or former grassland communities (USDA FS 2009b). The vegetation condition class results indicate that the vegetation composition and structure of the grasslands are highly departed (vegetation condition class 3) from reference conditions (refer to table 30 for details). Much of the departure is due to increased canopy cover from shrubs. Early seral structure is deficit overall except for the Tumacacori Mountains where the 2011 Murphy Fire burned a large area of grasslands. These results would indicate a transition from grassland to shrubland due to a lack of wildfire among other potential factors as discussed in Schussman and Smith (2006a) and the Coronado National Forest Ecological Sustainability Report (USDA FS 2009b).

The success of recent planned fire ignitions and mechanical treatments to reduce shrub cover in current and former grasslands indicates the potential for grassland restoration. However, several factors must be carefully monitored to assess treatment effectiveness. One is the response of nonnative grasses to fire, and whether fire treatments will lead to increases in nonnative grasslands (USDA FS 2009b). For example, nonnative grasslands produce hotter fires and respond more quickly after fire than native grasses (Schussman and Smith 2006). Other factors that affect treatment effectiveness relate to changes in climate, particularly precipitation patterns. In general, summer rains favor regeneration of grasses, while increases in shrub cover correlate with winter rains. The effectiveness of any treatment will be heavily influenced by precipitation amounts and patterns in future years (USDA FS 2009b).

With warmer and drier climate conditions, grassland communities are susceptible to decreased plant productivity, increased insect attacks, colonization of invasive species, longer and more severe fire seasons, and altered frequency, intensity, timing, and spatial extent of disturbance events (droughts, fires, flash floods, landslides, and wind storms; see appendix A in the revised forest plan). Grasses use moisture in the upper soil layers. Intense precipitation increases runoff, but decreases the degree and effectiveness of water infiltration. This may decrease vigor of native plants and encourage colonization of nonnative invasive plant species.

Grasslands – Environmental Consequences

Effects Common to All Alternatives

According to the 2009 ecological sustainability report, 52 percent of the Coronado grasslands are in a shrub-invaded state (USDA FS 2009b). Under all alternatives, wildfire and mechanical treatments will be utilized with the goal of reducing shrub encroachment.

Effects of livestock grazing on grassland communities are well documented. They vary with timing, duration, and intensity and include changes in vegetation structure and composition, soil structure, and water infiltration rates. While unmanaged grazing may result in negative effects, literature supports that well-managed grazing at light to moderate levels can be benign or even beneficial to various rangeland ecosystem components, processes, or both.

No Action

The 1986 forest plan does not address grassland community ecosystems specifically and does not define desired future conditions and provide guidance on how to manage grassland communities.

Vegetation treatments would likely continue in accordance with limited direction in the 1986 plan, which emphasizes treatment for sustained livestock forage including ripping and seeding, mechanical treatment for mesquite removal, planned fire ignitions for amole reduction, and chemical use for

amole, catclaw, mesquite, burrobrush, and snakeweed. This emphasis, however, appears to have allowed shrub invasion to continue. Approximately 81,000 acres of grasslands have been treated with wildfire. Thinning and mastication projects targeting manzanita treated an additional 5,000 acres over the last 24 years of the 1986 plan. On average, the annual treatment rate is approximately 3,600 acres per year. Management of unplanned ignitions have been more frequent in the period following the 2005 plan amendment allowing wildfires to be managed outside of wilderness. However, clear, predefined desired outcomes and measures of success would be lacking because the plan lacks goals and objectives specific for grasslands. Success would be measured by the overall management emphasis of managing for sustained production of livestock forage and game animal habitat. Although treatments have occurred under the 1986 plan, the explicit goals and desired conditions stated in the revised forest plan would facilitate project level planning better than the lack of them in the 1986 plan.

The 1986 forest plan does not provide guidance related to current threats to grassland's structure, composition, and function (e.g., nonnative and woody plant invasion, fire exclusion, and fragmentation), which could result in further shrub invasion and/or the disruption of ecosystem processes and consequent overall loss in total grassland acres. A reduction of the grassland communities would result in reduced habitat for grassland-dependent species and a decrease in forage for both livestock and wildlife. As the grasslands are one of the most diverse vegetation communities in terms of wildlife on the Coronado, a loss in grassland habitat would potentially impact an abundance of species.

An increase of woody species correlates to a decrease in herbaceous cover and would increase soil erosion through runoff and wind. Soil loss is a driving factor in the irreversible conversion of grasslands to shrubland communities (Schussman and Smith 2006) and may further this conversion. This loss of herbaceous cover would also result in a decline in water infiltration and availability to individual plants, decreasing the overall resiliency of the system and its ability to combat climate change and other disturbances. In addition, a decrease in herbaceous cover would limit the spread of fire across the grasslands, through the reduction of continuous fine fuels, negatively impacting nutrient cycling. Nonnative plant invasion also impacts the role of fire through this system, as these nonnative grasses burn at a higher intensity than native grasses (Cable 1965, Schussman and Smith 2006). This change in fire intensity increases the risk of soil damage.

Proposed Action

The proposed action would result in plant composition trending toward desired conditions, as would plant density, individual plant basal area, and root density in the surface soil horizon. The proposed action defines desired conditions based on the reference conditions for grassland communities and provides management objectives and guidelines that would provide a framework for implementing site-specific projects to achieve desired conditions. These plan components would guide management through planned and unplanned ignitions and mechanical treatments on at least 72,500 acres every 10 years (7,250 acres per year) to maintain open, native grasslands with appropriate shrub and overstory cover. The proposed treatment rate, 7,250 acres per year, is roughly double that of current management.

The proposed action would maintain grasslands in a more open state that would restore fire to its characteristic role in these communities. The reduction of shrub encroachment and the promotion of continuous fuels would increase fire spread and improve nutrient cycling, thus improving the health and vigor of individual plants. Encouraging characteristic disturbance in the grasslands also promotes a functioning system and further maintains the open, native states described by the desired conditions. Furthermore, a reduction of woody species would maintain fire intensity at a characteristic level and, thereby, reduce the risk of soil damage from fire; however, as the revised forest plan does not address the removal or containment of naturalized, nonnative species such as Lehmann's lovegrass, fire intensity increases due to the presence of nonnative species will remain unchanged under the proposed action.

Promoting open grasslands would positively impact the system as a whole. Maintaining the grassland communities would improve habitat for grassland-dependent species such as pronghorn (Wyoming Game and Fish Department 2002) and Montezuma quail. The promotion of herbaceous cover would also improve forage for both livestock and wildlife species.

The mechanical treatment proposed under the revised forest plan may adversely impact the soil resource through increased erosion, scarification, and sedimentation in the short term. However, the removal of woody plants and consequent promotion of herbaceous cover may counteract these negative impacts. Schussman and Smith (2006) summarized that herbaceous cover is a driving factor in soil maintenance in the grasslands and reduces the risk of shrub invasion. The promotion of herbaceous cover would reduce soil erosion from runoff and wind.

Understory cover also increases water infiltration and availability, improving the health and vigor both of the individual plants and the community as a whole. This improved health and vigor translates to the increased resiliency of the system to disturbance events and the stresses of climate change, of which water availability is a major factor.

Four areas would be recommended for wilderness designation under the proposed action: the present Mount Graham Wilderness Study Area, and Ku Chish, Whetstone, and Chiricahua Addition North. Due to the limited area that would be impacted, the effects to the grasslands of recommending wilderness designation would be negligible. Approximately 9,025 acres, or approximately 1.7 percent, of the grassland communities would be allocated within these recommended wilderness areas. The impacts of recommending the Mount Graham Recommended Wilderness Area are common to all alternatives and are discussed in more detail on page 98. Portions of the Ku Chish and Chiricahua Addition North Recommended Wilderness Areas recently burned, which reduced fuel loading and consequential fire hazard, but left the area moderately departed from reference vegetation structure. However, due to the limited area of impact, the effects to grasslands within recommended wilderness designations would be negligible. The Whetstone Recommended Wilderness Area is inaccessible and would have little impact on treatments within the grassland community. The effects of recommending the four areas as wilderness under the proposed action would be similar to those described under alternative 1 (page 100 and below) except that fewer acres would be affected.

Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to the grassland community would be similar to the proposed action in terms of the guidance and objectives provided. In addition, the effects described under “Alternative 1” on page 100 also apply.

The grassland communities are present in each of the recommended wilderness areas (table 34). Approximately 31,708 acres, or 7 percent, of the grassland communities would be recommended to wilderness designation under alternative 1. If a grassland vegetation management project is planned within a recommended wilderness area requiring treatment or part of a project falls across the boundary, the limitations in wilderness could impede management and the movement toward, or attainment of, grasslands desired conditions within these areas.

Alternative 2

Approximately 21,459 acres of grasslands are present in the Motorized Recreation Land Use Zone specified by alternative 2. This is an increase of approximately 18,942 acres over the acreage of grasslands specified by the proposed action and alternative 1 (table 32).

Because alternative 2 incorporates the direction of the revised forest plan, effects to the grasslands would be similar to the proposed action in terms of the guidance and objectives provided. Effects specific to the expansion of the Motorized Recreation Land Use Zone for the grassland communities are identical to those discussed under “Alternative 2” on page 101.

Table 34. Acreage of grasslands within recommended wilderness

Recommended Wilderness	Acres of Grasslands
Bunk Robinson Wilderness Study Area	6,036
Chiricahua Addition North	144
Chiricahua Addition West	33
Dragoon	1,708
Galiuro Addition	578
Jhus Canyon	27
Ku Chish	2,211
Mount Fagan	1,787
Mount Graham Recommended Wilderness Area	3,640
Mount Wrightson	1,688
Santa Teresa Addition North	190
Santa Teresa Addition South	240
Tumacacori	8,190
Whetstone	3,030
Whitmire Canyon Wilderness Study Area	2,119
Winchester	87

Interior Chaparral – Affected Environment

Interior chaparral covers 9 percent of the Coronado and occurs as a discontinuous band of vegetation. Most chaparral exists at mid-elevations (3,000 to 6,000 feet) and is bordered and intermixed with Madrean encinal woodland at the upper elevations, and grasslands or Sonoran Desert at lower elevations. The Coronado manages a tiny fraction of the interior chaparral in the southwestern United States (USDA FS 2009b). However, across the Southwestern Region, the Forest Service manages the majority of this vegetation community (Schussman and Smith 2006).

Interior chaparral is typically found on mountain foothills and lower slopes where low-elevation desert transitions into wooded evergreens. It comprises mixed shrub associations including, but not limited to, the following species: manzanita (*Arctostaphylos* spp.), crucifixion thorn (*Canotia holacantha*), desert ceanothus (*Ceanothus greggii*), mountain mahogany (*Cercocarpus montanus*), antelope bush (*Purshia* spp.), silktassle (*Garrya* spp.), Stansbury cliffrose (*Purshia stansburiana*), shrub live oak (*Quercus turbinella*), and sumac (*Rhus* spp.). In general, the proportion of interior chaparral vegetation on the Coronado is similar to that which is found in surrounding areas outside the national forest boundaries (USDA FS 2009b).

Interior chaparral has few wildlife species associations of conservation concern. Because the interior chaparral community is fire adapted, wildlife species that have evolved in this vegetation community are resilient to the effects of fire. None except for Ball's monkey grasshopper (*Eumorsea balli*) are chaparral specialists (USDA FS 2009b).

Although there is little direct evidence of the historical fire regime in the interior chaparral, indirect evidence points to a system that historically experienced high-intensity, stand-replacing fire every 20 to 100 years (Schussman and Smith 2006). Little is known about the extent these fires burned historically (Schussman and Smith 2006). Current conditions within the interior chaparral are characterized by increases in open conditions due to fires occurring more frequently than did historically. This increased frequency is likely a result of the distribution and adjacency to vegetation communities with more frequent fire return intervals and the increased occurrence of unplanned human-caused ignitions. The trend is expected to continue. Desired conditions directly mirror

reference conditions in the majority of the interior chaparral. Table 35 shows the change in desired conditions to current conditions. The desired conditions within the wildland-urban interface dictate lower vertical structure to better manage fire and protect human communities.

The interior chaparral is highly departed (vegetation condition class 3). The results indicate a surplus of both open and closed structure, with a higher proportion being open. For detailed vegetation condition class information, refer to table 30.

Table 35. Current conditions versus desired conditions within the interior chaparral*

Structural Class	Current Conditions	Desired Conditions
Recently burned	22%	2%
Shrub, open canopy	35%	5%
Shrub, closed canopy	43%	93%

* Structural classes represented in this table were derived from the 2009 ecological sustainability report (USDA FS 2009b)

With warmer and drier climate conditions, interior chaparral ecosystems are susceptible to decreased plant productivity, increased insect infestation, colonization of invasive nonnative species, longer and more severe fire seasons, and altered frequency, intensity, timing, and spatial extent of disturbance events (droughts, flash floods, landslides, and wind storms; see appendix A in the revised forest plan).

Interior Chaparral - Environmental Consequences

Effects Common to All Alternatives

Vegetation treatments that would be permissible under each of the alternatives can have common effects on interior chaparral communities. In some cases, factors outside of Forest Service control, such as unplanned ignitions, may exacerbate effects. Frequent fire occurrence alters reference composition and structure of interior chaparral. Wildland fire can have varying impacts to interior chaparral based on the timing and frequency. Fire increases the risk of soil repellency, which may increase erosion and sedimentation, reduce water infiltration, and consequently impede germination. In contrast, fire also jump-starts nutrient cycling, increasing soil fertility and plant productivity (Schussman and Smith 2006).

No Action

Under the no-action alternative, the overall structure of chaparral would remain similar to the current condition, although changes at the species composition and structural stage may result from more frequent fire. The 1986 forest plan does not address interior chaparral ecosystems except in the context of rangeland, and does not provide desired conditions and guidance on how to manage this vegetation community. Under the direction of the 1986 forest plan, management activities in the interior chaparral have included chemical and planned fire ignition treatments targeting oak, piñon pine, manzanita, and juniper followed by aerial seeding of grasses to improve forage production. Currently, the observed trend is toward more acres of chaparral in recently burned and open canopy conditions, which is expected to continue.

While treatments would continue under the 1986 forest plan, direction in the no-action alternative is not focused on the all-inclusive future condition of a healthy vegetation community, which includes its structure, composition, and function. The Coronado would be able to meet desired conditions that are output oriented, with success measured by rangeland and livestock forage. Furthermore, the 1986 forest plan promotes type conversion of the interior chaparral to grassland. Although history has shown that the conversion of interior chaparral has been unsuccessful with chaparral community achieving pretreatment levels of canopy closure and density within 7 years (Pond and Cable 1960 from Schussman and Smith 2006), the continued promotion of chaparral conversion is harmful to the

overall health of the system. The lack of clearly defined desired conditions under the 1986 forest plan promotes varied interpretations of plan direction at the project level, which does little to move the interior chaparral toward the more ecologically sustainable system defined by the desired conditions in the revised forest plan.

The short-term conversion of interior chaparral may improve forage for livestock and some wildlife species; however, the reduction of shrub density reduces hiding and thermal cover for white-tail (*Odocoileus virginianus couesi*) and mule deer (*O. hemionus eremicus*) and adversely impacts overall habitat quality of black bear (*Ursus americanus*). Due to the discontinuous nature of the interior chaparral and its presence as an ecotone, the impacts to chaparral as habitat may be limited.

More open conditions would increase short-term water yield from the community with limited improvement in water availability to chaparral vegetation. However, the increase in water would be short lived and would likely not impact the resiliency of the system to long-term stressors such as climate change. However, such limited increases in water availability may, if coincidentally timed, improve response to natural disturbances such as fire and insect and disease attack.

Proposed Action

Under the proposed action, management would move the interior chaparral toward canopy closure that more closely mimics reference conditions and promotes the attainment of ecosystem restoration. The revised forest plan defines desired conditions based on the reference conditions for interior chaparral and provides management objectives and guidelines that provide a framework for implementing site-specific projects to move the community toward desired conditions. Forest plan components specific to the vegetation community provide for better informed decisions and a basis for monitoring the effectiveness of future treatments. The plan components defined by the revised forest plan would guide management through planned and unplanned ignitions and mechanical treatments on 5,000 acres every 10 years to maintain species diversity and promote eventual canopy closure.

The revised forest plan addresses desired conditions for interior chaparral within the wildland-urban interface. The revised forest plan would maintain vegetation structure horizontal and close to the ground to reduce the fire intensities to a more manageable level within high-risk, wildland-urban interface communities.

The movement toward reference densities described by the desired conditions may increase the habitat quality for Ball's monkey grasshopper and black bear as well as improve cover for deer species. Due to the discontinuous nature of the interior chaparral and its presence as an ecotone, the impacts to chaparral for wildlife habitat improvement may be limited.

The maintenance of dense conditions would have little impact on water yield and availability for vegetation. Short-term increases in water yield may result following stand-replacing fire, but due to the regenerative ability of most chaparral species, these increases would likely have little lasting impact to the system. Under the proposed action, as interior chaparral trends toward canopy closure, water yield may decrease over the long term. However, a decrease in surface runoff due to increased ground cover may translate to improved soil retention and an increase in water infiltration and availability to individual plants.

Four areas would be recommended for wilderness designation under the proposed action: the present Mount Graham Wilderness Study Area, and Ku Chish, Whetstone, and Chiricahua Addition North. Approximately 11,410 acres, approximately 7 percent, of the interior chaparral would be allocated in these recommended wilderness areas. The impacts of recommending the Mount Graham Recommended Wilderness Area are common to all alternatives and are discussed in more detail on page 98.

Portions of the Ku Chish Recommended Wilderness Area recently burned, which reduced fuel loading and consequent fire risk, but left the area moderately departed from reference vegetation structure. The 2,253 acres of interior chaparral community that occurs within this recommended wilderness

likely saw a short-term increase in open conditions. The effects of recommending wilderness designation for the Ku Chish area would be negligible.

The effects of recommending the four areas as wilderness under the proposed action would be similar to those described under alternative 1 (page 100) except that fewer acres would be affected.

Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to the interior chaparral would be similar to the proposed action in terms of the guidance and objectives provided. In addition, the effects described in the "Alternative 1" section on page 100 also apply.

Interior chaparral is present in each of the recommended wilderness areas (table 36). Approximately 23,038 acres, or 15 percent, of interior chaparral would be recommended to wilderness designation under alternative 1. If an interior chaparral vegetation management project is planned within a recommended wilderness area requiring treatment or part of a project falls across the boundary, the limitations on management in wilderness could impede management and the movement toward or attainment of interior chaparral desired conditions within these areas.

Table 36. Acreage of interior chaparral within recommended wilderness

Recommended Wilderness	Acres of Interior Chaparral
Bunk Robinson Wilderness Study Area	511
Chiricahua Addition North	642
Chiricahua Addition West	289
Dragoon	1,623
Galiuro Addition	3,949
Jhus Canyon	1,141
Ku Chish	2,253
Mount Fagan	129
Mount Graham Recommended Wilderness Area	5,607
Mount Wrightson	700
Santa Teresa Addition North	772
Santa Teresa Addition South	658
Tumacacori	344
Whetstone	2,908
Whitmire Canyon Wilderness Study Area	152
Winchester	1,360
Total	23,038

Alternative 2

In addition to incorporating the direction in the revised forest plan (proposed action), alternative 2 proposes to enlarge the area of the Motorized Recreation Land Use Zone in comparison to the area specified by the proposed action and alternative 1. Approximately 2,282 acres of interior chaparral are present in the Motorized Recreation Land Use Zone specified by alternative 2. This is an increase in around 2,002 acres over that in the Motorized Recreation Land Use Zone specified by the proposed action and alternative 1 (table 32).

Because alternative 2 incorporates the direction of the revised forest plan, effects to the interior chaparral would be similar to the proposed action in terms of the guidance and objectives provided. Effects specific to the expansion of the Motorized Recreation Land Use Zone for interior chaparral are identical to those discussed under "Alternative 2" on page 101.

Madrean Encinal Woodland – Affected Environment

Madrean[18] encinal woodland vegetation occurs on foothills, canyons, bajadas,[19] and plateaus between the desert grasslands and Madrean pine-oak woodlands. This community is dominated by Madrean evergreen shrubs, such as Arizona white oak (*Quercus arizonica*), Emory oak (*Quercus emoryi*), gray oak (*Quercus grisea*), Mexican blue oak (*Quercus oblongifolia*), and Toumey oak (*Quercus toumeyi*). In addition, Chihuahuan pine (*Pinus leiophylla* var. *chihuahuana*), Arizona cypress (*Hesperocyparis arizonica*), piñon (*Pinus subsection cembroides*), juniper (*Juniperus* spp.), and interior chaparral species may be present, but do not codominate. Ground cover is dominated by warm-season grasses, such as threeawns (*Aristida* spp.), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), Rothrock grama (*Bouteloua rothrockii*), Arizona cottontop (*Digitaria californica*), plains lovegrass (*Eragrostis intermedia*), curly-mesquite (*Hilaria belangeri*), green sprangletop (*Leptochloa dubia*), muhly grasses (*Muhlenbergia* spp.), or Texas bluestem (*Schizachyrium cirratum*).

This is the most abundant and widespread vegetation community, covering approximately 42 percent of Coronado National Forest lands. The greatest percentage of Madrean encinal woodland in the states of New Mexico and Arizona (19 percent) is managed by various private land owners. The Coronado manages the second largest (11 percent), the greatest percentage under a single management entity in the area (USDA FS 2009b). Although the Madrean encinal woodland is the most common vegetation community on the Coronado, only 10 percent of its range occurs within the United States (Schussman and Smith 2006), making the Coronado's management of these encinal woodlands important.

There are more forest planning species associated with Madrean encinal woodlands than any other vegetation community on the Coronado. Many of these species are more typical of Mexico than the United States. All physical attributes (riparian, aquatic, rock, cave) have characteristic species in this vegetation community. Some of the many species include: jaguar (*Panthera onca*), New Mexico ridge-nosed rattlesnake (*Crotalus willardi obscurus*), Arizona ridge-nosed rattlesnake (*Crotalus willardi willardi*), Mexican stoneroller (*Campostoma ornatum*), Tarahumara frog (*Lithobates tarahumarae*), elegant trogon (*Trogon elegans*), Huachuca giant skipper (*Aganthymus evansi*), black bear (*Ursus americanus*), Arizona gray squirrel (Sciurus arizonensis), acorn woodpecker (*Melanerpes formicivorus*), giant spotted whiptail (*Aspidoscelis burti stictogramma*), Pygmy sonorella (*Sonorella micra*), and many other talus snails, lichens, spreading marina (*Marina orcuttii* var. *orcuttii*), Chiricahua mock pennyroyal (*Hedeoma costatum*), and many vascular plants (USDA FS 2009b).

Livestock grazing, fire suppression, fuelwood harvest, and fragmentation associated with Euro-American settlement of the Madrean encinal woodland have pushed this vegetation community from its natural state to a current condition departed from desired conditions. Both overgrazing and fragmentation have reduced the role of fire in the Madrean encinal woodland by limiting fire spread. Fire suppression has led to woody species encroachment and, in some cases, a composition shift from encinal woodlands to mesquite and juniper woodlands. In addition to the increases in woody species density, intense fuelwood harvest in the late 1800s is associated with a reduction of tree size and productivity as well as an increase in the number of stems per tree (Schussman and Smith 2006).

Little is known about the fire regime within the Madrean encinal woodland, but strong inferences suggest that historic fires would have burned more often and less severe than fires of today (USDA FS 2009b). It is probably complex due to the intermixing of this community with the interior chaparral

[18] Referring to the Sierra Madre mountain range.

[19] A broad slope of debris spread along the lower slopes of mountains by descending streams.

and the high variability of topography, slope, and aspect. Historically, fire severity was likely variable with low-severity fire occurring where understory cover and open conditions allowed. High-severity or stand-replacing fire likely impacted this community about every century, as crown fire transitioned from the interior chaparral to dense stands in the Madrean encinal woodland. Based on fire return intervals of the surrounding communities, historical low-intensity fires probably occurred every 2.5 to 10 years between April and June (Schussman and Smith 2006, USDA FS 2009b). Denser stands on north-facing slopes and in drainages probably burned less frequently.

Vegetation mapping indicates that currently, the Madrean encinal woodland is characterized by a diversity of structural stages; however, there is an overabundance of the late-seral and lack of mid-seral closed state when compared to the desired conditions. Historically, these oak woodlands were dominated by open stands of oaks with denser stands occupying drainages and north-facing slopes. Although closed conditions (more than 30 percent canopy cover) in the mid-seral state dominate desired conditions, these stands likely occupied more mesic sites as described above.

Desired conditions for the Madrean encinal woodland were derived directly from reference conditions. Table 37 shows the current conditions versus the desired conditions for this community. Currently, 20 percent of this community is dominated by the grasses, forbs, and shrubs that regenerate after a stand-replacing fire. Dense and open areas of regenerating overstory vegetation, namely seedlings and saplings 0 to 5 inches in diameter at root collar,[20] and more mature, small (5 to 10 inches diameter at root collar) trees, typify 13 percent of the Madrean encinal woodland. This state is classified as the mid-seral, open canopy, where open canopy is characterized by 10 to 30 percent canopy cover. Only 10 percent of the Madrean encinal woodland occupies the mid-seral closed stage, where small trees form stands with over 30 percent canopy cover. Closed states generally have decreased grass and forb cover when compared to open canopy states. An open canopy of medium (10 to 20 inches diameter at root collar) and very large trees (more than 20 inches diameter at root collar) make up 25 percent, represented by the late-seral open stage. The late-seral closed stage is composed of a higher density of medium and very large trees to create closed canopy conditions. This stage represents 32 percent of the vegetation community.

Table 37. The current and desired conditions for the Madrean encinal woodland

Structural Class	Current Conditions	Desired Conditions
Early-seral	20%	20%
Mid-seral open	13%	25%
Mid-seral closed	10%	40%
Late-seral open	25%	15%
Late-seral closed	32%	0%

The vegetation condition class results indicate that the vegetation composition and structure of the Madrean encinal woodland reflects low to moderate departure (vegetation condition class 2) overall. A lack of open canopy and late seral conditions may be an indication of less frequent low and mixed severity fire. Conversely, an abundance of post fire (early-seral) structure reflects recent wildfire disturbance. Refer to table 30 for detailed information on vegetation condition class.

Domestic livestock grazing, at a moderate level, is a widespread use of Madrean encinal woodland on the Coronado. The effects of livestock grazing are discussed in more detail under the grasslands

[20] Tree diameters are measured at the root collar for most woodland tree species instead of at breast height as is done with larger trees found in forested areas. This is done since most woodland species branch lower than breast height or are multistemmed at the root collar. In the case of trees multistemmed at the base, these diameters are totaled (square root of the sum of squares) to what an equivalent single stem tree diameter would measure.

section in this chapter. Livestock grazing is an extensive human-caused disturbance on the Coronado and is a historical use that predates establishment of the national forest. Eighty-two percent of the Coronado is available as designated grazing allotments. While unmanaged grazing may result in negative effects, literature supports that well-managed grazing at light to moderate levels can be benign or even beneficial to various rangeland ecosystem components and/or processes. Currently, stocking on the Coronado is light to moderate, which is consistent with sustaining rangeland ecosystems.

With the warmer and drier conditions predicted under climate change, Madrean encinal woodland ecosystems are susceptible to decreased plant productivity, increased insect infestation, colonization of invasive nonnative species, longer and more severe fire seasons, and altered frequency, intensity, timing, and spatial extent of disturbance events (droughts, flash floods, landslides, and wind storms; see appendix A in the revised forest plan).

Madrean Encinal Woodland – Environmental Consequences

Effects Common to All Alternatives

Under all alternatives, mechanical treatments would continue at a similar rate. The continuation of mechanical treatments poses the risk of soil compaction, scarification, erosion, and sedimentation. This becomes important due to the vulnerability of the thin soils within these woodlands (Borelli et al. 1994, Ffolliott et al. 2011). However, these actions provide for the more active role of fire by reducing overstory density and ladder fuels and encouraging herbaceous growth, thereby allowing the spread of low-intensity fire. Under all alternatives, soil mitigation measures would be taken into account at the project level to decrease the negative effects of mechanical treatment.

The use of unplanned and planned ignitions would continue in the Madrean encinal woodland. When properly managed, fire may pose less risk to soil damage and loss compared to mechanical treatments. Fire also improves nutrient cycling, facilitates understory cover, and promotes forge for wildlife. The number of acres treated using fire differs greatly between the no action and the proposed action, alternative 1, and alternative 2. The effects of this change will be discussed by alternative below.

A Vegetation Dynamics Development Tool (VDDT) analysis was done for the Madrean encinal woodland community; however, the model did not accurately represent the dynamics of this community. Therefore, the effects of each alternative are discussed qualitatively, based on the scientific information available for the Madrean encinal woodland.

No Action

The no-action alternative does not hinder movement toward or attainment of desired conditions, but the lack of direction provided by the 1986 forest plan does not encourage proactive management. Under the direction of the 1986 forest plan, management has consisted of both mechanical and wildfire treatment of the Madrean encinal woodland. A total of approximately 208,000 acres have been treated in the last 24 years, equating to about 8,700 acres per year. From 2005 to 2010, wildfires and prescribed burning projects occurred frequently, resulting in the setback of shrub populations and reduction of overstory density on over 90,000 acres. Thinning and mastication projects that targeted manzanita during this same time reduced shrub cover and created more open structure on an additional 20,000 acres. In terms of acres treated, managers would continue to be able to make progress in the Madrean encinal woodland under the 1986 plan.

From future planned actions, we assume that under the 1986 plan treatment would continue at a rate of about 6,700 acres per year, or a total of 67,000 acres every 10 years. When considering the treatments that occurred only within the period from 2005 to 2010, the number of acres treated per year increases drastically due to a plan amendment, which authorized the use of unplanned ignitions outside of wilderness. Due to the recent history of the management of unplanned ignitions, a larger number of acres may be treated under no action if this trend continues.

Under the no-action alternative, the Madrean encinal woodland would move toward desired conditions through slow, incremental changes, as about only 9 percent of this vegetation community would be treated every 10 years. Mechanical and fire treatments would work to create and maintain open and closed mid-seral classes and open late-seral classes. However, without increases in treatment rates, movement toward desired conditions would be slow and variable, not affecting major change in the short term.

Due to slow rates of treatment, the Madrean encinal woodland would likely exhibit continued overabundance of the late-seral stages and lack of mid-seral stages. When compared to the proposed action, a lack of wildfire treatments would result in reduced understory cover and diversity, which equates to a decrease in forage production and browse (Ffolliott et al. 2011), in addition to reduced ability to carry low-intensity surface fire. The reduced occurrence of fire would allow denser midstory conditions to develop, restricting growing space and inhibiting individual tree health and vigor, and decreasing tree and woodland resiliency to insect and disease outbreak. Under climate change, growing space (i.e., decreased water, nutrient, and sunlight availability) becomes more important as competition for water becomes a driving factor in the ability of this system to overcome the disturbances associated with a changing climate.

The reduced number of planned ignitions under the no-action alternative compared to the proposed action would likely diminish the role of surface fire across the landscape, barring unplanned ignitions. Less fire on the landscape would reduce nutrient cycling and aid the encroachment of woody vegetation. The increased presence of shrubs and other woody vegetation may have a detrimental effect to habitat quality for wildlife species.

Proposed Action

The proposed action defines desired conditions based on reference conditions for the Madrean encinal woodland and provides management objectives and guidelines as a framework for implementing site-specific projects to achieve these conditions. These forest plan components allow for better informed management decisions and provide a basis for monitoring the effectiveness of treatments. Furthermore, these forest plan components would guide management to treat more of the Madrean encinal woodlands than would be expected under the no-action alternative. Through an increase of wildfire treatments, the revised forest plan would treat 367,000 acres every 10 years compared to the 67,000 acres expected under the no-action alternative. This represents almost a 40 percent increase when compared to the no-action alternative.

The increased use of fire would promote understory grasses and forbs, increasing browse and forage for both domestic livestock and wildlife species. By providing a continuous fuel source for the spread of low-intensity fire, the increase in understory cover would also encourage the restoration of characteristic, low-intensity fire to the system. The more open conditions and an increase in treatment would result in enhancement of the availability of growing space (water, nutrient, and sunlight availability), reducing individual tree competition for water and nutrients. As a result, tree health, vigor, and resiliency to natural disturbances and to the environmental stress associated with climate change would be improved.

Mixed-severity fire would also play a role in mesic sites, recruiting mid-seral structural classes. Open states would likely recruit or maintain open states, while closed states would recruit closed states. For example, mixed-severity fire affecting the late-seral closed state would likely increase the early seral in the short term and develop into mid-seral closed through resprouting. A similar pattern would occur where higher severity fire affects the late and mid-seral open states; fires burning at lower intensities would likely maintain the open structural class.

The increased use of fire would also arrest the encroachment of shrubs and other woody species, slowing the shift from oak dominated woodlands to mesquite or juniper-dominated woodlands and providing for improved habitat quality and availability for some wildlife species (Ffolliott et al. 2011).

However, due to the sprouting of oak species, increased fire in this community may increase the number of stems per tree, while reducing overall cover (Pavek 1994a and 1994b).

Four areas would be recommended for wilderness designation under the proposed action: the present Mount Graham Wilderness Study Area, and the Ku Chish, Whetstone, and Chiricahua Addition North Recommended Wilderness Areas. Approximately 48,145 acres, or approximately 6 percent, of the Madrean encinal woodland communities would be allocated in these recommended wilderness areas. Recommendation of Madrean encinal woodland across 13,472 acres of the Mount Graham, and 16,817 acres of the Ku Chish recommended wilderness areas is common to all alternatives and is discussed in more detail on page 53. Madrean encinal woodlands occur across 12,894 acres of the Whetstone Recommended Wilderness Area and 4,962 acres of the Chiricahua Addition North Recommended Wilderness Area. Due to the large amount of the Madrean encinal woodland across the areas, future treatments to maintain desired conditions may be limited by recommending this area. The effects of recommending the four areas as wilderness under the proposed action would be similar to those described under alternative 1 (page 100 and below) except that fewer acres would be affected.

Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to the Madrean encinal woodland community would be similar to the proposed action in terms of the guidance and objectives provided. Alternative 1 proposes 16 land parcels be managed for wilderness character. The Madrean encinal woodland is present in each of the recommended wilderness areas. Approximately 130,326 acres, or about 17 percent, of the Madrean encinal woodland would be recommended for wilderness designation under alternative 1. Table 38 displays the acres of Madrean encinal woodland in each recommended area.

Recommendation of the Ku Chish and Mount Graham areas for wilderness designation would result in identical effects when compared to the proposed action, as each would be recommended as part of the revised forest plan. See page 98 for a more information regarding the recommendation of the Mount Graham Recommended Wilderness Area and a discussion of wilderness management. Refer to “Proposed Action” and “Alternative 1” sections on page 99 and 100 for more information regarding the Ku Chish Recommended Wilderness Area.

The remaining recommended areas account for about 100,037 acres, or 13 percent, of Madrean encinal woodland. Refer to “Alternative 1” on page 100 for a discussion of effects related to each recommended area. If a Madrean encinal woodland vegetation management project is planned within a recommended wilderness area requiring treatment or part of a project falls across the boundary, the limitations on management in wilderness could impede management and the movement toward or attainment of desired conditions within these areas.

Alternative 2

Because alternative 2 incorporates the direction of the revised forest plan, effects to the Madrean encinal woodland community would be similar to the proposed action in terms of the guidance and objectives provided. See the “Proposed Action” section of the “Madrean Encinal Woodland Community” section on page 120 for a more detailed discussion of these effects. Effects specific to the expansion of the Motorized Recreation Land Use Zone for the Madrean encinal community are similar to those discussed under “Alternative 2” on page 101.

Approximately 14,853 acres of Madrean encinal woodland is present in the area proposed for the Motorized Recreation Land Use Zone under alternative 2. This is an increase in 13,900 acres over the area of Madrean encinal woodlands specified in the Motorized Recreation Land Use Zone by the proposed action and alternative 1 (table 32). Although the land use zone expansion encompasses a large area, the increase accounts for less than 2 percent of the Madrean encinal woodland. The effect of alternative 2 would be similar to the proposed action.

Table 38. Acreage of Madrean encinal woodland within recommended wilderness

Recommended Wilderness	Acres of Madrean Encinal Woodland
Bunk Robinson Wilderness Study Area	11,619
Chiricahua Addition North	4,962
Chiricahua Addition West	1,847
Dragoon	8,815
Galiuro Addition	7,799
Jhus Canyon	5,585
Ku Chish	16,817
Mount Fagan	2,408
Mount Graham Recommended Wilderness Area	13,472
Mount Wrightson	9,637
Santa Teresa Addition North	1,581
Santa Teresa Addition South	1,731
Tumacacori	17,521
Whetstone	12,894
Whitmire Canyon Wilderness Study Area	9,674
Winchester	3,964

Madrean Pine-Oak Woodland – Affected Environment

Madrean pine-oak woodland covers approximately 8 percent of the national forest and is slightly more abundant on the Coronado than in the surrounding landscape (USDA FS 2009b). This vegetation community is dominated by an open to closed canopy of evergreen shrubs, such as Arizona white oak (*Quercus arizonica*), alligator juniper (*Juniperus deppeana*), Chihuahua pine (*Pinus leiophylla*), various other pines, and a grassy understory.

Madrean pine-oak woodlands usually occupy foothills and mountains ranging from approximately 4,000 to 7,000 feet in elevation. Climate generally consists of mild winters and wet summers, with mean annual precipitation ranging from about 10 to 25 inches. Half of the precipitation typically occurs in summer, with the remainder occurring during the winter and spring (USDA FS 2009b).

The literature often combines this habitat with Madrean encinal woodland, cumulatively referring to them as Madrean evergreen woodland; it is difficult to separate species associations between the two, and many species occur in both (USDA FS 2009b). Generally, the presence of Chihuahua pine and other Madrean pines and the higher elevation Madrean oaks, such as silverleaf oak and netleaf oak, determine the Madrean pine-oak woodland. The oaks common to both communities are generally larger tree-form in the pine-oak woodlands instead of shrub-form as in the encinal woodlands (except in productive terrace sites such as Gardner Canyon).

For the wildlife community, the assumption is that Madrean species requiring grassy openings are present in Madrean oak (encinal) woodlands, but not in Madrean pine-oak woodlands. The Madrean pine-oak woodland is a biologically diverse ecosystem, especially for invertebrates and plants, associated with all physical attributes (rock, cave, terrestrial, aquatic). The Madrean pine-oak woodland is included in Conservation International's list of global conservation hotspots (Mittermeier et al. 2004). Forest planning species typical of this vegetation community include Chiricahua fox squirrel (*Sciurus nayaritensis chiricahuae*), many land snails, lichen grasshopper (in rocky areas) (*Trimerotropis saxatilis*), some notothenid moths, Patagonia eyed silkmoth (*Automeris patagoniensis*),

Catalina beardtongue in rocky areas (*Penstemon distans*), Huachuca mountain lupine (*Lupinus huachucanus*), Pinaleño Mountains rubberweed (*Hymenoxys ambigens*), and purple-spike coralroot (*Hexalectris warnockii*) (USDA FS 2009b).

Fire suppression associated with Euro-American settlement of the Madrean pine-oak woodland has pushed this vegetation community from its natural state to a current condition departed from desired conditions. Livestock grazing likely played a role in passive fire suppression in the Madrean pine-oak woodland by limiting fire spread. The reduction of fire as a natural process in this vegetation community has led to the increasing densities of pine, oak, and other associated species. Furthermore, the subsequent increase in uncharacteristic, high-intensity fire has skewed the species composition from a community dominated by pine to one dominated by oak. Structural changes within the community have reduced understory cover, further diminishing the role of characteristic surface fire (Schussman and Smith 2006).

Fire, insects, and drought are the primary natural disturbances associated with the Madrean pine-oak woodland. Domestic livestock grazing at light to moderate levels continues in the Madrean pine-oak woodlands as well. The historical role of insects as disturbance agents in the vegetation community is poorly known, but bark beetles were probably significant disturbance agents in pine species. Recently, Chihuahua pine has been impacted by nonnative bark beetle species that are experiencing northward range expansion (Moser et al. 2005). Historically, fires may have burned with higher frequency and at lower severity, than they do today (USDA FS 2009b). These historical fires likely occurred every 3 to 9 years in early spring and summer (Schussman and Smith 2006).

Vegetation mapping indicates current conditions within the Madrean pine-oak woodland are characterized by an increase in overstory density and a decrease in herbaceous cover. Table 39 displays the current disparity between the current and desired conditions; desired conditions for this vegetation community mirror the reference conditions. There is an overabundance of Madrean pine-oak woodland in structural stages that lack an understory component. Conversely, structural stages with understory components are not well represented. The lack of resprouter-dominated acres represented under current conditions may be due to the lack of fire in the Madrean pine-oak woodland; however, mapping may not have distinguished between the early-seral and resprouter-dominated classes.

Table 39. The current and desired (reference) conditions in the Madrean pine-oak woodland

Structural Class*	Current Conditions	Desired Conditions
Early-seral	11%	4%
Resprouter dominated	0%	5%
Young pine-oak without understory	11%	3%
Young pine-oak with understory	5%	24%
Old pine-oak with understory	10%	60%
Old pine-oak without understory	63%	4%

* The early seral stage is characterized by grasses, seedlings, and saplings with low canopy cover of 0 to 9 percent. Structural stages without understory are characterized by 60 to 100 percent canopy cover, whereas those with understory have a reduced canopy cover of 10 to 59 percent. Canopy cover within the resprouter-dominated stage is variable, ranging from 30 to 100 percent.

The vegetation condition class analysis indicates Madrean pine-oak woodland is moderately departed (vegetation condition class 2). There is a surplus of closed canopy structure and deficit of open canopy relative to the reference conditions. This is likely due to a reduction in the frequency of low-severity fire, which historically maintained the open structure (Schussman and Gori 2006, USDA FS 2009). The relative amount of early seral structure varies across the Coronado with the highest proportions in the recent burned areas. There is a varying amount of uncharacteristic conditions across the national

forest, in part due to limitations of the mapping and model. Refer to table 30 for detailed vegetation condition class information for the Madrean pine-oak woodland.

With warmer and drier climate conditions predicted under climate change, Madrean pine-oak woodland ecosystems are susceptible to decreased plant productivity, increased insect attacks, colonization of invasive species, longer and more severe fire seasons, and altered frequency, intensity, timing, and spatial extent of disturbance events (droughts, flash floods, landslides, and wind storms; see appendix A in the revised forest plan).

Madrean Pine-Oak Woodland – Environmental Consequences

Effects Common to All Alternatives

Because wildfire has been used to treat the surrounding communities with no action and would continue to be used as part of the revised forest plan, wildfire as a treatment in the Madrean pine-oak woodland is common to all alternatives. By reducing fuel loading and creating more open conditions, fire would alter vegetation and fuel structure, bringing the Madrean pine-oak woodland more in line with desired conditions. Fire would also promote nutrient cycling, increasing soil fertility, and plant productivity. Due to the removal of vegetation, fire may increase erosion and sedimentation in the short term. Fire also has the potential to create hydrophobic soils within high-severity areas, reducing water infiltration, which may consequently impede germination.

Under all alternatives, conditions in the Madrean pine-oak would remain departed from desired structure. This departure is characterized by increased tree density and diminished understory cover as compared to desired conditions. The degree to which the effects of continued closed structure represent the Madrean pine-oak community vary under each alternative.

No Action

Under the direction of the1986 forest plan, vegetation treatments within the Madrean pine-oak woodland would continue as part of management of various other plant communities including interior chaparral, Madrean encinal woodland, and ponderosa pine-evergreen shrub communities.

Under the direction of the 1986 forest plan, 250-year predictions from the 2009 ecological sustainability report indicate that current management would increase old pine-oak woodland without understory and decrease young and old pine-oak with understory to a very small percentage of the community. Young pine-oak without understory is expected to trend toward desired conditions; yet significant departure from desired conditions is expected to continue under current management (USDA FS 2009b). Although Vegetation Dynamics Development Tool (VDDT) modeling was not completed under the no-action alternative for the Madrean pine-oak woodland, current conditions are 74 percent departed from desired conditions.

Under the no-action alternative, departure from desired conditions is expected to continue. As departure from desired conditions is characterized by increases in overstory density and decreases in herbaceous cover (USDA FS 2009b), the no-action alternative will be analyzed under these conditions.

The dense conditions and lack of understory expected under the no-action alternative would result in diminished grass and forb species within the Madrean pine-oak woodland, correlating to a lack of forage for livestock and wildlife species. A continued reduction in herbaceous cover would further diminish the role of characteristic fire, further encouraging closed canopy conditions, and diminishing natural nutrient cycling. The promotion of closed canopy conditions would increase the risk of uncharacteristic high-severity fire, favoring oak and other resprouting species (Schussman and Smith 2006).

The restricted growing space associated with denser conditions (less water, nutrient, and light availability) would adversely impact individual health and vigor, decreasing tree and woodland

resiliency to insect and disease outbreak. This would especially impact pine species by increasing susceptibility to bark beetle attack. Under climate change, growing space would become more important as competition for water becomes a driving factor in the ability of system to overcome the disturbances associated with a changing climate.

Proposed Action

The proposed action defines desired conditions based on reference conditions for the Madrean pine-oak woodland and provides management objectives and guidelines as a framework for carrying out site-specific projects and activities to achieve desired conditions. These forest plan components allow for better informed management decisions and provide a basis for monitoring the effectiveness of treatments. Furthermore, these forest plan components would guide management to treat the Madrean pine-oak woodlands through planned and unplanned ignitions and mechanical treatments on 25,000 acres every 10 years to maintain species diversity and appropriate diversity of canopy closure. This would result in conditions for more acres of old pine and oak individuals with understory. Not addressing the Madrean pine-oak woodland limits our understanding of how much of this community has been treated under the 1986 forest plan. Without this information, we assume the revised forest plan would increase management to move the Madrean pine-oak woodland toward desired conditions. In addition, the revised forest plan would include desired conditions for coarse-woody-debris, snag, and large tree components that are important wildlife habitat features.

The proposed action would result in less departure from desired condition vegetation fuels and disturbance regimes over the 20-year modeling period. Overall departure from desired conditions is expected to decrease to 55 percent as increases in the use of mechanical and fire treatments would reduce tree densities and increase the structural classes with understory cover (table 40).

Table 40. The 20-year projected change in structural class under the proposed action based on VDDT modeling results[1]

Structural Class[2]	Current Conditions	Proposed Action	Desired Conditions
Early-seral	9%	11%	4%
Resprouter dominated	0%	6%	5%
Young pine-oak without understory	12%	8%	3%
Young pine-oak with understory	5%	3%	24%
Old pine-oak with understory	10%	26%	60%
Old pine-oak without understory	64%	46%	4%
Departure[3]	**74%**	**55%**	**0%**

1. Projected percentages for the no-action alternative are meant to provide information on the relative distribution of structural classes and trend toward or away from desired conditions. These numbers are not to be interpreted as definite projections for the future.
2. The early seral stage is characterized by grasses, seedlings, and saplings with low canopy cover of 0 to 9 percent. Structural stages without understory are characterized by 60 to 100 percent canopy cover, whereas those with understory have a reduced canopy cover of 10 to 59 percent. Canopy cover within the resprouter-dominated stage is variable, ranging from 30 to 100 percent.
3. Departure is the collective divergence of seral stage percentages, on a scale of 1 to 100, from the desired condition percentages.

While management under the no-action alternative may make some progress toward desired conditions, direction from the revised forest plan would result in stronger movement toward desired conditions. The revised forest plan's emphasis on mastication and fire treatments is key, as Vegetation Dynamics Development Tool modeling outputs highlight the importance of utilizing both mechanical and planned fire ignition treatments to move the Madrean pine-oak community toward desired

conditions (USDA FS 2009g). Because desired conditions are characterized by increases in understory cover and decreases in tree density and canopy cover (USDA FS 2009b, Schussman and Smith 2006), the effects analysis will focus on these attributes.

The more open conditions that would result from management under the revised forest plan would increase the presence of the understory component. The promotion of understory cover would increase forage for livestock and wildlife species and encourage the return of characteristic fire to the system. Further promotion of fire as a management tool would maintain more open conditions and improve nutrient cycling.

Reductions in overstory density would release growing space, corresponding to an increase in available water, nutrients, and sunlight. This would improve individual health and vigor, positively impacting the Madrean pine-oak woodland as a whole by improving resiliency to natural disturbances and those uncharacteristic disturbances associated with climate change.

Mechanical treatments associated with the proposed action could increase the risk of soil compaction, scarification, erosion, and sedimentation. Yet, the benefits of mechanical treatment may outweigh the negative soil impacts by encouraging the return of characteristic fire to this community. Mitigation measures to protect the soil resource should be implemented at the project level.

After the 20-year modeling period, acres of large and old trees, large snag density, and the amount of surface fuels would trend toward desired conditions. See table 41 for a comparison of these metrics. Reductions in surface fuels would encourage lower fire intensities that are characteristic in the Madrean pine-oak woodland.

Table 41. The 20-year projected change in large trees, snag density, and surface fuel abundance under the proposed action for Madrean pine-oak woodland

	Late Seral Stages	Averaged Across All Seral Stages				
			Surface Fuels (tons/acre)			
Condition or Alternative	Acres of Large/Old Trees	No. Snags (>18 in. d.b.h./acre)	≤3 in.	>3 and ≤12 in.	>12 in.	Total
Current Conditions	103,388	1.1	3.8	4.5	2.4	10.7
Proposed Action	101,971	1.0	3.1	3.6	2.0	8.6
Desired Conditions	90,641	0.9	range from 1-5			

Four areas would be recommended for wilderness designation under the proposed action: the present Mount Graham Wilderness Study Area, and Ku Chish, Whetstone, and Chiricahua Addition North. Approximately 14,964 acres, or approximately 10 percent, of the Madrean pine-oak woodland would be allocated within these recommended wilderness areas. Madrean pine-oak woodland occurs on 2,942 acres of the Ku Chish, and 10,095 acres of the Mount Graham Recommended Wilderness Areas, resulting in effects common to all alternatives. This vegetation community also occurs across 1,425 acres of the Whetstone and 502 acres of the Chiricahua Addition North Recommended Wilderness Areas. Although wilderness management is more complex and restrictive than nonwilderness (see page 98), due to the limited acreage and reduction of fuel loading within this area, the immediate effects to the Madrean pine-oak woodland of recommending wilderness designation would be negligible. The effects of recommending the four areas as wilderness under the proposed action would be similar to those described under alternative 1 (page 100 and below) except that fewer acres would be affected.

Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to the Madrean pine-oak woodland community would be similar to the proposed action in terms of the guidance and

objectives provided. Alternative 1 proposes 16 land parcels be managed as recommended wilderness. The Madrean pine-oak communities are present in each of the recommended wilderness areas. Approximately 25,448 acres, or 18 percent, of the Madrean pine-oak woodland would be recommended for wilderness designation under alternative 1. The recommendation of the Ku Chish and Mount Graham areas would result in identical effects when compared to the proposed action, as each would be recommended as part of the revised forest plan. See page 97 for more information regarding recommendation of the Mount Graham Recommended Wilderness Area and a discussion of wilderness management. Refer to the "Proposed Action" section on page 99 for more information regarding the Ku Chish Recommended Wilderness Area.

The remaining acres of Madrean pine-oak woodland included under alternative 1 are represented in table 42.

Table 42. Acreage of Madrean pine-oak woodland within recommended wilderness

Recommended Wilderness	Acres of Madrean Pine-Oak Woodland
Bunk Robinson Wilderness Study Area	25
Chiricahua Addition North	502
Chiricahua Addition West	415
Dragoon	735
Galiuro Addition	4,104
Jhus Canyon	2,101
Ku Chish	2,942
Mount Fagan	4
Mount Graham Recommended Wilderness Area	10,095
Mount Wrightson	1,269
Santa Teresa Addition North	551
Santa Teresa Addition South	367
Tumacacori	245
Whetstone	1,425
Whitmire Canyon Wilderness Study Area	110
Winchester	558

Refer to the "Alternative 1" section on page 100 for a discussion of effects related to each recommended area. If a Madrean pine-oak woodland vegetation management project is planned within a recommended wilderness area requiring treatment or part of a project falls across the boundary, the limitations in wilderness could impede management and the movement toward or attainment of desired conditions within these areas.

Alternative 2

Because alternative 2 incorporates the direction of the revised forest plan, effects to the Madrean pine-oak woodland community would be similar to the proposed action in terms of the guidance and objectives provided. See the "Madrean Pine-Oak Community, Environmental Consequences Common to All Alternatives" section for a more detailed discussion of these effects. Effects specific the expansion of the Motorized Recreation Land Use Zone for the Madrean pine-oak woodland are similar to those discussed under "Alternative 2" on page 101.

Approximately 627 acres of Madrean pine-oak woodland would be included in this expanded Motorized Recreation Land Use Zone, compared to 59 acres of this vegetation community in the proposed action and alternative 1 (table 32). Although this community would be impacted by new roads and trails, the expanded Motorized Recreation Land Use Zone also concentrates the negative impacts of motorized travel. Due to the limited acreage (less than 1 percent) and potential for the protection of the greater Madrean pine-oak community, alternative 2 would result in similar impacts when compared to the proposed action.

Ponderosa Pine-Evergreen Shrub – Affected Environment

Ponderosa pine-evergreen shrub forests comprise about 3 percent of the Coronado, generally occurring at elevations ranging from 5,000 to 10,000 feet. The community is dominated by ponderosa pine and Arizona pine (*Pinus ponderosa* and *Pinus arizonica*, respectively), which distinguishes it from the Madrean pine-oak woodlands. Ponderosa pine-evergreen shrub has two subclasses: one with a continuous layer of perennial grasses and a relatively minor shrub component and one with an understory of primarily evergreen shrubs, including manzanita, turbinella oak, sumac, and mountain mahogany.

On the Coronado, there are few pure, large stands of ponderosa and Arizona pine. Stands are mostly transitional between other communities or occur in small patches. However, a surprising number of species are typical of, or find optimal habitat in, this habitat type. Most of them are plants. Forest planning species include northern (Apache) goshawk (*Accipiter gentilis*), Slevin's bunchgrass lizard (in open, grassy stands) (*Sceloporus slevini*), Arizona gray squirrel, Lemmon's beggar-tick (*Bidens lemmonii*), Mexican hemlock-parsley (*Conopholis alpina* var. *mexicana*), giant-trumpet (*Macromeria viridiflora*), Chiricahua mountains larkspur (*Delphinium andesicola*), Chiricahua gentian (*Gentianella wislizeni*), and many other plants, plus Arizona mantleslug (*Pallifera pilsbyri*), Pinaleño mountain snail (in rocks) (*Oreohelix grahamensis*), and heart vertigo snail (*Vertigo hinkleyi*).

The reference condition of overstory vegetation differs from the current condition. Livestock grazing, logging, and fire suppression practices that arose from Euro-American settlement of the Southwest, created overly dense conditions in the ponderosa pine-evergreen shrub forest of today (Covington and Moore 1994). These factors have pushed this vegetation community from its natural state to a current condition departed from reference conditions. The reduced competition from understory species due to heavy grazing increased successful seedling germination. Both overgrazing and fragmentation have reduced the role of fire in the ponderosa pine-evergreen shrub by limiting fire spread. Fire suppression has led to increases in tree density, whereas selective logging reduced the prominence of large old trees within this vegetation community (Schussman and Smith 2006).

Fire, insects, dwarf mistletoe, and drought are the primary natural disturbances in ponderosa pine-evergreen shrub forests on the Coronado. Historically, fires burned with higher frequency and at lower severity than they do today (USDA FS 2009b). Higher severity fire may have occurred on a fine scale as individual trees and small patches experienced crown fire due to the localized buildup of ladder fuels (Schussman and Smith 2006). Within the ponderosa pine-evergreen shrub subclass dominated by understory shrubs, greater vertical continuity due to the robust shrub component generally results in mixed severity fire characteristics as compared to the low severity fire characteristic of grass dominated understory subclass. The historical fire return interval in the ponderosa pine-evergreen shrub forest ranges from 2 to 17 years. Historically, fires burned over large tracts of land, maintaining the open structure of the ponderosa pine-evergreen shrub and surrounding communities (Schussman and Smith 2006).

Vegetation mapping results indicate current conditions within the ponderosa pine-evergreen shrub community are characterized by an abundance of closed structural classes when compared to the desired conditions. Table 43 indicates the disparity between current conditions and desired conditions for the ponderosa pine-evergreen shrub forest. The structural classes are more evenly distributed in both open states the desired conditions, whereas currently, the majority of the ponderosa pine-

evergreen shrub forest is in the closed old pine with grass state. Based on mapping, departure for this community is 77 percent.

Desired conditions accurately reflect the reference conditions for this community with the exception of the wildland-urban interface, where desired conditions call for more open horizontal structure to better manage fire in these areas. Desired conditions were adapted from the reference conditions defined in the 2009 ecological sustainability report to better represent the shrub component (USDA FS 2009b); therefore, the desired conditions outlined in table 43 may be more representative of the shrub subclass than the grass subclass within the ponderosa pine-evergreen shrub forest community, which is appropriate given their prevalence on the Coronado

Table 43. The distribution of structural classes in ponderosa pine-evergreen shrub for both current and desired conditions

Structural Class	Current Conditions	Desired Conditions
Early-seral	7%	4%
Resprouter dominated	0%	5%
Young with grass, moderate cover	4%	24%
Young with grass, closed	7%	3%
Old with grass, moderate cover	7%	60%
Old with grass, closed	75%	4%

The vegetation condition class analysis indicates the ponderosa pine-evergreen shrub community is highly departed (vegetation condition class 3) across the Coronado. The historically dominant late-seral open structure makes up only 5 percent or less of the vegetation. Departure is also reflected by the increased proportions of early-seral and mid-development structure reflected in areas with large fire disturbance of over the last couple of decades. Other areas on the Coronado contribute to the overall departure with an abundance of late seral closed structure. Conflictingly, these areas have experienced recent wildfires—Clark Peak in 1996 and Nuttall Complex in 2004—however, a majority of the ponderosa pine-evergreen shrub affected was either unburned or burned at low severity. Detailed information on vegetation condition class for the ponderosa pine-evergreen shrub community can be found in table 30.

With warmer and drier climate conditions, ponderosa pine-evergreen shrub ecosystems are susceptible to decreased plant productivity, increased insect attacks, colonization of invasive species, longer and more severe fire seasons, and altered frequency, intensity, timing, and spatial extent of disturbance events (droughts, flash floods, landslides, and wind storms; see appendix A in the revised forest plan). High-risk occurrences include uncharacteristically intense wildfire, increased rate of insect or disease attack due to warming temperatures, and increasing challenges to regeneration of ponderosa pine, especially on warmer, drier areas such as south-facing slopes.

Ponderosa Pine-Evergreen Shrub – Environmental Consequences

Effects Common to All Alternatives

Wildland fire and prescribed cutting would continue to be used to treat the ponderosa pine-evergreen shrub community. By reducing fuel loading and creating more open conditions in some areas, fire and prescribed cutting would alter vegetation and fuel structure, bringing the ponderosa pine-evergreen shrub community more in line with desired conditions (Reynolds et al. 2013). Fire would also promote nutrient cycling, increasing soil fertility and plant productivity. Due to the removal of vegetation, fire may increase erosion and sedimentation in the short term. Fire also has the potential to create hydrophobic soils within high-severity areas, reducing water infiltration, which may consequently impede germination.

Under all alternatives, conditions in the ponderosa pine-evergreen shrub community would remain departed from desired structure. This departure is characterized by increased tree density, fuel loading, and diminished understory cover as compared to desired conditions. Although no alternative achieves the desired condition, all alternatives move the ponderosa pine-evergreen shrub community toward desired conditions. The differences among the alternatives are shown through the Vegetation Dynamics Development Tool (VDDT) departure statistics. The degree to which the effects of continued closed forest structure represent the ponderosa pine-evergreen shrub community also varies with each alternative.

No Action

The guidance provided for the ponderosa pine-evergreen shrub community is not wholly applicable nor are the desired habitat conditions always attainable. The 1986 forest plan describes this community as the transition coniferous forests, but vegetation management direction is discussed in the context of Mexican spotted owl and northern goshawk habitat needs in ponderosa pine forests. However, the greater ponderosa pine forest community for which Mexican spotted owl and goshawk habitat requirements were developed, lacks the evergreen shrub component that is integral to the ponderosa pine on the Coronado. Old-growth conditions within this vegetation community are discussed in more detail under the "No Action" section on page 98.

Under the 1986 forest plan, treatments in this vegetation community have consisted of planned and unplanned ignitions. Based on planned future actions, we assume that under the 1986 plan, the ponderosa pine-evergreen shrub community would be treated at a rate of about 1,000 acres per year, or a total of 10,000 acres every 10 years.

Continued management under the direction of the 1986 plan would lead to less departure from desired condition vegetation, fuels, and disturbance regimes during the 5-year modeling period compared to the current conditions. Structural classes would trend toward desired conditions for all but the early-seral and young closed states. Table 44 shows the changes expected under the no-action alternative. Although management under the no-action alternative would trend the ponderosa pine-evergreen shrub forest toward desired conditions, dense conditions would continue to prevail. Model projections suggest that the ponderosa pine-evergreen shrub community would remain 60 percent departed from desired conditions.

Table 44. Projected structural class changes under the no action (5-year) alternative and the proposed action (10-year) for ponderosa pine-evergreen shrub based on VDDT modeling results* (USDA FS 2009b)

Structural Class	Current Conditions	No Action	Proposed Action	Desired Conditions
Early seral	7%	8%	5%	4%
Resprouter dominated	0%	3%	2%	5%
Young with grass, moderate cover	4%	12%	6%	24%
Young with grass, closed	7%	32%	6%	3%
Old with grass, moderate cover	7%	14%	35%	60%
Old with grass, closed	75%	31%	46%	4%
Departure	**77%**	**60%**	**46%**	**0%**

* Projected percentages for the no-action alternative are meant to provide information on the relative distribution of structural classes and trend toward or away from desired conditions. These numbers are not to be interpreted as definite projections for the future.

The effect of the 2011 fire season on departure would likely be no change or a slight decrease due to minimal increases in the open structure and understory and shrub component. However, due to the

limited area affected by fire, these structural changes would not likely impact the overall departure under the no-action alternative.

The continued abundance of closed conditions correlates to a decrease in the overall health of the ponderosa pine-evergreen shrub forest. High tree density would result in the diminished presence of the shrub component in the shrub dominated subclass and a decrease in understory cover and richness (Laughlin et al. 2004) in the perennial grass/shrub subclass. Diminished understory cover, especially the herbaceous component, would impact wildlife species associated with this vegetation community, including the northern goshawk. Furthermore, this diminished understory component would limit the role of characteristic fire by limiting its natural spread.

Dense conditions may transition to an increased risk of uncharacteristic, high-intensity fire through the promotion of fuel accumulation and continuity. The impacts of high-severity fire on this system would include soil damage, loss of habitat, and higher risk of conversion to an uncharacteristic shrubland/grassland state. The increased risk of high-intensity fire is especially important in the wildland-urban interface, where threats to human life and property are high.

Dense conditions promote the spread and intensification of southwest dwarf mistletoe (*Arceuthonbium vaginatum*) and increase the risk of outbreaks by native and range expanding bark beetles. Dense conditions also reduce growing space and the availability of nutrients, water, and sunlight to individual plants, thereby decreasing individual health and vigor, which translates to the greater ecosystem. A reduction in the resiliency of the ponderosa pine-evergreen shrub forest that would result would decrease the ability of this vegetation community to recover from increased water stress, insect and disease attack, and uncharacteristic fire events that are expected under a changing climate. After the 5-year modeling period, acres of large and old trees, large snag density, and the amount of surface fuels under the no-action alternative would not trend toward desired conditions as strongly as the proposed action. See table 45 for a comparison of these metrics by alternative. Decreases in surface fuels expected under the no-action alternative would promote lower intensity fire and reduce the negative fire impacts to the soil resource. A loss of large and old trees compared to the desired conditions would negatively impact forest structure and wildlife habitat.

Table 45. The projected change in large trees, snag density, and surface fuel abundance under the no-action alternative (5-year) and the proposed action (10-year) for ponderosa pine-evergreen shrub

Condition or Alternative	Late Seral Stages	Averaged across all Seral Stages				
	Acres of Large/Old Trees	No. Snags (>18 in. d.b.h./acre)	Surface Fuels (tons/acre)			
			≤3 in.	>3 and ≤12 in.	>12 in.	Total
Current Conditions	32,369	1.6	2.0	5.5	3.4	10.9
No Action	17,763	1.5	1.7	4.3	2.6	8.6
Proposed Action	31,974	1.7	1.6	4.2	2.7	8.5
Desired Conditions	25,263	1.0 to 2.0	3.0 to 10.0	3.0 to 10.0	3.0 to 10.0	9.0 to 30.0

Proposed Action

The proposed action defines desired conditions based on reference conditions for the ponderosa pine-evergreen shrub community and provides management objectives and guidelines as a framework for implementing site-specific projects to achieve the desired conditions. Included is a desired condition for this community at the wildland-urban interface, specifying smaller, more widely spaced groups of trees than in areas outside the wildland-urban interface to promote low intensity surface fires when fire does occur. Furthermore, community-specific objectives would guide management to treat the

ponderosa pine-evergreen shrub forest through planned and unplanned ignitions and mechanical treatments on 12,500 acres every 10 years to maintain species diversity and an appropriate diversity of open conditions and structural classes (Reynolds et al. 2013).

Under the direction of the revised forest plan, management would move this vegetation community toward desired conditions for all structural classes. Table 45 shows the changes expected by each structural stage. Although moderate canopy cover classes would remain well below and the old-closed state would continue to surpass the desired conditions, substantial progress toward desired levels would be made. Stand characteristics would trend from closed canopy to moderately closed. Based on the VDDT modeling, departure from desired condition vegetation structure the 10-year modeling period would improve from a 77 to 46 percent departure.

Although dense conditions would continue, the effects discussed under the “No Action” section on page 130 would be diminished for the proposed action. The proposed action makes considerable headway in the progress toward desired conditions, characterized by movement toward more open conditions. This would result in the improved overall health of the ponderosa pine-evergreen shrub community. The reduced density of overstory species would promote the shrub and herbaceous components of the understory community, furthering the restoration of characteristic fire to the ponderosa pine-evergreen shrub community. Moreover, a reduction of overstory density and development of uneven-aged forest structure would promote lower intensity characteristic fire and reduce vulnerability to bark beetle outbreaks.

An increase in the shrub and herbaceous components may positively impact the heterogeneity of the vertical structure, improving wildlife habitat quality. Due to the reduction of canopy closure that is a desired condition in the wildland-urban interface, fire intensity in these areas with high, human values would be reduced to a level that supports management of lower intensity fire conditions for the protection of human life and property.

Mechanical treatments associated with the proposed action could increase the risk of soil compaction, scarification, erosion, and sedimentation. Yet, the benefits of mechanical treatment may outweigh the negative soil impacts by encouraging the return of characteristic fire and improving the overall health of this community. Mitigation measures to protect the soil resource should be implemented at the project level.

More open conditions would also improve the availability of water, nutrients, and sunlight to individual plants, enhancing health, vigor, and resiliency within the ponderosa pine-evergreen shrub forest community as a whole. Increased resiliency would translate to the improved response to natural disturbances such as insect and disease attack and to exacerbated disturbances from climate change. The availability of growing space (i.e., more water, nutrient, and light availability) would also improve the growth of residual trees, encouraging larger trees that are a more prominent component in both the reference and desired conditions of the ponderosa pine-evergreen shrub forest. The reduction of canopy cover may also increase water yield from the system.

In terms of old-growth conditions within the ponderosa pine-evergreen shrub forest, the revised forest plan supports development and maintenance of large trees, multistoried structure, snags, and downed woody debris as integrated components of an uneven-aged forest. Old-growth components would occur as individual or groups of old, declining, and dead trees and woody debris well distributed throughout the vegetation community. The location of old growth would shift on the landscape over time as a result of tree growth and mortality. The appropriate treatment of old growth in the revised forest plan would encourage consistent interpretation of this important component at the project level and do more to move the ponderosa pine-evergreen shrub community toward desired conditions for old growth occurrence and function. After the 10-year modeling period, acres of large and old trees, large snag density, and the amount of surface fuels under the proposed action would trend more strongly toward desired conditions when compared to the no-action alternative. See table 45 for a comparison of these metrics by alternative. Decreases in surface fuels would promote lower intensity fire and reduce the negative fire impacts to the soil resource.

Four areas would be recommended for wilderness designation under the proposed action: the present Mount Graham Wilderness Study Area, and Ku Chish, Whetstone, and Chiricahua Addition North. Approximately 22,970 acres, or 59 percent, of the ponderosa pine-evergreen shrub forest would be allocated within the Mount Graham Recommended Wilderness Area; no acres of this vegetation community would be represented in the Ku Chish or Whetstone areas (see page 97). Only 1 acre of ponderosa pine-evergreen shrub occurs in the Chiricahua Addition North area, therefore effects in this area would be negligible. Therefore, the effects of recommending the four areas as wilderness under the proposed action, and total acres of ponderosa pine-evergreen shrub affected, would be the same as those described under alternative 1 (page 100 and below) and alternative 2.

Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to the ponderosa pine-evergreen shrub community would be similar to the proposed action in terms of the guidance and objectives provided. Alternative 1 proposes that 16 land parcels be recommended for wilderness designation, which includes both the Mount Graham and Ku Chish Recommended Wilderness Areas. Approximately 22,970 acres, or 59 percent, of the ponderosa pine-evergreen shrub would be allocated within the Mount Graham Recommended Wilderness Area, resulting in effects common to all alternatives (see page 97). No acres of ponderosa pine-evergreen shrub would be present in the Ku Chish Recommended Wilderness Area, resulting in no effect to the ponderosa pine-evergreen shrub community.

The remaining acres of ponderosa pine-evergreen shrub forest that may be included under alternative 1 are represented in table 46. Refer to the “Alternative 1” section on page 100 for a discussion of effects related to each recommended wilderness area. The small percentage (just over 1 percent) of ponderosa pine-evergreen shrub within these recommended areas would make the designation of any or all recommended wilderness of little impact to management of the this community. Therefore, alternative 1 would result in similar effects when compared to the proposed action.

Table 46. Acreage of ponderosa pine-evergreen shrub within recommended wilderness

Recommended Wilderness	Acres of Ponderosa Pine-Evergreen Shrub Forest
Chiricahua Addition North	5
Jhus Canyon	12
Mount Graham Recommended Wilderness Area	22,970
Santa Teresa Addition North	314
Santa Teresa Addition South	142

Alternative 2

Because alternative 2 incorporates the direction of the revised forest plan, effects to the ponderosa pine-evergreen shrub community would be similar to the proposed action in terms of the guidance and objectives provided. Furthermore, the ponderosa pine-evergreen shrub community is not represented in the expanded Motorized Recreation Land Use Zone (table 32); therefore, the environmental consequences of alternative 2 would be identical to those of the proposed action. See page 131 for a more detailed discussion of these effects.

Mixed-conifer Forest – Affected Environment

Descriptions of Dry and Wet Mixed-Conifer

The mixed-conifer forest community is an upper elevation coniferous forest comprised of multiple species. Douglas-fir (*Pseudotsuga menziesii*) is common throughout this community. Comprised of

both wet and dry mixed-conifer forest communities, this vegetation community generally occurs at elevations ranging from approximately 5,500 to 10,000 feet. The mixed-conifer vegetation community is transitional, intergrading with ponderosa pine-evergreen shrub community at lower elevations and with spruce-fir forest at higher elevations in the Pinaleño Mountains. As mixed-conifer transitions from dry to wet conditions along elevational gradients, and varying by topographic aspect, ponderosa pine and Gambel oak (*Quercus gambelii*) become less abundant while aspen (*Populus tremuloides*), white fir (*Abies concolor*), and southwestern white pine (*Pinus strobiformis*) become more abundant. The mixed-conifer forest typically occurs with understories of grasses, forbs, shrubs, and young trees.

On the Coronado, the transition between dry and wet mixed-conifer forests is gradual and difficult to define, both on the ground and through aerial mapping techniques. The distinction between wet and dry mixed-conifer is typically determined through both a shift in dominant seral species and disturbance regime. Disturbances in the mixed-conifer community include fire, insects, diseases, and wind. On drier sites, fire is the primary disturbance agent, historically occurring frequently. Fire is generally not limited by lack of fuel connectivity or high fuel moistures. Insects are generally small-scale disturbance agents, but have the potential to cause large-scale disturbances. Dwarf mistletoes, parasitic plants found on several coniferous species, are chronic disturbance agents. Conversely, on wetter sites, fire is more limited by higher fuel moistures, occurring as larger scale, less frequent disturbances usually during periods of long-term drought. Historically on the Coronado, insects, diseases, and wind have caused frequent, small-scale disturbances. However, elsewhere in the West, insects cause large-scale disturbances in the wet mixed-conifer.

Typical forest planning species in mixed-conifer include the Mexican spotted owl, pungent talus snail (*Sonorella odorata*) (and many other land mollusks), band-tailed pigeon (*Patagioenas fasciata*), Mount Graham red squirrel, twin-spotted rattlesnake (*Crotalus pricei*), black bear (*Ursus americanus*), and Coues' white-tailed deer (*Odocoileus virginianus couesi*).

Livestock grazing, fire suppression, and selective logging have pushed the mixed-conifer forest from its natural state to a current condition departed from desired conditions. The use of mixed-conifer forests as summer range for livestock and fragmentation from logging operations in the late 1800s and early 1900s reduced the role of fire in the mixed-conifer forest by reducing fuels and fuel connectivity. Fire suppression has led to the increase of structural homogeneity across the landscape and the encroachment of more fire susceptible trees, such as Douglas-fir, white fir and southwestern white pine. In addition to the increases in overstory density, selective harvesting that targeted large Douglas-fir and ponderosa pine further skewed the age and species distribution to younger trees and less fire-tolerant species (Schussman and Smith 2006).

Historically, fires may have occurred more often and burned at lower severity than they do today (USDA FS 2009b). However, the fire regime within the mixed-conifer forest is more complex due to the high variability of topography, soils, and moisture that drive the differentiation between wet and dry mixed-conifer. Fires typically burned with mixed severity; as the mixed-conifer transitions from dry to wet, fire frequency decreases, but fire intensity increases. Fires likely occurred every 10 to 22 years (USDA FS 2009b) in the dry period, between May and June (Schussman and Smith 2006).

Current conditions in much of the wet and dry mixed-conifer are conducive to Douglas-fir beetle outbreaks (Yasinski 1958, USDA FS 2004). Douglas-fir dwarf mistletoe (*Arceuthobium douglassii*), is parasitic on Douglas-fir, and western spruce dwarf mistletoe (*A. microcarpum*) is parasitic on Engelmann spruce, a dry mixed-conifer species discussed below, reducing tree health over several decades. Fire exclusion fosters spread and intensification of dwarf mistletoe as mistletoe seeds from plants in the overstory rapidly infect understory trees.

With warmer and drier climate conditions, mixed-conifer forest ecosystems are susceptible to decreased plant productivity, more frequent and severe insect outbreaks, colonization of invasive species, longer and more severe fire seasons, and altered frequency, intensity, timing, and spatial extent of disturbance events (droughts, flash floods, landslides, wind storms, and ice storms; see

appendix A in the revised forest plan). Extended drought could lead to increased tree mortality, which may increase the probability of wildfire (Jenkins et al. 2008).

Dry Mixed-conifer Forest: The dry mixed-conifer subclass is transitional with increasing elevation between ponderosa pine-evergreen shrub and wet mixed-conifer communities and generally occurs at elevations ranging from approximately 5,500 to 9,500 feet. The dry mixed-conifer forest characterizes the majority of the greater mixed-conifer community, representing approximately 88 percent of the Coronado's mixed-conifer forest. Dry mixed-conifer forests are dominated by tree species such as ponderosa pine, southwestern white pine, Douglas-fir, Madrean oaks, and Gambel oak, with a lesser and localized presence of aspen, white fir, corkbark fir (*Abies lasiocarpa* var. *arizonica*), and Engelmann spruce (*Picea engelmannii*). This forest type typically occurs with understories of grasses, forbs, shrubs, and young trees. Fires occur frequently and are generally not limited by lack of fuel connectivity or high fuel moistures. Insects are generally small-scale disturbance agents, but have the potential to cause large-scale disturbances. Dwarf mistletoes, parasitic plants found on several coniferous species, are chronic disturbance agents. Drought also impacts this system.

The dry mixed-conifer has a fire regime very similar to ponderosa pine. Frequent low intensity surface fire is the dominant mode of disturbance. Fire intervals range from 2 to 17 years with a mean of 15 years. Lethal fires can occur on a limited scale but is not the norm. These will be characterized as mixed fires because they most likely occur as a part of a more widespread surface fire.[21]

Vegetation mapping results indicate current conditions within the dry mixed-conifer forest are characterized by an increase in mid-aged trees and more closed classes when compared to the desired conditions. Desired conditions in this community are characterized by a mature or aging overstory with a maturing mid-story and regeneration. Understory cover (i.e., grasses, forbs and shrubs) vary negatively with increasing tree cover. Current conditions within the dry mixed-conifer type indicate a 99 percent departure from desired conditions (table 47). Younger, more closed states make up the contemporary landscape as fire exclusion has allowed characteristic openings to infill with trees. Desired conditions accurately reflect the reference conditions for the dry mixed-conifer forest with the exception of the wildland-urban interface, where desired conditions call for more open horizontal structure to better manage fire in these areas.

Table 47. The distribution of structural classes in dry mixed-conifer for both current and desired conditions

Structural Class*	Current Conditions	Desired Conditions
Early-seral and uncharacteristic grassland, open	6%	0%
Young, open	2%	0%
Mid-aged, open	3%	0%
Mature/old with regeneration, open	1%	100%
Early seral, closed	1%	0%
Young, closed	9%	0%
Mid-aged, closed	44%	0%
Mature/old with regeneration, closed	34%	0%

* Open and closed refer to percent tree cover. Within the early seral class open indicates less than 10 percent cover, closed is more than 10 percent cover. Young, mid-aged and mature/old open and closed are characterized by less than 30 percent and more than 30 percent cover, respectively.

[21] http://www.fs.fed.us/database/feis/pdfs/PNVGs/Southwest/R3MCONwd.pdf

The vegetation condition class analysis indicates dry mixed-conifer is moderately departed (vegetation condition class 2) in the recently burned Chiricahua Mountains and highly departed (vegetation condition class 3) over the remaining locations on the Coronado. Forestwide, the dry mixed-conifer community is on the threshold between moderate (vegetation condition class 2) and high departure (vegetation condition class 3). Detailed information on vegetation condition class can be found in table 30. The vegetation composition and structure of dry mixed-conifer varies by location on the Coronado, but there is a general deficit of open canopy structure likely due to fire exclusion. Conversely, early seral structure is over-represented in the Chiricahua Mountains, likely a result of the 2011 Horseshoe 2 wildfire.

Wet Mixed-conifer Forest: The wet mixed-conifer forest subclass generally occurs at elevations ranging from approximately 5,500 to 10,000 feet, representing only 12 percent of the greater mixed-conifer vegetation community. Tree species composition varies depending on seral stage, elevation, and moisture availability. The wet mixed-conifer forest is characterized by early seral species, such as aspen, Douglas-fir, New Mexico locust (*Robinia neomexicana*), southwestern white pine, and Rocky Mountain maple (*Acer glabrum*); and late-seral species, such as white fir and Engelmann spruce. Ponderosa pine may be present in small proportions that decrease with increasing elevation. The wet mixed-conifer forest intergrades with the spruce-fir forest community at its upper elevation range (Pinaleño Mountains only), with ever increasing amounts of Engelmann spruce and corkbark fir in the later seral stages. Wet mixed-conifer has an understory of a wide variety of shrubs, grasses, forbs, and young trees depending on soil type, aspect, elevation, disturbance, and other factors.

Disturbances in wet mixed-conifer typically occur at two spatial and temporal scales: large-scale infrequent disturbances (mostly fire) and small-scale frequent disturbances (fire, insect, disease, and wind). Fire occurrence and behavior are generally limited more by higher fuel moisture than by lack of woody fuels, occurring as larger scale, less frequent disturbances usually during periods of long-term drought, often following disturbance events such as insect mortality. Fire frequencies are very variable and the wet mixed-conifer supports a mixed fire regime. Mixed severity fires occurred every 6 to 60 years.[22] Lethal fires are usually at longer intervals, 100-plus years. Damaging mid-scale Douglas-fir beetle (*Dendroctonus pseudotsugae*) outbreaks occur infrequently, but can cause significant mortality to larger size classes of Douglas-fir when they do. Historically on the Coronado, insects, diseases, and wind cause small scale, frequent disturbances; however, elsewhere in the West, insects cause large-scale disturbances in this vegetation community.

Vegetation mapping results indicate current conditions within the wet mixed-conifer subclass are less departed from desired conditions when compared to the dry mixed-conifer; yet, current conditions are characterized by similar increases in younger age classes (table 48). Current departure is 37 percent. Due to the lack of fire, the aspen and mixed deciduous class has decreased in abundance, whereas large high-severity fires may have caused an increase in early seral stage where aspen and oak are regenerating through the production of ramets.[23] Desired conditions accurately reflect the reference conditions for wet mixed-conifer forest with the exception of the wildland-urban interface, where desired conditions call for more open horizontal structure to better manage fire in these areas.

The vegetation condition class analysis indicates wet mixed-conifer is moderately departed from the reference condition. Detailed information on vegetation condition class for the wet mixed-conifer community can be found in table 30. The wet mixed-conifer in the Pinaleño Mountains contributes to the overall departure with an overrepresentation of mid-development closed and early seral structure. Having the majority of the wet mixed-conifer in the Pinaleño Mountains in these structural classes is in part reflective of the fire history of the area over the last couple of decades. The Clark Peak Fire of

[22] http://www.fs.fed.us/database/feis/pdfs/PNVGs/Southwest/R3MCONcm.pdf

[23] An individual clone, one of a group of clones. An individual plant that has grown vegetatively from another individual as a clone of that plant, but a separate plant. Specifically the separate "offspring" plant. For instance, in a clump of aspens, one single tree that is not the original tree is a ramet.

1996 and Nuttall Complex of 2004 burned 32 percent of the wet mixed-conifer in the Pinaleño Mountains at moderate to high severity. In other words, the acres burned in these severity classes would show up as early seral and mid-development closed classes in the current data.

Table 48. The distribution of structural classes in wet mixed-conifer for both current and desired conditions

Structural Class	Current Conditions	Desired Conditions
Early-seral with aspen[1]	6%	1%
Aspen/mixed deciduous[2]	14%	21%
Small-medium mixed-conifer[3]	45%	29%
Old mixed-conifer with regeneration[3]	35%	49%

1. This class includes aspen and oak regeneration, 10 to 40 percent cover.
2. This class includes young conifer species. Percent tree cover is more than 40 percent.
3. Percent tree cover is 20 to 60 percent.

On other areas of the Coronado, vegetation condition class results show the majority of vegetation in mid- through late-development closed structure. The Chiricahua Mountains show the most early seral structure due to the recent Horseshoe 2 Fire that burned throughout the wet mixed-conifer. The abundance of late development closed structure suggests that many of the sites that could support aspen as an overstory dominant or codominant are currently dominated by conifers.

Mixed-conifer Forest – Environmental Consequences

Dry Mixed-conifer Forest – Effects Common to All Alternatives

Under all alternatives, departure from desired conditions for vegetation, fuels, and disturbance regime would decline. Treatments would not achieve, but would move the dry mixed-conifer toward desired conditions, over the 10-year modeling period.

Table 49 displays the projected structural distribution of the dry mixed-conifer under the no action and proposed action. Stand characteristics would diversify from their current aggregation of mid-aged and mature or old classes with greater than 30 percent cover to a wider age distribution and generally less than 30 percent cover. The Vegetation Dynamics Development Tool (VDDT) departure from reference condition vegetation structure would improve departure of the dry mixed-conifer subclass to 87 percent.

By creating more open conditions, fire and prescribed cutting would alter vegetation and fuel structure, bringing the dry mixed-conifer community more in line with desired conditions (Reynolds et al. 2013). Fire would also promote nutrient cycling, increasing soil fertility, and plant productivity. Due to the removal of vegetation, both fire and cutting may increase erosion and sedimentation in the short term. Fire also has the potential to create hydrophobic soils within areas that burn under high-severity conditions, reducing water infiltration, which may consequently impede germination. The benefits of treatment may outweigh the negative soil impacts as the intents of prescribed cutting and wildfire treatments would be to return the dry mixed-conifer forest to characteristic structural classes and to provide for the natural role of fire in this ecosystem. A reduction in density of young, shade-tolerant fire susceptible trees would result in reduced competition and improved growing space (i.e., increased water, nutrient and light availability); increased individual tree health and vigor and improved forest resiliency; reduced vulnerability to Douglas-fir beetle outbreak and enhanced understory production and richness (Laughlin et al. 2004). Increases in understory cover coupled with reductions in ladder fuels would help restore characteristic low-intensity fire to the mixed-conifer community; mixed- and high-severity fire would still impact the system, denser more homogenous stands would persist. Yet this mix of fire severity would increase the structural heterogeneity of the mixed-conifer forest at the landscape scale, improving wildlife habitat and reducing risks of

widespread stand-replacing events, such as insects, disease, and wildfire. Furthermore, increases in the resiliency of the system would also facilitate forest response to these disturbances and those projected under climate change.

Table 49. Structural class 10-year projected changes for dry mixed-conifer under the proposed action alternative based on VDDT modeling results*

Structural Class	Current Conditions	No Action	Proposed Action	Desired Conditions
Early-seral and uncharacteristic grassland, open[1]	6%	6%	6%	0%
Young, open[2]	2%	5%	5%	0%
Mid-aged, open	3%	14%	14%	0%
Mature/old with regeneration, open	1%	13%	13%	100%
Early seral, closed	1%	9%	9%	0%
Young, closed	9%	8%	8%	0%
Mid-aged, closed	44%	26%	26%	0%
Mature/old with regeneration, closed	34%	19%	19%	0%
Departure	**99%**	**87%**	**87%**	**0%**

1. Projected percentages for the proposed action alternative are meant to provide information on the relative distribution of structural classes and trend toward or away from desired conditions. These numbers are not to be interpreted as definite projections for the future.
2. Open and closed refer to percent tree cover. Within the early seral class, open indicates less than 10 percent cover, closed is more than 10 percent cover. Young, mid-aged, and mature/old open and closed are characterized by less than 30 percent and more than 30 percent cover, respectively. The effect of the 2011 fires season on departure would likely be a slight increase due to promotion of aspen, Douglas-fir, and ponderosa pine regeneration.

Wildlife habitat quantity may also be positively impacted as reductions in risk of extensive disturbance mortality would result in diminished risk of habitat loss for species dependent on mixed-conifer such as Mexican spotted owl and northern goshawk. Increases in understory production would also impact the available forage for both livestock and wildlife species.

After the 10-year modeling period, large snag density, and the total surface fuels would trend toward desired conditions. Acres of large and old trees would trend away from desired conditions as the increase in open structure in younger age classes correlates to a decrease in the mature/old, closed states. However, the increase in the mid-aged open class provides the pathway to mature/old with regeneration open class if it the canopy openness can be maintained as the unit grows. All actions would result in decreased tree density when compared to the current condition, but large trees would be lacking when compared to the desired condition. See table 50 for a comparison of these metrics. The diminished presence of large, old trees would negatively impact forest structure wildlife habitat within this community; however, improved open conditions would have the opposite positive effect on habitat components such as forage and prey bases.

While treatments in the dry mixed-conifer forest would strive to move toward desired conditions, this subclass would remain highly departed from desired structure. This departure is characterized by high tree density, the proliferation of less fire-tolerant species composition and age class distributions, high fuel loading, and diminished understory cover as compared to desired conditions.

Table 50. The projected change after 10 years in large trees, snag density, and surface fuel abundance under the proposed action for dry mixed-conifer

Condition or Alternative	Late Seral Stages	Averaged Across All Seral Stages				
	Acres of Large/Old Trees	No. Snags (>18 in. d.b.h./acre)	Surface Fuels (tons/acre)			
			≤3 in.	>3 and ≤12 in.	>12 in.	Total
Current Conditions	17,116	5.5	8.8	15.3	8.4	32.5
No Action	15,649	6.5	7.6	13.2	7.0	27.8
Proposed Action	15,649	6.5	7.6	13.2	7.0	27.8
Desired Conditions	48,904	average 3	range from 5-15			

Dry Mixed-conifer Forest – No Action

Under the no-action alternative, the 1986 forest plan addresses the mixed-conifer community as a whole and only in the context of habitat for Mexican spotted owl and northern goshawk. The 1986 plan does not provide specific direction for the dry mixed-conifer subclass and does not discuss the differences between the wet and dry mixed-conifer forest. In addition to the lack of subclass-specific information, the 1986 plan provides no desired conditions or guidance on how to achieve desired conditions. Under the direction of the 1986 forest plan, management activities have included the use of fire and mechanical treatment to improve wildlife habitat and reduce fuel loading.

Old-growth conditions in this vegetation community are discussed in more detail under the "No Action" section on page 98. Old growth in the dry mixed-conifer forest occurs as individual or groups of old, declining, and dead trees and woody debris integrated well distributed throughout the vegetation community.

Dry Mixed-conifer Forest – Proposed Action

The proposed action defines desired conditions based on reference conditions for the dry mixed-conifer community and provides management objectives and guidelines as a framework for implementing site-specific projects to achieve the desired conditions. Included is a desired condition for this community at the wildland-urban interface, specifying smaller and more widely spaced groups of trees than in areas outside the wildland-urban interface to promote low-intensity surface fires when fire does occur. These forest plan components and specific guidance for the dry mixed-conifer would allow for more informed management decisions and provide a basis for monitoring effectiveness of treatments. Forest plan components would guide management to treat the dry mixed-conifer forest through planned and unplanned ignitions and prescribed cutting treatments on 13,800 acres over 10 years to maintain species diversity and an appropriate diversity of open conditions and structural classes.

In terms of old growth within the dry mixed-conifer forest, the revised forest plan supports development and maintenance of old growth and large trees, multistoried structure, snags, and downed woody debris as integrated components of an uneven-aged forest. Old growth would occur as individual or small groups of old, declining, and dead trees and woody debris well distributed throughout the vegetation community. The location of old growth would shift on the landscape over time as a result of tree growth and mortality. The appropriate treatment of old growth in the revised forest plan would encourage consistent interpretation of this important component at the project level and do more to move the mixed-conifer forest toward desired conditions for old-growth occurrence and function.

Four areas would be recommended for wilderness designation under the proposed action: the present Mount Graham Wilderness Study Area, and Ku Chish, Whetstone, and Chiricahua Addition North. Approximately 5,349 acres, or approximately 11 percent, of the dry mixed-conifer forest would be recommended within these areas. Of this, 4,681 acres (89 percent) are in the Mount Graham area; 400

acres and 268 acres occur within the Chiricahua Addition North and Ku Chish areas, respectively. The recommendation of the Mount Graham Recommended Wilderness Area results in effects common to all alternatives (see page 98).

The effects of recommending the four areas as wilderness under the proposed action would be similar to those described under alternative 1 (page 100) except that fewer acres would be affected. In particular, future treatment needs may be impacted if Ku Chish is designated as wilderness. Applying pheromone bubble packets to protect Mexican spotted owl habitat may be impacted due to the limitations discussed on page 98. This is a standard treatment to disperse Douglas-fir beetles from attacking large trees, an important habitat component for Mexican spotted owl, in nesting and roosting sites following wildfires. The relatively small area in Ku Chish would limit the impacts of wilderness recommendation, but it could reduce the long-term sustainability of one Mexican spotted owl protected activity center. As mixed-conifer forests are rare on the Coronado and exist as discontinuous patches and stringers across the landscape, this vegetation community is of high value to Mexican spotted owl and other wildlife species. The loss of a few acres may result in disproportionate negative impacts to species that depend on this community.

Dry Mixed-conifer Forest – Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to the dry mixed-conifer community would be similar to the proposed action in terms of the guidance and objectives provided. Alternative 1 proposes that 16 land parcels be recommended for wilderness designation, which includes both the Mount Graham and Ku Chish Recommended Wilderness Areas. Approximately 6,106 acres, or 12 percent, of the dry mixed-conifer forest would be allocated within these recommended wilderness areas. The majority of this acreage (9 percent) occupies the Mount Graham Recommended Wilderness Area. Recommending both the Mount Graham and Ku Chish Recommended Wilderness Areas would result in identical effects in those areas when compared to the proposed action.

The remaining acres of dry mixed-conifer forest that may be included under alternative 1 are displayed in table 51. The effects of recommending these areas are discussed on pages 97 and 100. Alternative 1 would result in similar effects when compared to the proposed action.

Table 51. Acreage of dry mixed-conifer within recommended wilderness

Recommended Wilderness	Acres of Dry Mixed-Conifer
Chiricahua Addition North	400
Chiricahua Addition West	7
Galiuro Addition	450
Jhus Canyon	300
Ku Chish	268
Mount Graham Recommended Wilderness Area	4,681

Dry Mixed-conifer Forest – Alternative 2

The dry mixed-conifer community is not represented in the Motorized Recreation Land Use Zone that, under alternative 2, is much larger than the other alternatives (table 32). Since alternative 2 incorporates the same direction as the proposed action, effects to the dry mixed-conifer community would be identical to the proposed action. See page 139 for a more detailed discussion of these effects.

Wet Mixed-conifer Forest – Effects Common to All Alternatives

Under all alternatives, the wet mixed-conifer would trend from smaller and younger overstory to older stands of large trees; tree cover would remain largely the same. Table 52 shows the strong movement

toward desired conditions expected for the wet mixed-conifer subclass. The Vegetation Dynamics Development Tool (VDDT) departure from desired condition vegetation structure would improve to 8 percent departed for the wet mixed-conifer subclass, compared to 37 percent departed under current conditions.

Table 52. Structural class 10-year projected changes expected for wet mixed-conifer under the no-action and proposed action alternatives based on VDDT modeling results*

Structural Class	Current Conditions	No Action	Proposed Action	Desired Conditions
Early-seral w/aspen[1]	6%	3%	3%	1%
Aspen/mixed deciduous[2]	14%	25%	25%	21%
Small-medium mixed-conifer[3]	45%	31%	31%	29%
Old mixed-conifer w/ Regeneration[3]	19%	41%	41%	49%
Departure	**37%**	**8%**	**8%**	**0%**

* Projected percentages for the proposed action alternative are meant to provide information on the relative distribution of structural classes and trend toward or away from desired conditions. These numbers are not to be interpreted as definite projections for the future.

1. This class includes aspen and oak regeneration, 10 to 40 percent cover.
2. This class includes young conifer species. Percent tree cover is more than 40 percent.
3. Percent tree cover is 20 to 60 percent.

After the 10-year modeling period, acres of large and old trees, large snag density, and the amount of surface fuels would trend toward desired conditions. Surface fuels in some of size classes would surpass desired conditions. See table 53 for a comparison of these metrics by alternative.

Table 53. The projected 10-year change in large trees, snag density, and surface fuel abundance under the no-action alternative and the proposed action for wet mixed-conifer

Condition or Alternative	Late Seral Stages	Averaged Across All Seral Stages				
			Surface Fuels (tons/acre)			
	Acres of Large/Old Trees	No. Snags (>18 in. d.b.h./acre)	≤3 in.	>3 and ≤12 in.	>12 in.	Total
Current Conditions	2,351	8.7	10.8	20.6	14.1	45.5
No Action	2,754	9.4	11.5	21.1	13.6	46.2
Proposed Action	2,754	9.4	11.5	21.1	13.6	46.2
Desired Conditions	3,291	1-5	range from 2-40			

In all structural classes, the wet mixed-conifer community moves toward desired conditions. The increase of large/old trees and aspen would promote habitat characteristic important to wildlife species within the wet mixed-conifer subclass. Although tree cover would remain relatively high, this community is well adapted to higher densities as it occupies wetter sites and the mix of species present trend toward more shade tolerance. Therefore, the negative effects of density discussed in previous vegetation communities are diminished in wet mixed-conifer. Insect and disease would affect this community through characteristic, small-scale frequent disturbances, with occasional larger scale infrequent disturbances. Wildfire may occur infrequently at high severity or more frequently at mixed severity, as is characteristic for this type.

The reduced occurrence of the smaller, younger structural classes would likely limit high-intensity fire. Mixed- and high-severity fire would still impact the system after periods of long drought. This mix of fire severity would increase the structural heterogeneity of the wet mixed-conifer forest at the

landscape scale, improving wildlife habitat and reducing risks of widespread stand-replacing events such as insects, disease, and wildfire.

Under all alternatives, prescribed cutting and planned and unplanned ignitions would continue to be used at similar rates to treat the wet mixed-conifer subclass. By promoting large old trees and a diversity of forest structure, fire and prescribed cutting would alter vegetation and fuel structure, bringing the wet mixed-conifer community more aligned with desired conditions. Fire would also promote nutrient cycling, increasing soil fertility, and plant productivity. Due to the removal of vegetation, both fire and cutting may increase erosion and sedimentation in the short term. Fire also has the potential to create hydrophobic soils within high-severity areas, reducing water infiltration, which may consequently impede germination. The benefits of treatment may outweigh the negative soil impacts as the intents of prescribed cutting and wildfire treatments would be to return the wet mixed-conifer forest to characteristic structural classes and to provide for the natural role of fire.

Wet Mixed-conifer Forest – No Action

Under the no-action alternative, the 1986 forest plan addresses the mixed-conifer community as a whole and only in the context of habitat for Mexican spotted owl and northern goshawk. The 1986 plan does not provide specific direction for the wet mixed-conifer subclass and does not discuss the differences between the wet and dry mixed-conifer forest. In addition to the lack of subclass-specific information, the 1986 plan provides no desired conditions or guidance on how to achieve desired conditions. Under the direction of the 1986 forest plan, management activities have included the use of fire and mechanical treatment to improve wildlife habitat and reduce fuel loading.

Old-growth conditions within this vegetation community are discussed in more detail under the “No Action” section on page 98. In terms of old growth specific to the wet mixed-conifer subclass, the treatment of old growth as it would occur under an even-aged system is somewhat more appropriate. The wet mixed-conifer forest may occur in even-aged patches and exhibits some even-aged characteristics; however, this community is uneven-aged at the landscape scale. In the sky islands, old growth in the wet mixed-conifer forest occurs either in large uneven-aged stands or in even-aged patches where old-growth components (large and old trees, large snags, and multistoried structure) are concentrated, and as old-growth components integrated into the larger forest.

Wet Mixed-conifer Forest – Proposed Action

The proposed action defines desired conditions based on the reference conditions for mixed-conifer communities and provides management objectives and guidelines as a framework for implementing site-specific projects to achieve the desired conditions. Included is a desired condition for this community at the wildland-urban interface, specifying the dominance of early-seral, fire-adapted species growing in more open conditions than the remainder of the Coronado to promote lower intensity surface fires when fire does occur. These forest plan components and specific guidance for the wet mixed-conifer would allow for more informed management decisions and provide a basis for monitoring effectiveness of treatments. Forest plan components would guide management to treat the wet mixed-conifer forest through planned and unplanned ignitions and prescribed cutting treatments on 2,400 acres every 10 years to maintain species diversity and an appropriate diversity of open conditions and structural classes.

In terms of old growth within the wet mixed-conifer forest, the revised forest plan supports development and maintenance of old growth and large trees, multistoried structure, snags, and downed woody debris as more integrated components. Old growth would occur over large patches where old-growth components (i.e., old, declining, and dead trees, coarse woody debris, and structural diversity) are concentrated. The location of old growth would shift on the landscape over time as a result of tree growth and mortality. The appropriate treatment of old growth in the revised forest plan would encourage consistent interpretation of this important component at the project level and do more to move toward the desired conditions of old-growth occurrence and function as one component of many within the wet mixed conifer forest.

Four areas would be recommended for wilderness designation under the proposed action: the present Mount Graham Wilderness Study Area, and Ku Chish, Whetstone, and Chiricahua Addition North. This includes wet mixed conifer across approximately 528 acres in the Mount Graham area; and 45 acres in the Whetstone area, a total of 573 acres, or 9 percent, of this vegetation community. The effects of recommending the four areas as wilderness under the proposed action would be similar to those described under alternative 1 (page 100 and below) except that fewer acres would be affected. The wet mixed-conifer community is not represented within the Ku Chish or Chiricahua Addition North areas (see page 98).

Wet Mixed-conifer Forest – Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to the wet mixed-conifer community would be similar to the proposed action in terms of the guidance and objectives provided. Alternative 1 proposes that 16 land parcels be recommended for wilderness designation, which includes both the Mount Graham and Ku Chish Recommended Wilderness Areas. Approximately 641 acres, or 10 percent, of the wet mixed-conifer forest would be allocated within these recommended wilderness areas under alternative 1. The majority of this acreage (8 percent) occupies the Mount Graham Recommended Wilderness Area. Recommending both the Mount Graham and Ku Chish Recommended Wilderness Areas would result in identical effects when compared to the proposed action.

The remaining acres of wet mixed-conifer forest that may be included under alternative 1 are displayed in table 54. The effects of recommending these areas are discussed on pages 97 and 100. The limited acreage represented in the remaining areas would make the effects of the recommendation of any or all areas negligible. Alternative 1 would result in similar effects when compared to the proposed action.

Table 54. Acreage of wet mixed-conifer within recommended wilderness

Recommended Wilderness	Acres of Wet Mixed-Conifer
Dragoon	11
Mount Graham Recommended Wilderness Area	528
Whetstone	45
Winchester	57

Wet Mixed-conifer Forest – Alternative 2

The wet mixed-conifer community is not represented in the Motorized Recreation Land Use Zone that, under alternative 2, is much larger than the other alternatives (table 32). Since alternative 2 incorporates the same direction as the proposed action, effects to the wet mixed-conifer community would be identical to the proposed action. See page 139 for a more detailed discussion of these effects.

Spruce-fir Forest – Affected Environment

Also known as subalpine conifer forests, spruce-fir forests are located at elevations between 9,500 and 11,500 feet along a variety of gradients, including gentle to very steep mountain slopes. Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), or corkbark fir (*Abies lasiocarpa* var. *arizonica*) dominate this vegetation community, either alone or in mixed stands. Douglas-fir, mixed-conifer, and quaking aspen (*Populus tremuloides*) stands may also be present for long periods without regeneration. Herbaceous species may include, but are not limited to, red baneberry (*Actaea rubra*), starry false Solomon's seal (*Maianthemum stellatum*), fleabane (*Erigeron eximius*), blackberry (*Rubus pedatus*), and subalpine lupine (*Lupinus arcticus* spp. *subalpinus*). Natural disturbances in this vegetation community include blowdowns, insect outbreaks, and stand-replacing fires.

This habitat type has relatively few species, most of which are cold adapted and more typical of boreal forests than the Sierra Madre Occidental. Forestwide, this community is limited to the Pinaleño Mountains. Most wildlife species are terrestrial, rather than riparian or aquatic, and many of these are rock associates. Species of conservation concern include Mount Graham red squirrel, Pinaleño monkey grasshopper (*Eumorsea pinaleno*), cross snaggletooth (*Gastrocopta quadridens*), Heliograph Peak fleabane (*Erigeron heliographis*), white-flowered cinquefoil (*Potentilla albiflora*), Mount Graham beardtongue (*Penstemon deaveri*), New Mexico lupine, timberland blue-eyed grass (*Sisyrinchium longipes*), and Heller's whitlowgrass (*Draba helleriana*).

The impacts of anthropogenic disturbance are not well documented within the spruce-fir forest (Schussman and Smith 2006). With the onset of Euro-American settlement, spruce-fir forests experienced grazing, logging, fragmentation, and fire suppression that significantly impacted the fire regimes, composition, and structure of lower elevation forests. Yet, the lower commercial timber values and relative inaccessibility of the spruce-fir forest may have diminished these impacts within this high elevation community. However, anthropogenic change in mid-elevation forests may have increased the susceptibility of the spruce-fir forests to high-intensity wildfire. Although spruce-fir naturally experiences stand-replacing fire, historical, high-frequency fire in the mixed-conifer forests that surround this community probably limited the transmission of crown fire to the spruce-fir forest. The increasing risk of high-severity crown fire in the mixed-conifer communities has the increased potential to spread into the spruce-fir, thereby reducing the sustainability of the spruce-fir as a stable system (Schussman and Smith 2006, Swetnam et al. 2009).

Bark beetle outbreaks are unlikely for several decades, as residual trees in the unburned areas are too small to support significant outbreaks. Spruce aphid will likely persist in the Pinaleño and Chiricahua Mountains within the spruce-fir forest and on Engelmann spruce in the mixed-conifer forest. As a result, Engelmann spruce will probably have less representation in the future forests (Lynch 2009), although uncertainty exists relative to long-term impacts of spruce aphid in southwestern forests.

What little is known about the fire dynamics for spruce-fir in the Pinaleño Mountains suggests that the historic fire return interval is 311 years (Grissino-Mayer et al. 1995) and at the boundary between mixed-conifer and spruce-fir it is more than 150 years (Swetnam et al. 2009). A fire regime condition class evaluation was not conducted for the spruce-fir forest (USDA FS 2009b).

The spruce-fir forest is a rare vegetation community on the Coronado, comprising less than 1 percent of the total acreage, but it is disproportionately important because of its unique characteristics and lack of representation elsewhere. The spruce-fir forest at the top of the Pinaleño Mountains incurred a severe die-off of mature trees in the 1990s and 2000s, primarily due to insect outbreaks and two wildfires (Koprowski et al. 2005, Lynch 2009). These outbreaks involved a variety of species, including two native bark beetles, a defoliating moth, and the spruce aphid (an exotic to the southwestern U.S.). Activity by each of these insects is thought to be related to recent warmer than normal autumn and winter temperatures (Lynch 2003). Stand-replacement wildfire or continuing warmer winter temperatures could lead to a loss of this vegetation community (USDA FS 2009c). Two wildfires, the Clark Peak Fire in 1996 and the Nuttall-Gibson Complex in 2004, burned as stand-replacing fires over 40 percent of what remained of the spruce-fir community (University of Arizona 2008).

Generally, desired conditions for this community were directly derived from reference conditions. The exception occurs within the wildland-urban interface where desired conditions specify open horizontal structure and a lack of stand-replacing fire to protect human values within the spruce-fir community. Table 55 shows the desired and current structural distributions for the spruce-fir forest based on mid-scale mapping. Due to drought, insect attack, and high-severity fire that affected the majority of the spruce-fir forest on the Coronado, current conditions are 54 percent departed from desired conditions. Historically, the spruce-fir forest was characterized by a broad mix of old growth, mid-aged, and young trees (Schussman and Smith 2006). Currently, the spruce-fir forest is dominated by an abundance of early seral vegetation, which includes regenerating aspen and conifer species with

grasses, forbs, and shrubs in the understory. Limited distribution of young to mid-aged and mature forest structure is due to insect and fire mortality.

Table 55. Distribution of structural classes for the spruce-fir forest under current and desired conditions

Structural Class*	Current Conditions	Desired Conditions
Early seral with aspen	79%	25%
Young forest with regeneration	11%	35%
Mature or old forest with regeneration	10%	40%

* The early seral stage is characterized by 10 to 40 percent canopy cover, while the young and mature/old forest have more than 40 percent cover.

The vegetation condition class analysis indicates vegetation composition and structure of spruce-fir is low to moderately departed from the reference condition (vegetation condition class 2). Detailed information on vegetation condition class for the spruce-fir community can be found in table 30. Unlike the mid-scale mapping, an abundance of late development structure and lack of mid-development drives the vegetation condition class departure for this vegetation community. The differences in departure result from the disparity in the classification of structural classes between the mid-scale mapping and the data used in the vegetation condition class analysis and should be considered in the interpretation of these results.

Based on projections of future climate change for the region, spruce-fir forest ecosystems are susceptible to decreases in plant productivity from water limitations and increased heat, increases in insect attacks (which has already been observed), colonization of invasive species, longer and more severe fire seasons, and altered frequency, severity, timing, and spatial extent of disturbance events (droughts, flash floods, landslides, wind storms, and ice storms; see appendix A in the revised forest plan). Spruce-fir on the Coronado occurs at the highest elevations and, thus, is among the most susceptible to loss of suitable climate. Extended drought from a delayed monsoonal season could lead to increased tree mortality, resulting in increasing risk of intense wildfire.

Spruce-fir Forest – Environmental Consequences

Effects Common to All Alternatives

Under all alternatives, departure from vegetation, fuels, and disturbance regime desired conditions would decline to 44 percent in the 10-year modeling period. This movement toward desired conditions is likely due to natural forest and disturbance dynamics. Because the spruce-fir forest has recently undergone widespread stand-replacing disturbances, early-seral stages dominate this community. Within 10 years, the majority of structural change would occur through stand growth. Table 56 shows a shift from the early seral class to young forest and a slight shift from young to mature or old forest, due to growth and succession.

Table 56. Structural class 10-year projected changes for spruce-fir under the no-action and proposed action alternatives based on VDDT modeling results

Structural Class*	Current Conditions	No Action	Proposed Action	Desired Conditions
Early-seral with aspen	79%	69%	69%	25%
Young forest with regeneration	11%	20%	20%	35%
Mature or old forest with regeneration	10%	11%	11%	40%
Departure	**54%**	**44%**	**44%**	**0%**

* The early seral stage is characterized by 10 to 40 percent canopy cover, while the young and mature/old forest have more than 40 percent cover.

Early successional species would likely continue to dominate the overstory of burned areas until sufficient canopy closure allows for more shade tolerate species to establish. The presence of aspen may decline as conifers regenerate and reach canopy dominance, yet without artificial regeneration of conifer species aspen would continue to dominate in the short term. Over a longer period, aspen would remain as an integrated component in the forest, but no longer as large, pure stands. Due to the limited growing season of high elevation forests, the burned portion of the spruce-fir forest may require centuries to reach desired conditions where mature stands of spruce and fir occupy a more dominate role. Management can increase the proportion of young forest through planting, but cannot make significant change toward increasing the mature or old forest within 10 years. In unburned areas that experienced high insect-related mortality, regenerating trees would continue to grow at an increased rate when compared to relatively unaffected stands. Corkbark fir regeneration will probably be naturally favored over Engelmann spruce because of recurring spruce aphid damage. Open conditions after stand-replacing fire allow for increased water, nutrient, and sunlight availability, increasing production of the seedlings and saplings (Swetnam et al. 2009).

Extensive stand-replacing fire may not affect this community, as high-severity fire has already impacted much of the spruce-fir forests. However, residual unburned areas with insect-related mortality have the potential to burn in the future. Crown fires from lower elevation communities may threaten the remaining overstory. Overall, the open regenerating condition of the spruce-fir forest and the characteristic long fire return interval may reduce the likelihood of high-intensity fire in this vegetation community.

Due to the loss of overstory, some wildlife habitat would likely improve as growth and succession move this community to a greater diversity of structural classes and more forested state. As more conifer trees reach seed producing age, Mount Graham red squirrel habitat may improve; however, as dense conditions would not markedly improve, increases in habitat quality would be limited (Koprowski et al. 2005). Aspen is an important habitat component for other wildlife species; its continued presence may provide habitat for these species.

After the 10-year modeling period, acres of large and old trees, large snag density, and the amount of surface fuels would increase toward desired conditions. See table 57 for a comparison of these metrics by alternative. Increases in all metrics would provide important wildlife habitat components and improve forest structure.

Table 57. The 10-year projected change in large trees, snag density, and surface fuel abundance under the no-action alternative and the proposed action for spruce-fir forests

Condition or Alternative	Late Seral Stages	Averaged Across All Seral Stages				
	Acres of Large/Old Trees	No. Snags (>18 in. d.b.h./acre)	Surface Fuels (tons/acre)			
			≤3 in.	>3 and ≤12 in.	>12 in.	Total
Current Conditions	302	5.6	10.2	20.0	9.2	39.4
No Action	332	7.3	11.6	22.8	11.4	45.8
Proposed Action	332	7.3	11.6	22.8	11.4	45.8
Desired Conditions	1,206	1.0 to 3.0	5.0 to 40.0	5.0-40.0	5.0-40.0	15.0 to 120.0

No Action

Under the no-action alternative, the 1986 forest plan addresses spruce-fir ecosystems only in the context of Mount Graham red squirrel and northern goshawk habitat, and does not define desired future conditions or provide guidance on how to achieve them. Although vegetation treatments are described in the 1986 forest plan, under its direction, only fuels reduction treatments near facilities have been implemented.

Old-growth conditions within this vegetation community are discussed in more detail under the "No Action" section on page 98. In terms of old growth specific to the spruce-fir community, the treatment of old growth as it would occur under an even-aged system is somewhat more appropriate for spruce-fir. However, on the Coronado, this community occurs on such a limited area that even-aged dynamics are diminished when compared to the spruce-fir community regionwide. The spruce-fir community of the Coronado occurs on about 3,016 acres with pure spruce-fir forest accounting for only about 600 acres. Therefore, the community primarily functions at the mid- and fine-scales, where patch dynamics influence old growth. Old growth occurs, consequently, as patches of large and old trees, large snags, and multistoried structure.

Proposed Action

The proposed action defines desired conditions based on the reference conditions for spruce-fir communities and provides management objectives and guidelines as a framework for implementing site-specific projects to achieve the desired conditions. Included is a desired condition for this community at the wildland-urban interface, specifying more open conditions and reduced fire behavior to protect high value sites such as the Mount Graham International Observatory. These forest plan components would allow for more informed management decisions and provide a basis for monitoring effectiveness of treatments. Vegetation treatments in the spruce-fir vegetation community are expected to be similar to those in the 1986 forest plan; the revised forest plan does not identify an objective to treat a specified number of acres within the spruce-fir forest. This community would continue to grow without heavy management influence.

In terms of old growth within the spruce-fir forest, the revised forest plan supports development and maintenance of old growth and large trees, multistoried structure, snags, and downed woody debris as more integrated components. Old growth would occur over large patches where old-growth components (old, declining, and dead trees; coarse woody debris; and structural diversity) are concentrated. The location of old growth would shift on the landscape over time as a result of tree growth and mortality. The appropriate treatment of old growth in the revised forest plan would encourage consistent interpretation of this important component at the project level and do more to move the spruce-fir forest toward desired conditions for old-growth occurrence and function.

Four areas would be recommended for wilderness designation under the proposed action: the present Mount Graham Wilderness Study Area, and Ku Chish, Whetstone, and Chiricahua Addition North. Approximately 248 acres, or 7 percent, of the spruce-fir forest would be allocated within the Mount Graham Recommended Wilderness Area; no acres of this vegetation community would be represented in the Ku Chish, Chiricahua Addition North, or Whetstone areas (see page 98). The effects of recommending the four areas as wilderness under the proposed action would be the same as those described under alternative 1 (page 100 and below).

The impact of the revised forest plan on the spruce-fir community would be identical to those of the 1986 forest plan, with the exception of the management of old growth, and the impacts of more appropriate desired conditions, guidelines, and management approaches defined for this community.

Alternative 1

Because alternative 1 incorporates the direction of the revised forest plan, effects to the spruce-fir community would be similar to the proposed action in terms of the guidance and objectives provided. In addition, alternative 1 proposes that 16 land parcels be recommended for wilderness designation. Approximately 248 acres, or 7 percent, of the spruce-fir forest would be allocated in the Mount Graham Recommended Wilderness Area with effects common to all alternatives (see page 97). The spruce-fir forest is not represented in any other recommended areas. Therefore, alternative 1 would result in identical effects when compared to the proposed action.

Alternative 2

The spruce-fir community is not represented in the expanded Motorized Recreation Land Use Zone (table 32) and because alternative 2 incorporates the direction of the revised forest plan, effects to the spruce-fir community would be identical to the proposed action. See "Effects Common to All Alternatives" and "Proposed Action" on pages 145 and 147 for a more detailed discussion of these effects.

Riparian Areas – Affected Environment

Riparian areas occupy approximately 5,142 acres of the Coronado National Forest. Although this represents less than 1 percent of the Coronado, riparian areas are disproportionately important because the water that supports these communities is rare in the arid Southwest. Riparian areas occur on nearly level flood plains, low stream terraces, alluvial fans, and canyon bottoms throughout all vegetation communities. They are the transition areas between aquatic ecosystems and adjacent upland terrestrial ecosystems. Riparian areas are identified by soil characteristics and/or distinctive vegetation communities that require free or unbound surface or subsurface water. Most riparian areas on the Coronado National Forest are sustained by ephemeral or intermittent streams. Natural flood regimes result in diverse channel morphology, which is necessary for recruitment of some riparian plant species. Large riparian areas are geographically delineable at the landscape scale, and smaller riparian areas are geographically delineable at finer scales.

Because riparian areas offer a mesic and aquatic interface in an otherwise xeric landscape, plant and animal species biodiversity is extremely high and conservation issues are significant. Wildlife species from large and small mammals to reptiles, birds, and invertebrates depend on riparian ecosystems for water, food, cover, and nesting sites. Wildlife species of concern include adult phases of animals with aquatic larvae, including a multitude of insects (e.g., caddis flies, damselflies, and stoneflies) and special-status amphibians. Most species of bats that are rare or at risk use riparian areas for foraging. Land mollusks are often thought of as being upland rock associates, but some are typical inhabitants of mesic microclimates in riparian areas (e.g., Wet Canyon talus snail, Madera talus snail (*Sonorella clappi*) and Cave Creek woodland snail (*Ashmunella chiricahuana*)). Many rare and at-risk bird species depend on riparian habitats, including Bell's vireo (*Vireo bellii*), elegant trogon, and the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*). Numerous rare or at-risk plant species are riparian associates, including Gentry's indigo bush (*Dalea tentaculoides*), Chiricahua mountain alum-root (*Heuchera glomerulata*), California satin tail (*Imperata brevifolia*), Southwest monkey flower, frog's bit buttercup (*Ranunculus hydrocharoides*), and Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*).

Traditionally, riparian species were collected by Native Americans for a variety of uses. Willows (*Salix* sp.) are an important plant for traditional basketry. The light wood from cottonwoods was used for construction, certain tools, and coals for roasting food. Mesquite continues to be widely used for fuel and food. Walnuts are a traditional food for Mexican-Americans as well as Native Americans. Among aquatic plants, cattail (*Typha dominguez*) was used for basketry and food, and yerba mansa (*Anemopsis californica*) has traditional medicinal uses.

Riparian Vegetation Classification

Vegetation supported within riparian areas varies with watershed size, geology, elevation, and aspect. Riparian vegetation has been categorized by various entities using different nomenclature, and several have developed riparian area maps that include the Coronado National Forest (Arizona Game and Fish Department 1993; Winestead 1997; Wahl 1997; Lee et al. 2006; USDA FS 1984). Most recently, the Forest Service has undertaken the regional riparian mapping project (RMAP) to classify potential native vegetation types. The regional riparian mapping project classification system incorporates terrestrial ecological unit inventory vegetation subseries. The Coronado National Forest is currently developing its terrestrial ecological unit inventory. The riparian classification system described in this environmental impact statement will be the system adopted by the Coronado National Forest.

Descriptions of potential native vegetation type groups and regional riparian mapping project units that occur on the Coronado National Forest are shown below.

Desert Willow Potential Natural Vegetation Type Group: Desert Willow (RMAP Map Unit 130) is typically found at elevations ranging from 1,300 to 6,900 feet. Other riparian species commonly found in Map Unit 130 are netleaf hackberry and velvet mesquite.

Cottonwood Potential Natural Vegetation Type Group: Fremont Cottonwood-Shrub (RMAP Unit 180) is typically found at elevations ranging from 1,000 to 7,600 feet. Some areas of this map unit are dominated by Goodding's willow (*Salix gooddingii* C.R. Ball) and velvet ash (*Fraxinus velutina*) and have the potential for cottonwood regeneration. Other riparian species commonly found in Map Unit 180 are willow species, box elder, and desert willow. Map Unit 180 also supports a mesquite bosque subtype, mapped as Map Unit 180.6. Lanceleaf cottonwood, which is a hybrid between Fremont cottonwood and narrowleaf cottonwood (*Populus angustifolia*), may occur in place of Fremont cottonwood in some places as this map unit transitions with Map Unit 230 (Narrowleaf Cottonwood/Shrub).

Narrowleaf Cottonwood-Shrub (RMAP Unit 230) is typically found at elevations ranging from 1,900 to 10,000 feet. Other riparian species commonly found in Map Unit 230 include box elder, willow species, Arizona alder, and Arizona walnut. Lanceleaf cottonwood may occur in place of narrowleaf cottonwood in some places as this map unit transitions with Map Unit 180 (Fremont Cottonwood/Shrub).

Sycamore-Fremont Cottonwood (RMAP Unit 270) is typically found at elevations ranging from 1,400 to 7,700 feet. The primary cottonwood species in Map Unit 270 is Fremont cottonwood but includes the occasional incidence of narrowleaf cottonwood. Other riparian species commonly found in Map Unit 270 are box elder, velvet ash, Arizona walnut, and willow species.

Cottonwood-Evergreen Tree Potential Natural Vegetation Type Group: Freemont Cottonwood-Oak (RMAP Unit 170) is typically found at elevations ranging from 2,200 to 7,500 feet. Oak species in this map unit include Emory oak and Sonoran scrub oak. Other riparian species commonly found in Map Unit 170 are Arizona sycamore and velvet ash.

Fremont Cottonwood-Conifer (RMAP Unit 150) is typically found at elevations ranging from 2,100 to 8,800 feet. Other species commonly found in Map Unit 150 are juniper species and velvet mesquite.

Willow-Alder (RMAP Unit 110) is typically found at elevations ranging from 3,330 to 9,900 feet. While both Arizona alder and willow species are indicative of this unit, some areas may contain only one species or the other. Common willow species include red willow (*S. laevigata*) and arroyo willow (*S. lasiolepsis*). Other riparian species commonly found in Map Unit 110 are Arizona walnut, velvet ash, and Rocky Mountain maple (*Acer glabrum*).

Montane Conifer-Willow Potential Natural Vegetation Type Group: Upper Montane Conifer-Willow (RMAP Unit 280) is typically found at elevations ranging from 6,100 to 11,400 feet. Quaking aspen (*Populus tremuloides*) occurrence can range from mere presence to codominance. Conifer species include spruce, subalpine fir, white fir, and Douglas fir. Other riparian species commonly found in Map Unit 280 are thinleaf alder and box elder.

Ponderosa Pine-Willow (RMAP Unit 350) is typically found at elevations ranging from 4,500 to 9,700 feet. Map Unit 350 is typified by an overstory of ponderosa pine with an understory of shrubby willow species. Other riparian species commonly found in Map Unit 350 are Arizona walnut, box elder, and velvet ash.

Walnut-Evergreen Tree Potential Natural Vegetation Type Group: Walnut-Evergreen Tree (RMAP Map Unit 300) is typically found at elevations ranging from 4,000 to 8,300 feet. Map Unit 300 is typically found in central Arizona, southeastern Arizona, and southwestern New Mexico. This highly diverse unit tends to occur in dryer drainages than other riparian types and often also

includes species such as willows, box elder, ponderosa pine, piñon pine, juniper, and various species of oak.

Herbaceous Riparian Potential Natural Vegetation Type Group: Herbaceous Riparian (RMAP Map Unit 190) is typically found at elevations ranging from 2,100 to 13,000 feet. This map unit supports a host of riparian and wetland herbaceous species, and species occurrence varies greatly with elevation and climate. The former Map Unit 200 (Herbaceous Wetland) has been combined with and is now included in Map Unit 190.

Historic Riparian-Agriculture Potential Natural Vegetation Type Group: Historic Riparian-Agriculture (RMAP Map Unit 400) represents areas that historically supported riparian vegetation but that have been altered by anthropogenic disturbances. Current land use is agricultural in nature, including farming and ranching. Ancillary data and historic site potential were used to determine the historic riparian type and the map unit that would have been expected in the absence of anthropogenic disturbance.

Historic Riparian-Residential/Urban Potential Natural Vegetation Type Group: Historic Riparian–Residential (RMAP Map Unit 410) represents areas that historically supported riparian vegetation, but that have been altered by anthropogenic disturbances. Current land use is urban or residential in nature. Ancillary data and historic site potential were used to determine the historic riparian type and the map unit that would have been expected in the absence of anthropogenic disturbance.

Riparian Area Conditions and Trends

Some factors that contribute to conditions and trends in riparian areas are beyond Forest Service control, specifically climate change, border-related activities (including undocumented immigration, smuggling, and consequent law enforcement actions), and water rights held by others. Flooding and fire are natural disturbances that can be influenced but not entirely controlled by management. Flood frequency is controlled largely by precipitation events, although flood size can be affected by human disturbances. Wildfires are not always readily suppressed. During drought conditions, riparian areas are more susceptible to damage from wildfire than under normal conditions. Because of the narrow, linear structure of riparian areas, fire behavior and severity can be influenced by fuels in the vegetation communities on adjacent uplands.

Factors affecting conditions and trends in riparian areas that can be addressed by the Forest Service include motorized vehicle use, managed recreation, unmanaged recreation (especially off-highway vehicle use), prospecting for minerals, water withdrawals, livestock grazing, planned fire ignitions (prescribed fire), and management of some unplanned ignitions. In the past, poorly designed transportation systems and historic overgrazing have damaged some riparian areas and channels on the Coronado. Management changes have been made, and are continuing to be made, to address these situations. Managing recreation to minimize negative impacts has had limited success in riparian areas due to lack of personnel for enforcement, whereas mineral prospecting is generally well controlled to protect riparian areas. Water withdrawals will almost certainly continue, as will fires and floods at unnatural frequency and severity.

In 1993, the Coronado National Forest began using the Southwestern Region Riparian Area Survey and Evaluation System (RASES) (USDA FS 1989). Baseline vegetation data have been collected from riparian areas in all ecosystem management areas. Data include species composition, age classes, tree reproduction, bank protection, canopy cover, and plant vigor. Although the data are sound, evaluating riparian condition using the standards and guidelines in the 1986 forest plan is problematic, because the criteria for desired conditions are defined as percentages of “natural” conditions, which themselves are undefined. In addition, the same criteria are applied to riparian areas that differ greatly in their ecological potential for the particular criteria. Keeping these caveats in mind, 49 percent of 287 transects on all ecosystem management areas met the standard in the 1986 forest plan for species composition, age classes, and reproduction. In some instances, mature and sapling trees have been lost

to the drought that has been ongoing since 1999. The average score for bank protection was 49 percent, which was below the 1986 standard of 60 percent. The average score for canopy closure was 40 percent, which exceeded the standard of 30 percent. Scores for plant vigor in the excellent or good categories were achieved by 68 percent of sites. For the seven ecosystem management areas that have trend data available, the percent of monitoring transects showing upward or stable trends in species composition, age classes, and tree regeneration ranged from 33 to 87 percent. Riparian monitoring on the Coronado is ongoing.

In addition to vegetation parameters, the Riparian Area Survey and Evaluation System method monitors channel morphology and substrate sediment size composition. For channel measures, the general trend across the Coronado is upward or within the expected range of variability. Upward and stable trends in channel conditions are a result of improved management of recreation, prospecting, livestock grazing, and road location and maintenance.

Riparian Areas – Environmental Consequences

Effects Common to All Alternatives

Vegetation treatments that would be permissible under each of the alternatives can have common effects on riparian communities. In some cases, factors outside of Forest Service control, such as unplanned ignitions, may exacerbate effects. Frequent fire occurrence alters reference composition and structure of riparian areas. Wildland fire can have varying impacts to riparian areas based on the timing and frequency. Livestock grazing will continue to be authorized in some riparian areas. Effect will vary with timing, duration, and intensity and include changes in vegetation structure and composition, soil structure, and water infiltration rates.

No Action

Under the no-action alternative, management of riparian areas would continue to be directed by the forestwide and management area goals, objectives, standards, and guidelines in the 1986 forest plan (as amended). Current direction fails to address the following:

- There are no objectives for riparian areas. In particular, there are no quantitative objectives.
- Desired conditions defined as percentages of “natural” conditions, which themselves are undefined, do not reflect current ecological theory and practice that focus on describing states (present and potential), transitions between states, and management actions that can conserve or restore desired states.
- The riparian area classification system (Management Area 7A, wet deciduous and wet coniferous capability types; Management Area 7B, dry desert and dry oak capability types) does not correspond to the regional riparian mapping project riparian vegetation classification system being adopted by the Southwestern Region or the recently initiated Coronado National Forest terrestrial ecological unit inventory survey.

If no action is taken, upland watershed projects would continue under the direction of the 1986 forest plan. Riparian-specific projects would be conducted as opportunities are presented, and best management practices as described in Forest Service Handbook 2509.22 would be implemented to minimize alteration of riparian areas. This would result in continued movement of riparian areas toward desired conditions across the Coronado, with isolated areas of static or downward trends where opportunities to make changes are not available. However, a consequence to riparian environments of the no-action alternative would be slower movement of riparian areas toward desired conditions than under the proposed action, because the no-action alternative has no quantitative objective for treating upland vegetation, soils, or watersheds. Healthy upland vegetation, soils, and watersheds are crucial for maintaining healthy riparian areas. Quantitative objectives provide measureable accomplishment requirements and accountability in achieving them. In addition, damage to riparian areas could occur as a consequence of the no-action alternative because the alternative does not provide specific guidelines: that protect riparian areas from new road construction, that allow livestock grazing only

when there is no deleterious effects to riparian area structure or function, and that require vegetation treatments in riparian areas to retain large-diameter woody debris, snags, and large trees.

If no action is taken, the Coronado National Forest would be locked into an outdated riparian vegetation classification system for the next decade. The current riparian classification system does not correspond with the system recommended at the Forest Service regional level. This would result in inconsistencies in identification of riparian areas, data collection parameters, and condition assessments. Lack of clarity regarding riparian area classification could affect how areas are managed for riparian values and prioritized for protection, restoration, and treatment. The riparian vegetation categories used by the 1986 forest plan are very broad, encompassing multiple ecological sites with differing dominant species and potential vegetation communities, making it inappropriate to apply the same condition standards. Using inappropriately defined or undefined "natural" conditions as the criteria against which to evaluate current riparian conditions could result in confusing or misleading conclusions. For example "dry" riparian areas that do not have the capability to achieve arbitrary criteria for species composition, canopy cover, and channel morphology could be rated incorrectly as "at risk" or "impaired" when they are actually in satisfactory condition given their ecological potential. Resources for protection, restoration, and treatment of riparian areas are limited. A consequence of inaccurate classification or condition assessment to riparian environments could be the allocation of resources to riparian areas that have limited potential to respond and the neglect of areas that do have the potential to respond to protection, restoration, and treatment.

The 1986 plan does not provide resource management direction to develop adaptation and resiliency to the effects of climate change. Thus, in riparian ecosystems, in which vegetation, soils, air, water, and wildlife are integrated components, atypical temperatures and rainfall patterns may cause disturbances such as flooding, decreased water availability, increased threat of wildfire, and increased susceptibility to insects and disease.

Proposed Action

The proposed action includes the following objective that differs from the no-action alternative:

- Treat 2,500 to 10,000 acres of uplands with vegetation treatments or soil and watershed restoration treatments to maintain watershed stability and, thereby, the structure and function of streams, flood plains, and riparian vegetation.

The proposed action also provides these guidelines that are not included in the no-action alternative:

- New road construction in riparian areas should be avoided, except to cross drainages, unless alternate routes have greater overall resource impacts. If these activities are unavoidable, they should be designed and implemented to minimize effects to natural water flow and native vegetation communities.
- Livestock grazing in riparian areas should only be allowed when there are no significant deleterious effects to riparian area structure or function.
- Vegetation treatments in riparian areas should favor the retention of large diameter woody debris in and near stream channels.
- Vegetation treatments should favor the retention of snags and growth of large riparian trees.

Desired riparian area condition descriptions in the proposed action include the following:

- Channels and their adjacent flood plains are capable of filtering sediment, capturing bedload, aiding flood plain development, improving floodwater retention, and increasing groundwater recharge.
- Vegetation and root masses stabilize streambanks against the cutting action of water currents.
- All vegetation is native.
- The ecological condition of riparian areas is resilient to animal and human use.

- Tree canopy cover is between 30 and 100 percent.
- Soil along streambanks is stabilized by vegetation, gravel, rocks, boulders, and bedrock such that 60 to 100 percent of the bank is protected.
- Where water is perennial, streamflows and water quality characteristics (as described in the desired conditions for natural water sources) support aquatic wildlife. Native fish and other aquatic species are present, and habitat conditions are capable of providing self-sustaining populations.
- Native fish and amphibian populations are free from or minimally impacted by nonnative predation and diseases.
- Habitat and ecological conditions are capable of providing self-sustaining populations of native, riparian-dependent plant and animal species.
- Fire burns only rarely through this vegetation type, and fire in surrounding watersheds causes minimal erosion and channel modification.

Movement of riparian areas toward desired conditions would proceed more rapidly under the proposed action than the no-action alternative because the proposed action includes a quantitative objective for treating 2,500 to 10,000 acres of upland vegetation, soils, or watersheds to maintain watershed stability, the structure and function of streams and flood plains, and riparian vegetation. Upland conditions are critically important for their effects on water quality, soil erosion, disturbance regimes, and the health and vigor of riparian vegetative communities. By requiring a quantitative standard, treatment of uplands would assume a priority status that is lacking in the no-action alternative. The consequence to riparian environments would be improvements in riparian qualities affected by upland watersheds, such as reduced soil erosion and sedimentation and enhanced water quality and water table recharge.

The proposed action also has guidelines that are absent from the no-action alternative that address new road construction in riparian areas, thinning and fire management projects, and livestock grazing to protect riparian ecosystems while accommodating legitimate multiple uses.

Under the proposed action, the Coronado would adopt the regional riparian mapping project riparian vegetation classification system that corresponds with the system recommended at the Forest Service regional level. This would result in consist identification of riparian areas, data collection parameters, and condition assessments. Clarity regarding riparian area classification would enable the Forest Service to better manage riparian values and prioritize riparian areas for protection, restoration, and treatment.

The riparian vegetation categories under the proposed action would be clearly defined with respect to ecological sites with unique dominant species and potential vegetation communities, making it appropriate to apply the same condition standards. Criteria for evaluating riparian conditions would be specific to the vegetation community and consistent with regional protocols and the capability of the site to achieve desired species composition, canopy cover, and channel morphology, lending accuracy and credibility to condition ratings within the context of their ecological potential. Desired riparian conditions would be described in terms of structure and function with respect to vegetation, stream characteristics, and wildlife habitat. A consequence for the riparian environment would be the most effective allocation of resources to riparian areas most capable of responding to protection, restoration, and treatment.

Four areas would be recommended for wilderness designation under the proposed action: the Mount Graham Wilderness Study Area, Ku Chish, Whetstone, and Chiricahua Addition North. Combined, these areas include approximately 382 acres of riparian vegetation. Approximately 76 acres of riparian area identified by RMAP are found in the Ku Chish area, primarily in Wood Canyon. The Ku Chish area is currently grazed under the Rough Mountain Allotment and would continue to be grazed under wilderness designation. According to the regional riparian mapping project, riparian communities also occur across approximately 24 acres of Chiricahua Addition North, and seven acres of Mount Graham

recommended wilderness areas. The Whetstone area contains no riparian vegetation according to regional riparian mapping project. The need for watershed or riparian improvement or restoration projects, whether for management of grazing, fuels, recreation, or other purposes, would be evaluated on a site-specific basis and, if possible, would be accomplished within the constraints that apply to wilderness areas, such as no mechanized or motorized equipment. If improvement or restoration projects were needed, more time and possibly greater expense could be required for implementation because of the additional paperwork and less time-efficient methods approved for wilderness areas. However, these constraints can be lifted if a minimum requirements decision analysis[24] determines that the benefits of the prohibited activity outweigh or justify trammeling in wilderness. The effects of recommending the four areas as wilderness under the proposed action would be similar to those described under alternative 1 (page 100 and below) except that fewer acres would be affected.

Management of areas for wilderness character is generally consistent with the desired conditions regarding the preservation of natural landscapes and the reduction of ground disturbance and other intrusions. Road construction, vehicular traffic, recreational development, mining exploration, and other uses that are permitted on the Coronado National Forest outside of wilderness can damage riparian areas. A consequence for riparian environments of wilderness designation under the proposed action, which is not included in the no-action alternative, would be to protect riparian areas from degradation arising from these intensive uses.

The revised forest plan under the proposed action provides resource management direction to develop resource adaptation and resiliency to the effects of climate change. Thus, negative effects described under the “No Action” heading above would be better managed, and the health and vigor of riparian resources would be sustained.

Alternative 1

Alternative 1 incorporates all the components of the proposed action and recommends the designation of 16 additional wilderness areas. The consequences of implementing alternative 1 would include those listed for the proposed action along with additional effects associated with recommended wilderness areas in the Chiricahua, Dragoon, Galiuro, Peloncillo, Pinaleño, Santa Rita, Santa Teresa, Tumacacori, Whetstone, and Winchester Mountains. There are no regional riparian mapping project riparian areas in the Chiricahua Addition West Potential Wilderness Area, Whitmire Canyon Potential Wilderness Area in the Peloncillo Mountains, Mount Fagan Potential Wilderness Area in the Santa Rita Mountains, Santa Teresa Addition North Potential Wilderness Area, and Whetstone Potential Wilderness Area. Therefore, there would be no effects on riparian areas of designating these recommended wilderness areas.

The regional riparian mapping project (RMAP) does show riparian areas in the other proposed wilderness areas (Dragoon, Chiricahua Addition North, Jhus Canyon in the Chiricahua Mountains, Galiuro Addition, Bunk Robinson in the Peloncillo Mountains, Mount Graham in the Pinaleño Mountains, Mount Wrightson Addition in the Santa Rita Mountains, Santa Teresa Addition South, and Tumacacori). Acres of potentially effected riparian areas in these proposed wilderness areas are shown in table 58.

Currently, all of the recommended wilderness areas are grazed and would continue to be grazed under wilderness designation. The need for watershed or riparian improvement or restoration projects, whether for management of grazing, fuels, recreation, or other purposes, would be evaluated on a site-specific basis and, if possible, would be accomplished within the constraints that apply to wilderness areas (such as no mechanized or motorized equipment). If improvement or restoration projects were needed, more time and possibly greater expense could be required for implementation because of the additional paperwork and less time-efficient methods approved for wilderness areas. However, these

[24] Limitations on management actions within wilderness areas may be temporarily lifted if minimum requirements decision analysis determines the action both necessary and the minimum required to complete the work.

constraints could be lifted if a minimum requirements decision analysis determined that the benefits of the prohibited activity outweighed or justified trammeling in wilderness.

Table 58. Acres of riparian area (as designated by the RMAP) in wilderness areas recommended by alternative 1 listed by ecological management area

Ecosystem Management Area	Recommended Wilderness	Riparian Acres
Chiricahua	Ku Chish	121
Chiricahua	Chiricahua Addition North plus Jhus Canyon	175
Dragoon	Dragoon	147
Galiuro	Galiuro Addition	1
Peloncillo	Bunk Robinson	4
Pinaleño	Mount Graham Recommended Wilderness Area	27
Santa Rita	Mount Wrightson Addition	114
Santa Teresa	Santa Teresa Addition South	0
Tumacacori	Tumacacori	103
	Total Acres	692

Management of areas for wilderness character is generally consistent with desired conditions regarding the preservation of natural landscapes and the reduction of ground disturbance and other intrusions. Road construction, vehicle traffic, recreational development, mining exploration, and other uses that are permitted on the Coronado outside of wilderness can damage riparian areas, and wilderness designation could help protect riparian areas from degradation arising from these intensive uses. Alternative 1 would offer this protection to 842 riparian acres in recommended wilderness areas, whereas the proposed action would include only 324 acres of riparian vegetation.

Because alternative 1 includes the same direction as the proposed action with regard to climate change, the benefits to riparian resources would be the same (see “Proposed Action” discussion above).

Alternative 2

The consequences of implementing alternative 2 would include those listed for the proposed action along with additional localized effects on approximately 31 acres of riparian area included in the proposed Motorized Recreation Land Use Zone under alternative 2. By comparison, approximately 14 acres of riparian are included in the Motorized Recreation Land Use Zone under the proposed action and alternative 1 (table 32). Under alternative 2, riparian areas in the Motorized Recreation Land Use Zone occur in the Santa Catalina, Huachuca, Santa Rita, and Pinaleño Mountains. With alternative 2, there is potential for off-highway vehicle trails and other facilities to be built in riparian areas in support of motorized recreation, which would result in a net loss of this community on the Coronado.

In addition to localized effects, vegetation removal and soil compaction would likely extend beyond the footprint created by construction of facilities in the Motorized Recreation Land Use Zone and associated roads. There could also be effects downstream of the sites due to the significant disturbance expected from off-road vehicle use within the Motorized Recreation Land Use Zone, including increased erosion, sedimentation, changes to channel morphology, and increased risk of invasive plants.

On the other hand, an officially designated land use zone for motorized recreation could direct off-road activities to the land use zone and away from other riparian areas that are currently being used, in some cases with very significant effects on riparian vegetation, animals, soils, and channel

morphology, if there were enough personnel to effectively control motorized recreation outside the land use zone.

Alternative 2 provides limited direction with regard to climate change. The strategies in appendix A of the plan guide management of forest resources to develop resiliency and adaptation to natural disturbances resulting from climate change (see "Proposed Action" discussion). However, alternative 2 does not include plan components specific to climate change. Thus, this alternative is less effective than the proposed action and alternative 1 in sustaining riparian resources during climate change and slightly more effective than no action.

Cumulative Effects – Effects Common to All Alternatives

The multiple uses allowed in riparian areas on the Coronado and their associated uplands, coupled with factors outside the Forest Service's control, could result in cumulative effects beyond those of one activity. Climate change is predicted by many models to create warmer and drier conditions in the Southwest in future decades. This could increase evapotranspiration rates in both upland and riparian areas and lower water tables in riparian areas, affecting instream flows and perennial pools. Loss of perennial above or below groundwater could cause vegetation communities to transition to more dry-adapted species. Drought could reduce upland ground cover in grasslands or increase wildfires in forests and, thereby, increase erosion and sedimentation in streams. All of these effects could reduce wildlife habitat, especially for aquatic species. Stressed riparian vegetation could become more vulnerable to disturbance such as off-road vehicles, recreation, and livestock grazing. A riparian area impacted by a single disturbance (for example off-road vehicle use) might be able recover but lack the resilience to recover from multiple disturbances (such as off-road vehicle use during drought or accompanied by livestock grazing).

Many riparian areas on the Coronado share watersheds with, or originate in upstream reaches on, adjoining jurisdictions, including private lands, other agencies, and municipalities. Management on these watersheds and upstream reaches can have direct and profound effects on riparian areas on the Coronado. Off-road vehicle use, mining, recreation, grazing, fires, and invasive plants and animals may occur on watersheds and upstream reaches outside the Coronado that impact adjacent riparian areas on the national forest. These activities could contribute to increased erosion and sedimentation, altered channel morphology, and invasion of nonnative species in riparian areas on the Coronado. The environmental consequences to forest riparian areas could include degraded riparian conditions and reduced habitat for wildlife, especially aquatic species. Cumulative effects of off-forest activities, coupled with multiple uses in Coronado National Forest riparian areas and factors beyond the Forest Service's control such as climate change and drought, could result in greater degradation than any one factor alone.

Cumulative Effects of No Action

The cumulative effects to riparian areas arising from multiple uses on the Coronado, factors outside of forest control, such as climate change and drought, and activities on adjoining jurisdictions are similar for all the alternatives. However, the no-action alternative is not well suited to anticipating or mitigating cumulative effects because it lacks quantitative objectives for treating upland vegetation, soils, or watersheds, and appropriate criteria for classifying and monitoring riparian areas.

Cumulative Effects of Proposed Action

Although possible cumulative effects in riparian areas for the proposed action and the no-action alternative are similar, the proposed action is better suited to anticipating and mitigating cumulative effects than the no-action alternative because it includes quantitative objectives for treating upland vegetation, soils, or watersheds, and appropriate criteria for classifying and monitoring riparian areas. In addition, guidelines and desired conditions in the proposed action focus on managing activities in riparian areas for resilience and sustainability with emphasis on their value for wildlife habitat and maintaining flood plain and channel function.

Cumulative Effects of Alternative 1

The potential cumulative effects described for all the alternatives apply to alternative 1 for the Coronado overall, but might be reduced in the 16 additional wilderness areas proposed in alternative 1. Effects outside of the Forest Service's control such as climate change, drought, and the activities of other jurisdictions and their consequences for riparian health and wildlife habitat would remain the same in the proposed wilderness areas. Cumulative effects from activities under the Forest Service's control, such as roads, off-road vehicles, and developed recreation, would be reduced in the proposed wilderness areas.

Cumulative Effects of Alternative 2

The cumulative effects for alternative 2 are the same as those described for all the alternatives, except within the Motorized Recreation Land Use Zone proposed under alternative 2 and possibly riparian areas downstream from the Motorized Recreation Land Use Zone. The effects of off-road vehicles on 31 acres of riparian area within the proposed Motorized Recreation Land Use Zone would likely exceed those of the described cumulative effects. However, there could be additional cumulative effects downstream due to the significant disturbance expected from off-road vehicle use within the Motorized Recreation Land Use Zone, including increased erosion, sedimentation, changes to channel morphology, and increased risk of invasive plants. The environmental consequences of alternative 2 could increase downstream riparian degradation and loss of wildlife habitat.

Vegetation Communities, Fuels and Fire – Cumulative Effects

The cumulative effects spatial boundary for the vegetation and fire analysis was defined by the Bailey's (1983) ecological sections and ecoregion provinces represented on the Coronado and located within Arizona, New Mexico, and the country of Mexico.

Ecoregion provinces are defined by continental weather patterns such as length of dry season and duration of cold temperatures as well as similar soil orders (USDA FS 2009b). Sections are a subdivision of provinces. Ecological sections describe broad areas of similar subregional climate, geomorphic process, stratigraphy, geologic origin, topography, and drainage networks (USDA FS 2009b). Figure 3 shows the majority of the Coronado is represented by the Chihuahuan Desert-Basin and Range Section, with a very small portion (less than 1 percent) occupying the Sonoran Desert Section. Within the cumulative effects boundary, the remaining lands are owned or managed by other national forests, the states of Arizona and New Mexico, Bureau of Land Management, National Park Service, Department of Defense, country of Mexico, several tribes, and numerous private entities.

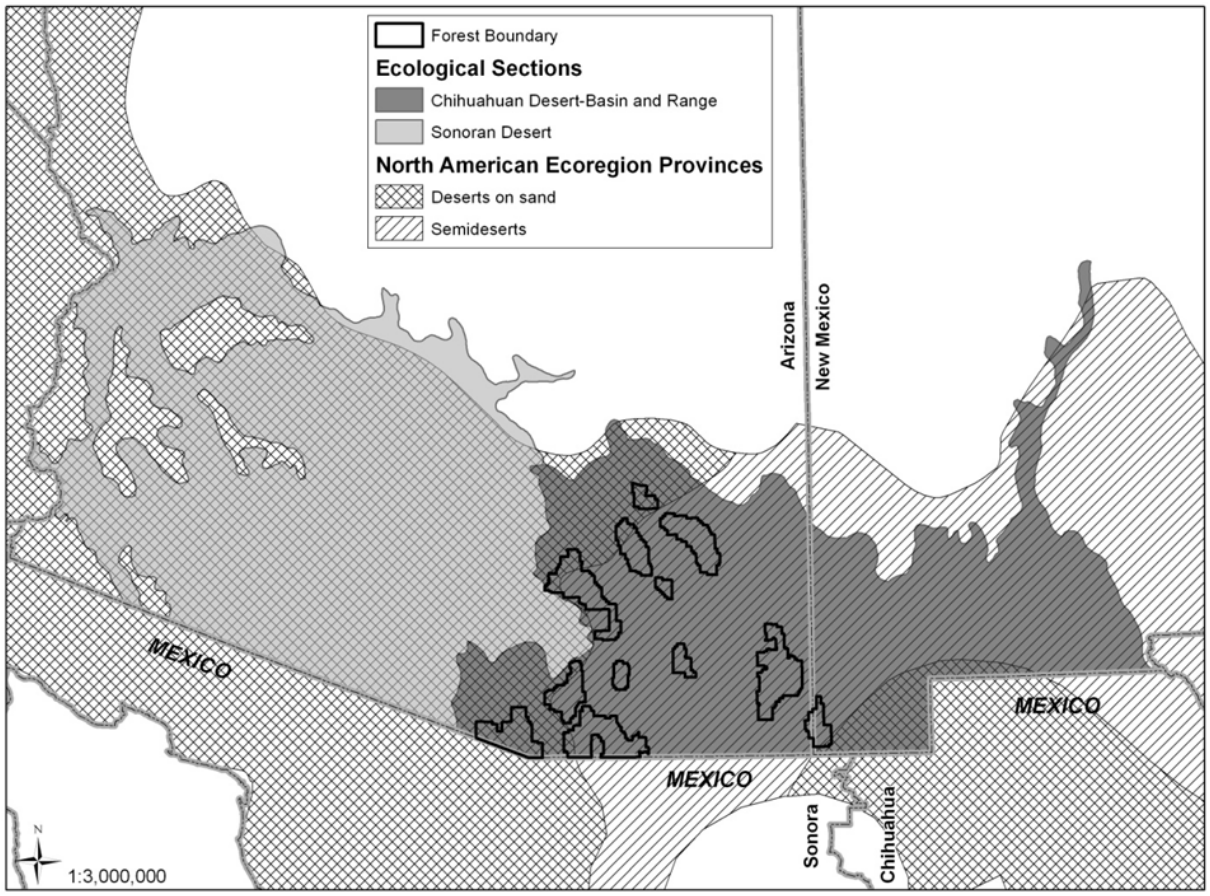

Figure 3. The ecological sections (Bailey 1983) and North American provinces represented on the Coronado and considered for the cumulative effects analysis

Table 59. The acreage and percentage on the Coronado National Forest and the spatial contribution to Bailey's ecological sections

Bailey's Ecoregion Sections	Total Acres of Section	Portion Within the Coronado National Forest			
		Acres	Percent of Section	Percent of Section in Arizona	Percent of Section in New Mexico
Chihuahuan Desert-Basin and Range	15,645,569	1,772,417	11.3%	18.4%	1.1%
Sonoran Desert	17,526,383	1,329	0.01%	0.01%	0.0%

The North American ecoregion provinces span both the United States and Mexico. Within the states of Arizona, New Mexico, Sonora, and Chihuahua, the Coronado contributes to almost 4 percent of the Semideserts Province and less than 1 percent of the Deserts on Sand Province (table 60). The combined states of Sonora and Chihuahua contain almost 70 percent and 25 percent of the Deserts on Sand and Semideserts Provinces, respectively. The small proportion of each province represented on the Coronado and the large proportion of these provinces located in Sonora and Chihuahua means that the contribution of the Coronado to the sustainability of the ecological communities and processes within the Desert on Sand and Semideserts Provinces is limited.

Table 60. The acreage and percentage on the Coronado National Forest and the spatial contribution to Bailey's ecoregion provinces

Bailey's North America Ecoregion Province	Total Acres of Province (AZ, NM, Sonora, Chihuahua)	Portion Within the Coronado National Forest			
		Acres	Percent of Province	Percent of Province in Arizona	Percent of Province in New Mexico
Deserts on Sand	89,848,752	428,519	< 1%	< 1%	< 1%
Semideserts	35,347,019	1,355,191	3.8%	3.6%	< 1%

The temporal boundary used for the vegetation and fire cumulative effects analysis includes 10 years in the past and 10 years in the future. However, some discussion will include effects since the approval of the 1986 forest plan. In effect, the temporal boundary spans 20 years, from 2002 to 2022.

Activities on Adjacent Land Ownerships and Management Entities

Activities on other land ownerships within these provinces and sections also contribute to the conditions of ecological communities and processes. Table 61 includes information considered in this cumulative effects analysis about the management of other land ownerships, specifically their activities that are likely to occur over the next 10 years.

There is limited information available on land management plans and resource accomplishments in Mexico. The few plans and projects listed in table 61 are a small representation of the land management activities in Mexico. However, as the Coronado has little influence on the provinces and associated vegetation communities that span Mexico, the limited information may not be a significant deficit in the cumulative effects analysis.

Table 61. Management plans for other lands considered in cumulative effects for vegetation and fire

Plan	Description and Relevant Effects	Effects Timeframe	Relevant Measure(s)
Arizona Forest Resource Strategy (2010)	Restoring declining ecosystems and protecting healthy ones to ensure the nation's lands are resilient to threats and impacts, including climate change.	Current	Amount of declining ecosystems restored and healthy ecosystems protected.
Community Wildfire Protection Plans (CWPP): Arivaca/Sasabe, Catalina, Cascabel, Graham County, Mt. Lemmon, Pinal County, Sonoita/Elgin	The overarching goals of CWPPs adjacent to the Coronado include: • Improve fire prevention and suppression, emphasizing firefighter and public safety. • Reduce hazardous fuels, emphasizing public and private property protection. • Restore forest, rangeland, and riparian health. • Promote community involvement and provide for community protection.	Current and under revision	Amount of threats to property and ecosystem health reduced in Chihuahuan Desert-Basin and Range.

Plan	Description and Relevant Effects	Effects Timeframe	Relevant Measure(s)
Southern Arizona Buffelgrass Strategic Plan (2008)	The strategic plan identifies five key strategies that provide the framework for successfully managing buffelgrass infestations within the region: • Minimize spread in areas where buffelgrass has not yet become established. • Set and implement control priorities based on actual and potential impacts. • Restore treated areas in ways that increase resilience against future invasion. • Mitigate wildfire risks to life and property in areas where control is no longer feasible. • Motivate legislation aimed at sustaining the control effort.	Current	Amount of threats to property and ecosystem health reduced
Saguaro National Park General Management Plan (2008), Fire Management Plan (2007	Fire and fuels management goals (not all inclusive): • Manage fire to minimize threats of unacceptable effects of fire to property outside the park and sensitive cultural and natural resources. • Restore and maintain fire-adapted ecosystems through the ecologically appropriate use of fire.	Current	Amount of declining ecosystems restored and healthy ecosystems protected.
Fort Huachuca Integrated Resource Management Plan (U.S. Department of Defense 2001) Fort Huachuca Integrated Wildland Fire Management Plan (2006)	These plans include the following goals: • Protecting life, property, military training, natural resources, and historic properties from uncontrollable wildfires; • Using prescribed fire to accomplish fuel reduction and improvement of ecological conditions and habitats; and • Managing fire to benefit natural resources and ecosystems outside of human settlements.	Current	Amount of threats to property and ecosystem health reduced in Chihuahuan Desert-Basin and Range

Plan	Description and Relevant Effects	Effects Timeframe	Relevant Measure(s)
Chiricahua National Monument General Management Plan (2001), Fire Management Plan (2005)	Fire and fuels management options: • Appropriate management response (suppression) is applied around high visitor use, developed areas, certain sensitive resources needing protection, and when wildfire use is not feasible or safe. • Prescribed fire is used to reduce fuels in high-risk areas and accomplish ecological goals. • Wildland fire use allows natural ignitions to burn when they meet predetermined prescriptions related to safety and ecological goals. • Nonfire applications—most notably thinning and herbicides—are treatments that are used instead of prescribed burning in areas where fire is inherently unsafe or undesirable given current fuels conditions.	Current	Amount of declining ecosystems restored and healthy ecosystems protected in Chihuahuan Desert-Basin and Range
Adjacent National Forests - Revised Forest Plans	Guidance documents have been developed by the Southwestern Regional Office (R3) revision team to provide regional consistency for ongoing land management plan revisions. (The Apache-Sitgreaves, Coconino, Coronado, Kaibab, and Prescott National Forests are currently in plan revision under the 1982 Planning Rule provisions.) Local variation, specific to each planning effort is allowed, subject to consistency with best science and review by the revision team.	Current and under revision	Amount of threats to ecosystem health reduced and ecological function and resiliency restored.
Bureau of Land Management	Arizona strategic goals for sustainability include: • Water – Living rivers preserve and enhance healthy vegetation, wildlife, and growing communities. • Ecological Function – Enhanced ecological conditions support healthy plant and wildlife communities. • Working Landscapes –Best multiple-use management practices enhance resource values.	Current	Amount of ecological function and resiliency restored.
Native American Tribes – Integrated Resource Management Plans	Forest management plans appear in many forms, reflect many different approaches, and vary tremendously in their content, depth, and coverage. This diversity is appropriate in so far as it is necessary to serve specific tribal goals, but makes monitoring and comparison of plans and their implementation more difficult (IFMAT, 2003).	Current and under revision	Amount of threats to ecosystem health reduced and ecological function and resiliency restored.

Plan	Description and Relevant Effects	Effects Timeframe	Relevant Measure(s)
Fish and Wildlife Service - Strategic Plan	The U.S. Fish and Wildlife Service's (USFWS) mission is, working with others, to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. USFWS recognizes that fish and wildlife conservation is based on not only intervention to protect individual species but also intervention to protect, enhance, or restore habitat upon which these species depend for survival.	Current (individual species recovery plans may be under revision)	Amount of habitat protected and restored.
Pinal County Comprehensive Plan (2009)	Natural environment goals: • Develop a connected system of open space areas that protect and conserve natural, physical, and social resources. • Strive to eliminate the fragmentation of wildlife habitat and support efforts to maintain or restore connectivity among habitats. • Promote practices that prevent the introduction and spread of invasive species.	Current	Amount of threats to ecosystem health reduced, open space preserved, and habitat protected and restored.
Cochise County Comprehensive Plan (as amended 2015)	Plan goals: • Land use element: Development should occur in a manner that preserves open space, agricultural and ranching resources, and existing historical sites which may include: wildlife corridors; hydrologic recharge areas; floodplains; geologic features; historic, archaeological, or cultural resources; or arable soils. • Water conservation and resources element: Sustain an adequate, safe water supply through water conservation measures, incentive programs, education, conservation and enhancement of natural recharge areas, and cooperative, multi-jurisdictional planning. • Adequate facilities and services element: Facilities for sewage disposal, water service, fire protection, streets, and utilities should be commensurate with the growth area classification and the intensity of proposed development.	Current	Amount of ecological function protected/restored in Chihuahuan Desert-Basin and Range

Plan	Description and Relevant Effects	Effects Timeframe	Relevant Measure(s)
Graham County Comprehensive Pan (2004)	Policy statement for forest/rangeland management: That existing and proposed forest management plans include activities such as timber salvaging, prescribed burning, and fuelwood cutting to effectively improve forest health, protect human lives, and reduce risk of catastrophic fires having the potential to create waste lands taking decades to recover.	Current	Amount of threats to property and ecosystem health reduced and ecological function and resiliency restored Chihuahuan Desert-Basin and Range
Santa Cruz County Comprehensive Plan(2007)	Environmental/Open Space Goals: • Open space and natural terrain remain dominant features of the landscape and view sheds are protected. • Land uses will contribute to the protection of national and state parks, conservation areas, preserves, and other special natural resource areas. • Wildlife habitat and wildlife movement corridors are recognized and preserved using established and innovative land use management tools.	Current	Amount of open space preserved and habitat and ecosystem health protected in Chihuahuan Desert-Basin and Range
Pima County Multi-species Conservation Plan (MSCP 2010)	MSCP Land and Resource Management Objectives: • Ensure the long-term viability and sustainability of native ecosystem structure and function and natural processes • Protect the biological resources from threats and other disturbance activities • Enhance and restore conservation targets in appropriate locations to improve habitat for covered species.	Current and under revision	Amount of threats to ecosystem health reduced, ecological function and resiliency restored, and habitat restored.
Hidalgo County Comprehensive Plan (2011)	Land and Water goals: • Goal 2: Promote, protect, and restore the open spaces and natural resources such as rivers, riparian areas, flood plains, wildlife habitats, forests and grasslands, and migration corridors. Hazard Mitigation goals: • Goal 1: reduce potential loss of life and damage to existing community assets, including structures, critical facilities, and infrastructure from all emergencies, including natural and human-caused hazards such as wildfires, flooding, drought, severe weather, earthquakes, and contaminants.	Current	Amount of open space preserved, habitat protected or restored, and amount of ecosystem health and property protected in Chihuahuan Desert-Basin and Range

Plan	Description and Relevant Effects	Effects Timeframe	Relevant Measure(s)
Coronado Memorial GMP (2004), Fire Management Plan (2005)	Fire and fuels management goals (not all inclusive): • Manage fire to minimize threats of unacceptable effects of fire to sensitive cultural and natural resources and properties within and outside the memorial. • Implement a program in the future to use prescribed burning and hazard fuels reduction to restore natural fuel loadings.	Current	Amount of declining ecosystems restored and amount of healthy ecosystems protected in Chihuahuan Desert-Basin and Range
Mexico Emergency Mutual Assistance Operating Plan (2011)	Reduce the loss of resources caused by wildfires or other causes within the zone of mutual assistance along the U.S.-Mexican border.	Current	Amount of ecosystem health and property protected
The Ministry of Environment and Natural Resources (Secretaria de Medio Ambiente y Recusos Naturales or SEMARNAT)	Main Purpose Statement: Promote the protection, restoration, and conservation of ecosystems and natural resources, as well as environmental goods and services, in order to promote their sustainable use and development.	Current	Amount of ecosystems protected and restored

Summary of Cumulative Effects

The majority of both Chihuahuan Desert-Basin and Range and Sonoran Desert Sections are managed by Federal agencies, which include the Forest Service, National Park Service, Bureau of Land Management, Department of Defense, and U.S. Fish and Wildlife Service. Table 62 summarizes the proportion of land ownership within the United States portion of the cumulative effects boundary. Other nearby Federal, State, and local jurisdictions share similar strategic goals with respect to fostering collaboration and ecosystem health. This includes promoting the natural role of fire in fire-adapted ecosystems, resiliency to climate change, and protection of wildlife habitat.

Table 62. Proportion under Federal, State, private, and tribal ownership within the cumulative effects boundary in Arizona and New Mexico

Federal	State	Private	Tribal
43%	21%	24%	12%

The first 10 years of the 1986 forest plan on the Coronado and surrounding national forests was driven much more by the production of forest products, and they were managed largely by using even-aged silvicultural methods, such as shelterwood and seed tree cuts. Although commercial timber harvest played a diminished role on the Coronado when compared to other national forests within the region, the legacy of this approach is reduced structural diversity and a general deficit of large and old trees. Other past management actions that are common on Department of the Interior and National Forest System lands that are still contributing to effects today include fire suppression (over several decades) and the lack of thinning in the sapling, small, and medium diameter classes. These actions have led to a surplus of trees that would likely continue to dominate untreated acres for several more decades.

From 2003 to 2011, the majority of acres treated by the Department of the Interior and Forest Service were primarily density reduction treatments that focused on lowering fuel hazard and resulted in maintaining the landscape's even-aged structure, which does not contribute to moving the forested landscape toward desired conditions of open and uneven-aged structure. Table 63 and table 64 display

the fuels treatments completed by Department of the Interior agencies and the Forest Service in Arizona and New Mexico. Past vegetation growth, trends, previous management and disturbance patterns, and annual weather patterns have contributed to the current vegetative composition, structure, densities, and conditions present today.

Table 63. Average yearly fuels treatment accomplishments by Department of the Interior agencies and Forest Service within the State of Arizona from 2003 to 2011

Agency	Wildland-Urban Interface			Other - Outside Wildland-Urban Interface		
	Fire	Mechanical	Total	Fire	Mechanical	Total
BIA	5,280	11,345	16,625	23,359	5,051	28,410
BLM	1,851	2,595	4,446	11,392	1,891	13,283
USFWS	3,262	95	3,357	5,831	511	6,342
NPS	1,820	345	2,165	7,353	508	7,861
USFS	35,184	29,503	64,687	51,140	14,948	66,088
Total	47,397	43,883	91,280	99,075	22,909	121,984
Average total planned fire ignition treatments per year (2003-2011)						146,472
Average total mechanical treatments per year (2003-2011)						66,792
Total						213,264

Source: http://www.forestsandrangelands.gov/resources/reports/

BIA = Bureau of Indian Affairs; BLM = Bureau of Land Management; USFWS = U.S. Fish and Wildlife Service; NPS = National Park Service; USFS = U.S. Forest Service

Table 64. Average yearly fuels treatment accomplishments by Department of the Interior agencies and Forest Service within the State of New Mexico from 2003 to 2011

Agency	Wildland-Urban Interface			Other - Outside Wildland-Urban Interface		
	Fire	Mechanical	Total	Fire	Mechanical	Total
BIA	18,631	99,354	117,985	64,882	123,315	188,197
BLM	34,479	32,808	67,287	187,784	23,118	210,902
USFWS	0	0	0	0	0	0
NPS	28,865	3,317	32,182	88,219	2,226	90,445
USFS	14,842	12,644	27,486	19,420	5,178	24,598
Total	142,620	139,573	282,193	307,550	69,842	377,392
Average total planned fire ignition treatments per year (2003-2011)						100,810
Average total mechanical treatments per year (2003-2011)						56,819
Total						157,630

Source: http://www.forestsandrangelands.gov/resources/reports/

BIA = Bureau of Indian Affairs; BLM = Bureau of Land Management; USFWS = U.S. Fish and Wildlife Service; NPS = National Park Service; USFS = U.S. Forest Service

Recently agencies have shifted toward managing natural ignitions to achieve desired land and resource management plan objectives, but this change has only gained momentum in the last 5 years and has yet to make a difference in landscape-scale effects. The 1996 forest plan amendment on all national forests in the Southwestern Region shifted national forests' timber harvest strategy to the use of more uneven-aged silvicultural systems, such as individual tree and group selection. Additionally, old-growth management was implemented in the same amendment and promoted the development and maintenance of old growth and large trees, snags, and downed woody debris across National

Forest System lands. The use of "maintenance" prescribed burning has been analyzed in most vegetation treatment environmental analyses, allowing for increased reintroduction of fire into the fire-adapted vegetation communities. The rate of implementing these changes in Forest Service management and similar shifts in silvicultural methods on other Federal lands have been slowly increasing since 1996 and have begun to shift the static trend of the previous period toward desired conditions.

Within the cumulative effects boundary (U.S. portion), the States of New Mexico and Arizona manage 21 percent of the land. Overall, there is strong alignment between the Federal and State strategic plans, and the Arizona Forest Resource Strategy (2010). Some of the common themes are: (1) using a science-based approach, (2) collaboratively solving forest issues, (3) engaging tribal governments in natural resource management, and (4) restoring declining ecosystems and protecting healthy ones to ensure the Nation's lands are resilient to threats and impacts, including climate change. The Arizona State Forestry Division completed approximately 14,000 acres of fuels treatments from 2002 to 2011.

Arizona State Land Department works closely with the state and private forestry branch of the Forest Service to secure funding to protect communities from wildfire, assist private forest land owners, promote healthy forest practices, and assist communities with their urban forests. Many communities adjacent to the Coronado have developed community wildfire protection plans for this purpose. From 2007 to 2011, about 676 acres of lands next to the Coronado were treated. Fuels reduction and restoration of vegetation composition and structure proposed under the revised plan will complement the activities proposed under community wildfire protection plans to contribute to the protection of the wildland-urban interface and the overall health of the ecological communities in the region.

The National Park Service is making some progress toward restoring degraded and at-risk vegetation communities, but their plan language is less specific and doesn't give a good indication of how their future actions would affect vegetation structure and composition in relation to restoring reference conditions on lands that they manage. The Park Service does promote the restoration of fire-adapted ecosystems contributing to the overall health of the shared vegetation communities proposed for treatment under the revised forest plan.

The U.S. Fish and Wildlife Service protects and restores habitat for fish, wildlife, and plants. In the San Bernardino, Leslie Canyon, and Buenos Aires National Wildlife Refuges, this takes on the form of riparian vegetation and grassland management. The U.S. Fish and Wildlife Service activities would increase the beneficial effects to species diversity and ecosystem restoration proposed under the revised plan objectives for the desert grassland and riparian vegetation communities.

The Bureau of Land Management provides wildland firefighting for resource protection, as well as using fire as a management tool to improve the health of the land. In managing livestock grazing on public rangelands, the overall objective of the Bureau of Land Management is to ensure the long-term health and productivity of these lands and to create multiple environmental benefits that result from healthy watersheds. Treatment objectives in the revised plan would complement Bureau of Land Management objectives by contributing to the restoration of fire-adapted ecosystems, improving species diversity, as well as watershed protection.

Fort Huachuca (Department of Defense) also has a management plan that supports fuels reduction and ecosystem restoration. Vegetation treatments on Fort Huachuca are often accomplished in collaboration with the Coronado and with help from Forest Service employees. A total of 20,886 acres have been successfully treated with planned ignitions on Fort Huachuca over the past 7 years. Proposed treatments on Forest Service land would enlarge the overall areas treated by the Fort Huachuca and maximize the associated resource protection and restoration objectives.

Of the six counties represented on the Coronado, only Graham County has adopted a plan that specifically supports vegetation management to achieve ecosystem health and restoration. Even then, Graham County focuses on fire risk reduction. Pima County has implemented a multispecies conservation plan that promotes the long-term viability and sustainability of native ecosystem

structure and function, yet does not specifically support vegetation management to achieve these goals. The remaining counties have plans that support the goals of the Coronado revised forest plan and include provisions such as the preservation of open space, the protection of wildlife habitat, and the promotion of ecosystem health and sustainability. However, the majority of the counties have not yet made the shift toward considering these issues as a part of the need to manage vegetation composition, structure, and function through fire and other management tools to move the landscape toward reference conditions. As a result, their plans would not contribute as much toward the trend of restoring ecological structure and function in vegetation communities as the actions of Federal agencies, Graham County, and the State of Arizona.

A recent mining claim from Rosemont Copper would impact the vegetation communities on the Coronado through the direct removal of vegetation. This would decrease the ability of the Coronado to support and sustain the ecological communities in the immediate vicinity of the proposed claim.

Mexico manages some 71 million acres in the cumulative effects boundary. Mexico and the United States mutually manage fires that cross the international border into Mexico. To date, fire occurrence along the international border has been human caused and, therefore, required a suppression response. Natural ignitions have yet to be managed in the border area, but having the mutual agreement will support the revised plan objectives to restore fire-adapted ecosystems across the landscape. Within Mexico, the Ministry of Environment and Natural Resources promotes the protection, restoration, and conservation of ecosystems and natural resources.

The no-action alternative would have similar cumulative effects as the proposed action, as vegetation treatments would continue, although at slower rates due to current treatment levels. Alternative 1 and 2 cumulative effects would be similar to the proposed action.

Invasive Species Treatments on Adjacent Lands

Treatment of invasive weeds on adjacent lands fosters activities that have cumulative environmental consequences in conjunction with all plan alternatives. Based on the last 6 years, on average the Forest Service has been treating 625 acres of invasive weeds per year. However, since 2010, the number of invasive species acres treated has increased about 100 to 200 percent. Under the forestwide invasive exotic plant management program, the Coronado will continue to treat invasive species across its 1.7 million acres.

Buffelgrass is one of the most pressing invasive species problems on the Coronado. Although the Coronado does not manage a large portion of the desert potential natural vegetation type in the Southwest, buffelgrass threatens deserts universally. Buffelgrass is widespread throughout southern Arizona and occupies huge areas managed by other jurisdictions, including Saguaro National Park, Bureau of Land Management, Pima County, city of Tucson, other municipalities, and Arizona Department of Transportation. The organizations contribute to the removal and control of buffelgrass and other invasive species, which enhances the current and proposed treatments on the Coronado.

Despite the concerted efforts of nonprofit organizations, State and Federal land management agencies, counties, municipalities, and other organizations to restrict the spread of buffelgrass and other invasive species, buffelgrass continues to be intentionally seeded to convert thousands of hectares of desert to grassland in Mexico. Buffelgrass is on the Arizona state noxious weed list and, therefore, can no longer be planted in Arizona. However, it is not included on the Federal noxious weed list or that of any other State and is still used as a pasture grass in other southwestern states. Fountain grass is also intentionally planted by private land owners as an ornamental, which spreads onto adjacent lands. Due to the conflicting management and existing vectors of transmission, invasive species will likely continue to be a problem in future.

Other Factors on Adjacent Lands

Other factors, common to all plan alternatives, outside the control of the Coronado that affect the condition of the vegetation communities in and around the Coronado include development on private

land. Development of private land adjacent to the national forest since 1990 has converted portions of some vegetation communities to urban or rural residential settings. Population growth within the counties that overlap the Coronado (excluding Hidalgo County) has increased on average between 20 and 54 percent from 1990 to 2000 and between 11 and 109 percent from 2000 to 2010. Only Hidalgo County has seen a decrease in population over the same time periods, decreasing 0.4 percent between 1990 and 2000 and 18 percent from 2000 to 2010 (U.S. Census Bureau 1990, 2000, and 2010). Even with this population growth, these counties are still relatively low density, and so population growth has expanded the footprint of towns and cities outwards.

Development increases fragmentation and decreases the ability of fire to play its natural role in the surrounding area. New homes and property developments change and increase the amount of values-at-risk from fire and, therefore, change the decision on whether or not to suppress fire or allow it to play a more natural role. Adjacent properties can also become vectors for the introduction of exotic, invasive species. The increase in development adjacent to the Coronado would essentially increase the need for treatments implemented under the revised plan wildland-urban interface objectives.

Soils – Affected Environment

Soil is the mineral and organic matter that occurs on the land surface. It is characterized by horizons or layers that are distinguishable from the parent material below (bedrock) as a result of weathering, organic content, and chemical and physical processes. Soil comprises the transition area between the atmosphere above and the parent material below and provides a medium that supports vegetation growth. Soils on the Coronado are the primary driver of potential natural vegetation types.

Soils may be shallow (less than 1 inch) or deep (several feet) and may contain varying amounts of sand, silt, and clay particles, as well as all sizes of unweathered rocks. The soil surface is essential to the exchange of gases and water infiltration. Compaction of the surface, erosion of the surface layer, and removal of vegetation all affect the processes soil carries out in its role of supporting vegetation communities.

Soil Types

Soil types on the Coronado are based on terrestrial ecological units described in a general ecosystem survey (GES) (USDA FS 1991; Carleton 1991). The general ecosystem survey provides a systematic analysis, mapping, classification, and interpretation of terrestrial ecosystems at the landscape level. Full details about the general ecosystem survey are provided in appendix B of the Coronado National Forest Ecological Sustainability Report (USDA FS 2009b).

The general ecosystem survey comprises 21 different units on the Coronado. Characteristics of the most common units are reported in table 65. Information in the table indicates forest soils tend to be present on elevated plains and hills, mountains, and escarpments; have very coarse surface texture (high cobble content); are generally deep and have a moderate erosion hazard. Predominant parent material on the Coronado is granite, with some alluvium. The limestone parent material of unit 483 makes it unique; however, this material has a severe erosion hazard. Table 66 reports the most common general ecosystem survey units in forest ecosystem management areas, most of which are described in table 65.

Table 65. General characteristics of predominant general ecosystem survey (GES) units on the Coronado National Forest

GES Unit	Landform	Elevation (feet)	Percent Average Gradient	Surface Texture	Soil Depth	Parent Material	Erosion Hazard	Percent of Forest
146	Elevated plains and hills	4,200 – 6,900	0 – 40	Gravelly loam	Deep	Alluvium	Slight to Moderate	8.3
303	Hills, mountains and escarpments	1,300 – 5,250	40 – 120	Extremely cobbly sandy loam	Shallow to moderate	Granite	Moderate	4.8
475	Hills, mountains and escarpments	4,200 – 7,200	40 – 80	Extremely cobbly sandy loam	Shallow	Granite, rhyolite	Moderate	33
476	Hills, mountains and escarpments	5,600 – 9,200	60 – 100	Extremely cobbly sandy loam	Deep	Granite	Moderate	17.5
490	Elevated plains and hills	4,200 – 6,900	0 – 25	Very cobbly sandy loam	Deep	Granite, rhyolite	Moderate to severe	16.1
381	Elevated plains and escarpments	5,500 – 7,200	0 – 40	Extremely gravelly to cobbly sandy loam	Shallow	Rhyolite	Slight	2.8
472	Hills, mountains, and escarpments	4,200 – 7,200	15 – 40	Extremely cobbly sandy loam	Shallow	Granite residuum	Moderate	2.3
483	Hills, mountains, and escarpments	3,200 – 7,500	40 – 120	Extremely cobbly loam to sandy loam	Shallow to moderately deep	Limestone	Severe	3.7

Table 66. Common general ecosystem survey (GES) units by Coronado National Forest ecosystem management area

Ecosystem Management Area	Most Common GES Unit	Acres*	Second Most Common GES Unit	Acres*
Chiricahua	475	90,167	476	86,874
Dragoon	475	22,108	490	17,198
Galiuro	476	86,292	483	30,176
Huachuca	146	92,235	472	39,735
Peloncillo	475	36,312	381	30,270
Pinaleño	475	98,156	476	51,111
Santa Catalina	475	110,834	303	85,410
Santa Rita	475	58,545	490	41,170
Santa Teresa	483	36,212	485	13,058
Tumacacori	475	108,517	490	83,836
Whetstone	475	23,066	490	10,075
Winchester	475	14.955	490	3,916

Soil types depend on many factors, including climate, time, parent material, biological action, and slope position. They, in turn, influence the potential natural vegetation types on the Coronado. Each vegetation type requires specific precipitation and soil types in order to reach its potential natural state. Soils support vegetative community types by providing available moisture and nutrients. For example, a granitic soil, regardless of its depth, will support different vegetation types than an alluvial or basalt soil located in the same precipitation zone with the same aspect.[25] This is because granitic soil is coarse textured and has low water retention capacity and/or nutrients available for plants. Basalt soil by contrast has a fine texture with much greater water retention capacity, hence, more water available for plant growth.

Soil Condition and Trends

Soil condition is influenced by climate, geomorphic processes, and human-caused disturbances and is assessed in terms of its ability to support the potential natural vegetation type. Historically, the Coronado has had cycles of natural and human-caused impacts. Drought, fire, livestock grazing, woodcutting, and development all have caused varying degrees of soil impacts. According to historical records, the biological environment of southeastern Arizona before 1870 was relatively stable. Exceptions related to soils were naturally erosive areas having unstable geology.

Generally speaking, flatter landforms, such as elevated and valley plains, have experienced greater management impacts historically than steeper slopes, which are not as accessible. Typically, vegetation communities represented on these flatter landforms are desert communities, semiarid grasslands, and Madrean encinal woodlands.

Soil condition assessments have evolved with better understanding of soil functions. Current assessment criteria found in Forest Service Manual 2550 and U.S. Forest Service Region 3 Technical Guide (2013). The technical guide classifies soil condition as “satisfactory,” “impaired,” and “unsatisfactory.” Satisfactory conditions are present where soils are functioning and soil loss is less than a specific threshold.[26] Unsatisfactory soil conditions are found where erosion rates are higher than the soil loss threshold, and there is a loss of soil surface horizons and a potential for lower soil productivity. Impaired soil conditions fall within the range between satisfactory and unsatisfactory.

Soil conditions across the Coronado were assessed between 1977 and 1986 using a protocol described in Hydrology Note 14 (USDA FS 1989) and again between 1998 and 2008, this time using a protocol from Forest Service Handbook 2509.18. Although the protocols differed, adequate vegetative ground cover was an important factor in both. The two studies found that soils classified as impaired or unsatisfactory were, in part, lacking vegetative ground cover, whereas ground cover was adequate on soils in satisfactory condition.

Low- to mid-elevation soils on the Coronado have improved over the past 20 years with improved range management. Most satisfactory conditions occur on resilient, stable, elevated plains, hills, and mountains and are represented in most vegetation communities. This indicates that onsite soil loss is within threshold limits, and that soil compaction is not adversely affecting the ability of the soil to absorb and infiltrate rainfall. The result is minimal soil loss and maintenance of soil productivity. This, in turn, leads to more resilient potential natural vegetation types.

Areas on the Coronado having the most impaired and unsatisfactory soil conditions are on highly disturbed elevated plains in the desert communities, encinal woodlands, pine-oak woodlands, and small areas of grasslands. In impaired or unsatisfactory areas, soil erosion may be beyond threshold limits, and soil compaction may be evident, limiting precipitation infiltration to support effective

[25] This is the compass direction that a feature faces.

[26] The soil loss tolerance threshold is defined as the rate of soil loss that can occur while sustaining inherent site productivity. Threshold values vary by kind of soil (depth, soil climate) and roughly equate to the point where long-term soil regeneration and soil productivity is sustained.

ground cover. Therefore, in these areas there is a risk of losing long-term soil productivity. Recovery of affected soils is a long-term process that varies with many factors, including precipitation and parent material.

Table 67 shows the trends on the Coronado regarding soil conditions by ecosystem management area from the1986 survey to the most recent (post-1998) survey. In 1986, about 530,000 acres of the Coronado had less than the tolerance threshold of groundcover to prevent accelerated soil erosion. Monitoring in a variety of vegetation types indicates that plant density and basal area, especially in the grass component, has improved since 1986, which represents an improvement in groundcover. Although the protocols differed for each survey, they were heavily dependent upon groundcover, especially the vegetative component, as a key indicator for soil productivity. Differing protocols may not make an absolute comparison of satisfactory soil conditions feasible, but it simply shows improving trends in all but two ecosystem management areas. The percentages from more recent surveys are a reasonable indicator of current conditions.

Table 67. Percentage of soils in satisfactory condition in ecosystem management areas on the Coronado National Forest, based on pre- and post-1986 surveys*

Ecosystem Management Area	Satisfactory Condition Pre-1986 (percent)	Satisfactory Condition Post-1998 (percent)
Chiricahua	66	96
Dragoon	73	94
Galiuro	81	92
Huachuca	75	82
Peloncillo	74	97
Pinaleño	75	80
Santa Catalina	55	99**
Santa Rita	71	93
Santa Teresa	31	79
Tumacacori	84	81
Whetstone	67	100
Winchester	100	97

*Figures include private inholdings and lands of other ownership.
**This is an estimate based on about 26 percent of the ecosystem management area having been surveyed

Soils – Environmental Consequences

Effects Common to All Alternatives

Each of the four alternatives provides direction for managing the following activities to maintain soil conditions and productivity: livestock grazing, motorized transportation, managed recreation, unmanaged recreation (especially off-highway vehicle use), minerals exploration and mining, water withdrawals, and border-related activities (including, but not limited to, undocumented immigration and smuggling). These activities have the potential to cause a direct loss of vegetation, which removes a protective layer for soils and creates higher erosion potential.

Livestock grazing and off-road vehicle use alter soil structure and water infiltration by increasing compaction and decreasing infiltration. These activities are vectors for the spread of invasive plant species, which may decrease soil productivity and alter the composition of vegetation communities.

Mining directly removes soils and permanently alters the landscape. Mining and special use permits for water diversions result in a loss of soil moisture and vegetation and, hence, decrease soil

productivity. Mitigation measures in allotment management plans, mining plans of operation, and terms and conditions of special use permits help alleviate some, but not all of these effects.

No Action

Management of soils would continue in accordance with forestwide and management area specific goals, objectives, standards, and guidelines in the 1986 forest plan. The plan establishes an objective to improve 1,053 acres of soils per year using ripping, shaping, seeding and planting, contour structures, brush crushing, and channel clearing or structures. Also, standards and guidelines in the plan prescribe management services to provide information to minimize disturbance and improve already disturbed areas. However, the plan does not include a definition of what constitutes "disturbance."

The 1986 forest plan prescribes reseeding with native or nonnative species in Management Area 4 (1,228,289 acres or 63 percent of the Coronado). The favored nonnative species it identifies for use in reseeding is Lehman's lovegrass. Based on this direction, the effects of reseeding achieved the goal of increasing plant-based ground cover in most areas. While some species may stabilize nutrients and soil cover, most tend to outcompete and replace native vegetation. Different soil organisms predominate under different kinds of vegetation. Replacement of native plant communities with invasive nonnative species can be expected to change soil microbial populations and, thus, nutrient cycling processes. Additionally, having nonnative species present in the landscape may change the fire regime and degrade important wildlife habitat. Seeding with nonnative species is no longer considered a good management practice and is not recommended in the revised plan.

Of all the alternatives, the risk of uncharacteristic fire at the landscape scale is greatest for the 1986 plan, because its prescribed rate of fuel treatments is less than all others. Also, the information on which the treatments are based is outdated compared to the other alternatives. Projections indicate that there will likely be shorter erosion cycles on the Coronado, as large wildfires and subsequent flooding occur. Uncharacteristic fire alters vegetation composition and structure. Accelerated erosion results from changes in ground and canopy cover as well as the ability of roots to hold soil particles through cohesion.

Although direction in the no-action alternative identifies trends toward improvement of the soils resource, it does not specifically address several of the indices for improved soil conditions that are included in direction given in revised plans under the action alternatives. Trends indicate that current management is contributing to improvements in overall satisfactory soil conditions. However, the 1986 plan does not identify specific desired conditions for vegetative groundcover, by potential natural vegetation type, and general soil conditions, and also does not have objectives for improving acreage in uplands with vegetation treatments and watershed or soil restoration.

With regard to transportation, the 1986 plan does not include sufficient direction to adequately minimize erosion and subsequent sedimentation adequately. It does not state specific objectives for decommissioning roads and maintaining roads, and managing highly erodible soils, riparian areas, and wetlands. Roads are often the main source of sedimentation in a watershed. Improperly located or maintained roads have the highest potential to cause soil detachment and transportation as sediment.

The 1986 plan does not directly address the issue of increased motorized recreation and the proliferation of off-highway vehicles. Even though motorized recreation is restricted to roads and trails, the plan does not establish desired conditions or guidelines for mitigating and/or avoiding effects on soil and watersheds where they are permitted.

Direction in the 1986 plan for soil protection in designated wilderness is consistent with the overriding direction in the Wilderness Act. In addition, it provides guidance for managing lands designated Management Area 9, which include all existing wilderness areas and the Mount Graham Recommended Wilderness Area. However, the 1986 forest plan does not mention or provide direction for management of soils in two other wilderness study areas, Bunk Robinson and Whitmire Canyon.

The 1986 plan does not provide direction for management of resources in response to climate change. Without management direction, atypical temperature and rainfall patterns characteristic of climate change[27] may adversely affect forest soils and the resources they support, such as vegetation, watersheds, and habitat.

Human and ecological systems rely on soil for water and nutrients essential for plant growth, the regulation of the water cycle, and the storage of carbon. The physical structure of soils, including its organic material content, is critical to their nutrient balance, stability, water retention capability, and diversity and abundance of soil organisms. These factors, in turn, are important to the health of vegetation and watersheds, and the quality of habitat for wildlife.

In the arid Southwest, soil erosion is likely to increase because of climate change, whether as the result of flooding caused by more intense storms or increased arid conditions resulting from warmer temperatures and drought. Without planning for such changes, increases in direct soil loss in runoff and heavier sedimentation in streams would occur.

Proposed Action

The proposed action establishes forestwide desired conditions for the soils resource based on reference conditions for specific areas. The desired conditions for soils are linked to desired conditions for potential natural vegetation type because it is desirable to maintain soil function and productivity so that the potential natural vegetation type for each soil type will be realized and sustained. During the life of the plan, it is expected that a terrestrial ecological unit inventory will be completed. As data become available, soil conditions will be assessed and further management objectives may be added by amending the forest plan.

The proposed action provides goals for desired ground cover based upon the vegetation type in each landform. Plant based ground cover is an important component of soil productivity and provides important nutrient cycling functions and erosional resistance. In addition to the desired conditions for plant-based soil ground cover in nonforested vegetation types, the proposed action specifies desired coarse woody debris tonnage for forested potential natural vegetation types. Coarse woody debris is an important organic component of the forest floor; it provides for nutrient cycling and increased water retention capacity.

Desired conditions for range management in the revised plan call for areas that are grazed to have stable soils. For soils that are currently or inherently unstable, range management guidelines provide direction so that grazing will not contribute to instability. Range management guidelines state that grazing practices (timing, frequency, and intensity) would be designed to maintain or promote ground cover that will provide for infiltration, permeability, soil moisture storage, and soil stability, appropriate for the ecological zone. To this end, all permits that authorize grazing will follow these guidelines to achieve desired conditions.

Forestwide desired conditions for soils are that ecological and hydrologic functions are not impaired by soil compaction. The goal is that soil condition ratings across the Coronado shall be “satisfactory.” To achieve this goal, vegetation and litter would be sufficient to limit the formation of rills, gullies, and pedestals; excessive soil deposition, and topsoil loss.

Having clear desired conditions for soil will support decisions, especially for range, minerals exploration, transportation, and recreation, that will maintain current satisfactory soil conditions and improve soil conditions that are less than satisfactory by setting outcomes appropriate to the reference

[27] Carbon in soil is broken down naturally and released into the atmosphere as carbon dioxide gas. However, as the air temperature increases, this process occurs more quickly, which means too much gas is produced, adding to the atmospheric trap, and consequently to global warming. See http://www.soil-net.com/legacy/schools/soil_climate1.htm

condition for these specific activities. By tying vegetation desired conditions to the soil type and landform, the proposed action better describes the desired understory and site capabilities for numerous activities than the 1986 plan.

Specific desired conditions for soils would also guide prioritization of forestwide treatment priorities according to which areas most need improvement. The integrated approach linking soil desired conditions and vegetation desired conditions would also increase the effectiveness of monitoring at the site-specific level.

Objectives are management targets that incrementally change resource conditions toward achieving desired conditions. Table 31 lists objectives for vegetation treatments by vegetation type, as specified in the revised plan under the proposed action. Attainment of the proposed action's objectives for vegetation treatment as well as its targets for vegetative ground cover and coarse woody debris would improve soil conditions more expediently than the no-action alternative. As treatments progress toward desired conditions, the probability of uncharacteristic fire would decrease in treated areas. Another objective specific to soils is to treat 2,500 to 15,000 acres of upland vegetation, soil, and/or watershed over 10 years to improve litter and plant basal area, which provide a measure of the soil condition indicator of ground cover.

In the short term, vegetation management activities would have a negative effect in that they would increase compaction of soils when heavy mechanized and motorized equipment are used. And, depending on the method of disposal and quantity of slash and woody material that is removed from specific areas, nutrients available to plants and soil microorganisms may decline in abundance.

However, in the long term, vegetation, coarse woody debris, and ground cover treatments would foster greater resiliency in vegetation and soils which, in turn, would decrease the likelihood of uncharacteristic fire and its which mass wasting and excessive soil erosion consequences. Ground cover would gradually move toward reference conditions as proposed treatments are completed, especially because reseeding, if necessary, would use native species. A sterile "nurse crop" such as sterile wheat or barley is sometimes used to enhance the success of seeded native species. The sterile species do not persist in the treatment area. As a result, a more robust and diverse understory community would develop across the landscape. The plan objective for enhancement or restoration of upland acreage, in particular, would accelerate the current trends in improved soil conditions.

The proposed action would allow the use of nonnative species for soil stabilization in areas where there are no other options and strongly discourage their use adjacent to wilderness areas. This would protect native plant communities better than the no-action alternative, which has no restrictions on the use of nonnative species for reseeding. This will have a long-term effect of promoting resilient native plant communities that, in turn, will secure satisfactory soil conditions.

Guidelines in the plan revised by the proposed action would help maintain or promote effective ground cover so that soil desired conditions associated with range management are met. This, in turn, would create a positive trend in the quality of the soils resource and increase the acreage of soils in satisfactory conditions. These, as well as range management desired conditions for stable soils, will help improve soil conditions over the 1986 forest plan by having specific direction for soil improvements that encourages a priority to address soil conditions using sound range management.

Wilderness direction in the proposed action better protects soil conditions than the no-action alternative. The revised plan's desired conditions are that natural processes dominate soil and water cycles and that trails and campsites do not contribute sediment to downstream water resources. Combined with group size limits and rehabilitation objectives for the most heavily used wilderness areas, these would reduce human-caused effects, such as trampling that creates bare ground and trail- and campsite-induced erosion.

Management of the Ku Chish Recommended Wilderness Area in the northern Chiricahua Mountains is expected to have minimal negative effects on the soils resource. This area will not be protected from

the effects of ground-disturbing activities such as off-road motor vehicle use, mining, or road construction. In wilderness areas, the desired condition is for natural cycles to dominate the soil and water resources with minimal erosion from trails and campsites.

The proposed action would better protect sensitive soils that are highly erodible or support wetland and riparian vegetation communities than the no-action alternative. Decommissioning, closing, and restoring roads in specific areas would restore productivity to soils that are currently out of the permanent productivity base. This, in turn, will help increase the percentage of soils across the Coronado in satisfactory condition. Installation of hardened crossings will further decrease sedimentation directly into streams and lead to satisfactory soil conditions in riparian areas as well as better functioning stream channels.

Unlike no action, the revised plan under the proposed action provides plan components that include desired conditions and management approaches for the Coronado's response to climate change. Goals include having forest ecosystems that are resilient to rapidly changing natural disturbances, such as drought, wind, fire, insects, and pathogens; and vegetation communities of various structure and ages across the landscape that can adapt to changing conditions. Toward achieving these goals, the soil functions of nutrient cycling, water infiltration, and carbon sequestration would sustain all vegetation types as they are adapting. Sustainable, adaptable, resilient vegetation would serve as the foundation of good quality habitat and healthy watersheds on the Coronado that support a variety of species, including those having special status.

Complimenting desired conditions regarding climate change are management approaches and plan components that are tiered from the climate change response strategies described in appendix A of the revised plan. These include incorporating engineering practices that minimize soil erosion and surface runoff, which decreases the potential for alteration of the physical structure of soil and adverse effects on soil functions.

Overall, the proposed action establishes quantifiable desired conditions and objectives toward which management can seek to attain them. Although monitoring suggests that current soil conditions are trending toward satisfactory, the proposed action ensures that this trend will continue because it recommends projects that directly restore soil conditions, decommission roads, and prioritize improvement of soil conditions.

Alternative 1

Alternative 1 emphasizes the importance of wilderness on the Coronado, proposing that 147,018 acres more than the proposed action and 194,593 acres more than alternative 2 be managed for wilderness characteristics (this includes recommended wilderness areas and wilderness study areas). While the effects of alternative 1 are qualitatively the same as those described for the proposed action, they will have a much greater benefit on soils, vegetation, and watersheds because of the increased area that will be managed as wilderness.

Because of its emphasis on wilderness management, alternative 1 would require proposed vegetation treatments to be carried out without the use of mechanized vehicles and equipment and that there be no motorized travel. These restrictions would reduce the degree of compaction of soils that occurs from heavy equipment and vehicle travel and use compared to the proposed action and alternative 2. Depending on the size of areas treated and progress in their implementation, alternative 1 may reduce the quantity of slash and woody material that is removed from specific areas, which would allow more nutrients to be retained in soils for plant and microorganism use than would the proposed action and alternative 2. Because of the wilderness restrictions, however, the achievement of desired conditions for vegetation and watershed may be slower than for other action alternatives.

This alternative would have no measurable adverse effects on satisfactory soil conditions.

Alternative 1 would provide the same direction for the management of resources in response to climate change as the proposed action. Therefore, it would have the same benefits on soils as described above under the "Proposed Action" heading.

Alternative 2

Alternative 2 proposes a Motorized Recreation Land Use Zone that is 40,255 acres larger than that proposed by both the proposed action and alternative 1. Increased soil compaction can lead to increased erosion and subsequent loss of soil productivity and satisfactory ratings. Motorized recreation increases ground-disturbing activities and the potential spread of invasive species. On a forestwide scale, there is little difference in effects to soils between this and the other alternatives, because alternative 2 encourages motorized use in specific locations. This alternative would move soils toward improving trends, but at a slightly lower rate than other alternatives.

Alternative 2 provides no plan components for management of soils to achieve resiliency and adaptation to changes that may result from warmer, drier climate conditions, which scientists currently believe will affect the Southwest as global warming occurs. It does, however, incorporate the strategies for management of climate change described in appendix A of the revised plan, which recommend approaches to address key climate change factors, such as insects, disease, and fire that exacerbate the effects of climate change. Because of this, adverse effects of climate change on soils under alternative 2 would be slightly greater than those resulting from direction under the proposed action and alternative 1, and slightly less than those resulting from the lack of direction in the no-action alternative.

Cumulative Effects

Although the soil resource is primarily within the boundaries of the Coronado National Forest, its function and productivity can be affected by activities and natural processes that originate beyond those boundaries or from private or other public inholdings surrounded by National Forest System land. Cumulative effects of multiple activities in the same area, such as within a watershed, depend upon the intensity of the activity and condition of the baseline environment.

Past, present, and future actions on the Coronado that contribute cumulatively to soils conditions include (1) ground-disturbing actions, including road, residential, and commercial construction, (2) grazing, (3) nonnative species proliferation, and (4) wildfire. The types of effects associated with these activities were discussed above under the consequences of the alternatives. Site-specific evaluations of cumulative soils impacts will be done on a case-by-case basis during future National Environmental Policy Act reviews of individual projects.

Potential additive effects on soils in 4th hydrologic unit code[28] (HUC) watersheds are possible during the 10- to 15-year life of the revised plan. All 4th-, 5th-, and 6th- hydrologic unit code watersheds, even those that are only partially on National Forest System lands, are within the area of potential effect. Generally, the upper portions of thirteen 4th hydrologic unit code watersheds, fifty-one 5th hydrologic unit code watersheds, and two hundred forty-nine 6th hydrologic unit code subwatersheds are represented on the Coronado. The lower areas are managed by private land owners or other public land management agencies, many interspersed within the Coronado National Forest boundary.

Private and public land development within and outside the national forest boundary disturbs and removes soils and vegetation, increasing erosion and sediment runoff to various watersheds when it rains or snows. With population growth in the area, the upward trend in land development is expected

[28] The U.S is divided and subdivided into successively smaller hydrologic units. The hydrologic units are nested within each other, from the largest to the smallest. Identifiers of hydrologic units are numeric codes that express the interrelationships of the units and represent the drainage of smaller watersheds into successively larger units (a 4th level hydrologic unit code watershed is larger than and may encompass a 5th level watershed).

to continue. In conjunction with growth, more people use the national forest, driving and parking more vehicles in unpaved areas, causing soil compaction and vegetation damage which, in turn, affects soil functioning and productivity.

Other activities on private land such as road building, grazing, mining, and fuel treatments may remove or disturb vegetation and soils and increase sediment in surface waters, affecting stream quality and aquatic habitat. All of these actions, individually or in combination, may contribute to cumulative effects on the soils resource on and outside of the Coronado.

The differences among the four alternatives in managing the soils resource were reported in the sections above. When considered in combination with past, present, and future actions that may directly affect soils or indirectly affect them by causing impacts on vegetation and watersheds, no action would have the greatest potential to cumulatively affect soils, because it establishes fewer objectives and desired conditions for managing soils and for vegetation and watershed improvement projects. It also recommends reseeding using nonnative plant species, which has been observed to result in nonnatives outcompeting natives for nutrients and space and whose presence may enhance the probability of uncharacteristic wildfire.

Of the three action alternatives, alternative 1 best conserves the soils resource by virtue of its emphasis on wilderness and the restrictions on the use of mechanical and motorized vehicles and equipment. Alternative 2, while it increases the area of forest devoted to motorized recreation, encourages motorized use in specific locations where the potential for soils damage is less than in other less disturbed areas. All three action alternatives provide equivalent direction for managing and improving soils and for completing vegetation and watershed projects to move the soils resource toward desired conditions more quickly than no action. No action and alternative 2 do not provide direction for managing resources in response to climate change. Therefore, cumulative effects of climate change would be more likely for these alternatives than for the proposed action and alternative 1.

Water Resources – Affected Environment

Water Quality

Surface water quality is a function of natural physical, biological, and chemical variables, such as elements present in soils and rock substrates, and concentrations of biological and chemical contaminants that originate either from a point (single) source (a discharge pipe) or from runoff that carries contaminants that accumulate over a landscape (nonpoint sources; for example, stormwater).

Reference (historic) water quality on the Coronado appears to have sustained ecological systems and species and accommodated all uses specified in state regulations. Historically, nonpoint sources of contamination in both Arizona and New Mexico, such as roads, timber harvesting, livestock grazing, recreation, and uncharacteristic fire, were neither widespread nor frequent.

The general classifications of surface water quality assigned by the Arizona Department of Environmental Quality (ADEQ) are as follows:

- **Category 1** - Surface waters assessed as “attaining all uses.” All designated uses are assessed as “attaining.”
- **Category 2** - Surface waters assessed as “attaining some uses.” Each designated use is assessed as either “attaining,” “inconclusive,” or “threatened.”
- **Category 3** - Surface waters assessed as “inconclusive.” All designated uses are assessed as “inconclusive” due to insufficient data to assess any designated use (insufficient samples or core parameters). By default, this category would include waters that were “not assessed” for similar reasons.

- **Category 4** - Surface waters assessed as "not attaining." At least one designated use was assessed as "not attaining" and no uses were assessed as "impaired." A total maximum daily load (TMDL) analysis[29] will not be required at this time because (reason cited).
- **Category 5** - Surface waters assessed as "impaired." At least one designated use was assessed as "impaired" by a pollutant. These waters must be prioritized for total maximum daily load development.

Based on these categories, any stream listed as category 4 or 5 is considered highly departed from reference conditions. Unlisted streams, or those in categories 1 to 3, meet the desired conditions and are considered as not impaired.

Designated uses of surface water in Arizona include full-body contact, partial-body contact, used as a domestic water source, fish consumption, aquatic and wildlife (cold water), aquatic and wildlife (warm water), aquatic and wildlife (ephemeral), aquatic and wildlife (effluent-dependent water), agricultural irrigation, and agricultural livestock watering .

The State of New Mexico defines water quality goals by designating uses for rivers, streams, lakes, and other surface waters, setting criteria to protect those uses, and establishing provisions to preserve water quality. In New Mexico, water quality standards for interstate and intrastate surface waters are defined in the New Mexico Administrative Code (NMAC, title 20, chapter 6, Part 4), and are under the oversight of the New Mexico Environment Department (NMED) . There are both water quality standard segment specific criteria (detailed in 20.6.4.97 through 20.6.4.899 NMAC) and designated use-specific criteria (detailed in 20.6.4.900 NMAC). The determination of use support using specified protocols is then combined to determine the overall water quality standard attainment category for each assessed unit (U.S. EPA 2011b). The unique assessment categories for New Mexico, which parallel those of Arizona, are described as follows:

1. Attaining the water quality standards for all designated and existing uses. Waters are listed in this category if there are data and information that meet all requirements of the assessment and listing methodology and support a determination that the water quality criteria are attained.
2. Attaining some of the designated or existing uses based on numeric and narrative parameters that were tested, and no reliable monitored data are available to determine if the remaining uses are attained or threatened. Assessment units are listed in this category if there are data and information that meet requirements of the assessment and listing methodology to support a determination that some, but not all, uses are attained based on numeric and narrative water quality criteria that were tested. Attainment status of the remaining uses is unknown because there is no reliable monitored data with which to make a determination.
3. No reliable monitored data and/or information to determine if any designated or existing use is attained. Assessment units are listed in this category where data to support an attainment determination for any use are not available, consistent with requirements of the assessment and listing methodology.
4. Impaired for one or more designated uses, but does not require development of a total maximum daily load because (reason cited).

[29] A total maximum daily load analysis determines the maximum amount of a pollutant that a surface water can assimilate (the "load") and still meet water quality standards during all conditions. It defines the loading capacity of the surface water relative to discharges from point and nonpoint sources in the watershed, natural background levels, seasonal variation, and with an incremental margin of safety.

5. Impaired for one or more designated or existing uses. The assessment unit is not supporting one or more of its designated uses because one or more water quality standards are not attained according to current water quality standards and assessment methodologies.

Under the Clean Water Act, Arizona and New Mexico must periodically evaluate water quality in their jurisdictions. All data are reported for stream reaches, rather than at the watershed or subbasin level. Thus, only a very small portion of each watershed or subbasin is evaluated. Streams and lakes are the only water bodies tested; springs, stock ponds, and cienegas are not. Water quality is assessed in select perennial stream reaches and lakes on the Coronado by comparing existing conditions with desired conditions that are set by the State under authority of the Clean Water Act of 1972 (Public Law 92-500).

The Arizona Department of Environmental Quality has evaluated approximately 5 percent, or 134.24 miles, of the watercourses on the Coronado (ADEQ 2009). Six lakes on the Coronado have also been tested. Outside the national forest, but within watersheds that originate on the Coronado, the water quality of 537.65 miles of streams and 8 lakes has been assessed.

According to the draft report, Status of Water Quality in Arizona: The Integrated 305(b) Assessment and 303(d) Listings Report (ADEQ 2009), the water quality of some reaches within and downstream of the Coronado is “impaired” and does not meet the status classifications for designated uses. These include one stream (7.5 miles) and two lakes on the Coronado (category 5). In addition, 5 streams (24.2 miles) and 2 lakes on the Coronado are classified as “not attaining” because they have total maximum daily load plans in process (i.e., they are category 4).

Off-forest and downstream of the Coronado in Arizona are 3.89 miles of category 4 streams that are “not attaining” and 132.38 miles of category 5 “impaired” streams. In New Mexico, no waters within or immediately downstream from the Coronado have been identified as not meeting standards. No category 4 or 5 streams are present.

The cause of impairment of forest water quality of streams is often due to the presence of heavy metals, *Escherichia coli* bacteria, or both. In lakes, the cause of impairment is the presence of heavy metal (mercury) or eutrophic (aging) conditions. Specifically, Cave Creek in the San Simon Subbasin is impaired because of selenium levels that may reflect natural background chemistry. Rose Canyon Lake in the Rillito Subbasin is classified as impaired because of eutrophic (aging) conditions. The condition of the lake changed after runoff from burned areas deposited a large quantity of organic material in it. In Parker Canyon Lake in the Upper Santa Cruz Subbasin, sampling and analysis indicates high concentration of mercury in fish.

Five streams on the Coronado are classified as category 4 (not attaining): Alum Gulch, Humboldt Canyon, Harshaw Creek, Three R Canyon, and Cox Gulch, all of which are in the Upper Santa Cruz Subbasin. Each of them has a total maximum daily load plan pending. All have heavy metals in the creek bottoms, runoff from past mining activities (numerous legacy mines) within their watersheds, and probably some natural background of heavy metals from seeps and springs. The two lakes on the Coronado, Arivaca Lake in the Brawley Wash Subbasin and Peña Blanca Lake in the Upper Santa Cruz Subbasin, have approved total maximum daily load plans for reducing heavy metals (mercury) in lake sediments. The sources of mercury are naturally occurring from the atmosphere and soil within the watershed, and anthropogenic from past mining activities.

Most contaminants in these waters originated from activities that did not exist in the period defined as the reference condition (1000 through 1889, before human alteration of the natural landscape); in particular, mining, grazing, stream channelization, pesticide use, recreation, motor vehicle travel, and agriculture. Original (reference) concentrations of heavy metal in the watersheds are unknown, although these contaminants do occur naturally, in varying degrees, in the watersheds of Arizona and New Mexico.

Perennial lakes are not natural in southeastern Arizona or southwest New Mexico; therefore, no reference water quality is available for them. Closed basin lakes, also known as "playa" lakes, are found in both southern Arizona and southern New Mexico. None of these is located on the Coronado National Forest. Because of the absence of reference water quality for lakes, Clean Water Act standards are used as surrogates for reference conditions. Compared to Clean Water Act standards, the water quality of Coronado lakes is degraded.

Within the Coronado, the most important nonpoint sources of pollution are from sediment generated from roads in close proximity to drainages and livestock grazing. The Coronado currently implements and monitors the use of site-specific best management practices for all activities that may potentially contaminate pollute state waters, including, but not limited to, transportation system operations and maintenance, road maintenance monitoring, range monitoring with annual operating instructions for range permittees (USDA FS 2012a), and implementation of total maximum daily load report recommendations.

Point sources of potential water contaminants on the Coronado include, but are not limited to, wastewater facilities associated with campgrounds, administrative sites, and other sites authorized by special use permit, and historic and existing mines. Point sources are also required to use best management practices including permitting, inspection, state certification, and mitigation of temporary point source pollution through the Clean Water Act, National Pollution Discharge Elimination System program, and Comprehensive Environmental Response, Compensation, and Liability Act program (Superfund).

Water Quantity – Surface Water

The extent of perennial streams on the Coronado has shifted slightly over time. Prior to the establishment of the Coronado, the Homestead Act of 1862 (Public Law 37-64) facilitated the transfer of some lands containing streams into private ownership. Stream diversions and irrigation ditches both on and outside the forest have reduced the streamflow along some stream segments.

Streams on the Coronado serve as headwaters to numerous watersheds. The Coronado contains a relatively high percentage of miles of perennial streams when compared to its total land area within watersheds having perennial water. The forest manages approximately 21 percent of the land area of its component subbasins and has about 36 percent of the miles of its perennial streams. Exceptions are the Upper San Pedro River Subbasin, the Animas Valley Subbasin, and the Whitewater Draw Subbasin, where there is no or very little perennial water. Perennial streams within Coronado administered and managed lands cover about 114 miles.

Surface flow is dependent on precipitation. The recent drought in the Southwest has reduced flows in some stream reaches occupied by native fish and other aquatic species. On the Coronado, surface water is currently available for administrative use for firefighting and Forest Service livestock and road maintenance, under Federal reserved water rights.[30]

The quantity of perennial surface water on the Coronado and in the watersheds beyond its boundaries is perceived to have departed from reference conditions; however, there are no streamflow data (or gauging stations) to confirm this perception of decline. Beyond the boundaries of the Coronado, withdrawal of groundwater for use in agriculture and urban water supplies has dramatically lowered the water table, which, in turn, has affected the quantity of perennial surface water.

Acquisition of Arizona instream-flow certified water rights ensures and protects perennial stream water quantity on the Coronado for recreation and wildlife. Many of the Coronado's instream-flow rights applications have been submitted and are pending Arizona Department of Water Resources

[30] Federal reserved water rights associated with public lands are reserved to satisfy the purposes for which the public land was established. These water rights, however, are subject to court adjudication.

water right certification, which will be junior to older certificates (see table 68). Because all these applications are included within the ongoing Gila River water rights adjudication process, their fate will be settled by the court. New Mexico does not have a system to acquire state-based instream-flow water rights.

Table 68. Fourteen submitted applications for instream flow water rights

Ranger District	Location
Douglas	Cave Creek
Nogales	California Gulch
Nogales	Sycamore Creek
Sierra Vista	O'Donnell Creek
Sierra Vista	Redrock Creek
Sierra Vista	Turkey Creek
Sierra Vista	Miller Creek
Sierra Vista	Scotia Canyon
Sierra Vista	Harshaw Creek
Sierra Vista	Parker Canyon
Safford	Frye Creek
Safford	Wet Canyon
Santa Catalina	Paige Creek
Santa Catalina	Sabino Creek

Reference levels of water yield are unknown; however, research suggests that the water yield of pre-Euro settlement, open canopied forests was higher than in the closed canopy forests that are prevalent today (USDA FS 2009b, Brown and Lowe 1974). Water yield from the Coronado is about 162,662 acre-feet annually. It is estimated that overall forest water yield[31] has been static to slightly downward over the last 20 years because of the following two ecosystem variables:

1. Aerial photo analysis in 2012 showed greater tree and shrub basal area and cover in several vegetation types over the last 20 years, which can result in increased evapotranspiration and decreased runoff and water yield.
2. Drought conditions have prevailed most years since 1995 and have probably contributed to decreased precipitation, runoff, and water yield.

Past studies indicate that vegetation treatments to increase water yield result in only short-term water yield increases (1 to 3 years) (Baker 1999). Today, treatments to increase water yield are not being considered on the Coronado; therefore, a detailed analysis of water yield has not yet been conducted.

In summary, on the Coronado, surface water quantity and water yield has been static to slightly downward trending.

Water Quantity – Groundwater

Because the majority of groundwater withdrawals in southeastern Arizona and southwestern New Mexico occur on lands outside the Coronado, the Forest Service has no influence on their control.

[31] Output of water yield or water supply (used synonymously in this analysis) is the amount of water that leaves the immediate site to become surface water yield or groundwater recharge. Essentially, it is the difference between total precipitation and actual evapotranspiration.

Forest Service groundwater policy (Forest Service Manuals 2560, 2880, and 2543) as well as agency technical guides provide direction for well drilling and pumping on the Coronado, specifying that these activities must not adversely affect connected riparian habitat and water quantity and quality. Because direction in the Forest Service manual is considered adequate and groundwater withdrawal is governed by State regulations, additional management direction was not specified by any of the action alternatives and they are not analyzed in this environmental impact statement.

Watersheds

Watersheds on the Coronado are defined using a uniform hierarchical system developed by the U.S. Geological Survey. The U.S. is divided and subdivided into successively smaller hydrologic units. The hydrologic units are nested within each other, from the largest to the smallest. Identifiers of hydrologic units are numeric codes (hydrologic unit codes or HUCs) that express the interrelationships of the units and represent the drainage of smaller watersheds into successively larger units.

All of the waters on the Coronado are in Region 15 of the U.S. Geological Survey National Surface Watershed Classification System (Lower Colorado River Region), in which three subregions are represented: 1504 (Upper Gila), 1505 (Middle Gila), and 1508 (Sonora). Subregions are divided into basins, basins are divided into subbasins, and subbasins are divided into watersheds. The term watershed in this environmental impact statement refers to the latter unit. The Coronado contains 13 subbasins, 51 watersheds, and 249 subwatersheds (6^{th} hydrologic unit code). Subbasins and watersheds are listed in appendix C of the Coronado National Forest Ecological Sustainability Report (USDA FS 2009b).

Sixth hydrologic unit code watersheds on the Coronado were evaluated in 2011 to determine existing conditions, using the national watershed condition framework and assessment tool (USDA FS 2010b). The evaluation included assessments of riparian and aquatic habitat and soils, which affect the quality, quantity, and timing of water flows. Of the 249 6^{th} hydrologic unit code watersheds present, 208 were evaluated. Forty-one were not evaluated because they occupy a very small percentage of the Coronado.

Watershed conditions are either properly functioning (in a natural pristine state, commonly called healthy watersheds), functioning at risk, or degraded (in a severely altered state or impaired). Watersheds that are properly functioning have terrestrial, riparian, and aquatic ecosystems that capture, store, and release water, sediment, wood, and nutrients within the range of natural variability for these processes. In this condition, they create and sustain terrestrial, riparian, aquatic, and wetland habitats that are capable of supporting diverse populations of native aquatic- and riparian-dependent species. In general, the greater the departure from the natural pristine state, the more impaired the watershed condition.

Watershed condition classification is the process of describing watershed condition in terms of discrete categories (or classes) that reflect the level of watershed health or integrity. In this analysis, watershed health and integrity are considered to be conceptually the same. Watersheds with high integrity are properly functioning and support ecosystems that show little or no influence from human actions.

Forest Service Manual 2521.1 uses three classes to describe watershed condition:

1. **Class 1 (properly functioning)** - These watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and are functioning properly.
2. **Class 2 (functioning-at-risk)** - These watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and are functioning at risk.
3. **Class 3 (impaired)** - These watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and are impaired function.

Table 69 summarizes the results of the assessment of 6th hydrologic unit code watersheds, grouped with their respective 4th hydrologic unit code watersheds, which overlap the Coronado in each watershed condition class. Results indicate that approximately 73 percent of the Coronado's 6th hydrologic unit code watersheds are properly functioning, 27 percent are functioning at risk, and none is impaired. Watersheds classified as functioning dominate the Coronado. The 27 percent of 6th hydrologic unit code watersheds that are functioning at risk are departed from their reference condition, but are not yet impaired. Most of them reflect the effects of human activities, such as increased runoff from a higher density of roads, heavy recreation impacts in riparian areas, large quantity well withdrawals, effects of past and present mining, and vegetation changes resulting from aggressive fire suppression.

Table 69. Results of a 2011 watershed condition assessment of 6th HUC watersheds on the Coronado National Forest

4th HUC Watershed Number and Name	Number of 6th HUC Watersheds	Number of 6th HUC Watersheds in Each Condition Class			Percent of 6th HUC Watersheds in Class 1
		Class 1: Functioning Properly	Class 2: Functioning at Risk	Class 3: Impaired	
15040003 – Animas Valley	4	4	0	0	100%
15040005 – Upper Gila-San Carlos Reservoir	17	16	1	0	94%
15040006 – San Simon	20	17	3	0	85
15050201 – Willcox Playa	24	20	4	0	83
15050202 – Upper San Pedro	26	15	11	0	58%
15050203 – Lower San Pedro	34	30	4	0	88%
15050301 – Upper Santa Cruz	39	19	20	0	49%
15050302 – Rillito	18	10	8	0	56%
15050304 – Brawley Wash	5	2	3	0	40%
15080200 – Rio de la Concepcion	7	6	1	0	86%
15080301 – Whitewater Draw	7	7	0	0	100%
15080302 – San Bernardino Valley	4	3	1	0	75%
15080303 – Cloverdale	3	3	0	0	100%
TOTAL	**208**	**152**	**56**	**0**	**73%**

Water Resources – Environmental Consequences

Effects Common to All Alternatives

The use of best management practices to improve or maintain water quality and water quantity and to minimize negative effects to watershed condition, such as channel damage, would be implemented in accordance with law, regulation, and policy. This will result in incremental improvements to existing watershed conditions because of the use of current science and technology to minimize negative effects from approved projects.

No Action

Management of water resources would continue in accordance with direction in the 1986 forest plan. For watersheds affected by historic mining, grazing, hydrologic modification (channelization), pesticide use, recreation, motor vehicle travel, and agriculture, actions to correct these situations would continue at the current rate, which may ultimately contribute to future violations of water quality standards.

The 1986 plan contains vague and outdated management direction to improve impaired waters, attain designated beneficial uses, and meet State water quality standards. It lacks direction regarding treatments that may be used to remediate impaired waters. The revised plan under each of the action alternatives provides such direction.

The 1986 plan contains no direction for implementing total maximum daily load recommendations to improve impaired waters on the Coronado; therefore, water quality improvement projects would only occur on an opportunity basis. Without planned treatments and management, the current static trend in water quality is likely to continue. The other three alternatives address this deficiency.

The no-action alternative provides no specific desired conditions for future watershed condition. It contains management emphasis statements that are outdated. It does not recommend treatments to improve watershed functions where they are most needed, which over time may lead to deterioration of watershed function and water quality. The lack of plan direction specific to 6th hydrologic unit code watersheds results in site-specific water resource improvements only, not improvements of overall watershed condition. The other three alternatives address this deficiency.

The no-action alternative does not contain any forest plan objectives to implement treatments designed to move watersheds toward properly functioning condition. Therefore, management would continue to plan and implement few treatments, resulting in less improvement of water quality and watershed function than would otherwise occur under the other three alternatives.

Direction specified by the no-action alternative does not provide a focused approach to watershed restoration. It does not provide guidance to prioritize treatments within particular watersheds and would not result in substantially improving functioning at risk or impaired watersheds. Because of the lack of objectives, the level of mechanical treatments would likely be less than other alternatives. As a result, it would be unlikely that entire watersheds would be restored except on an opportunity basis. Therefore, watershed function would continue to remain static.

To conclude, no action would not have a proactive effect on restoring and maintaining high quality, functioning water resources on the Coronado.

The 1986 forest plan does not provide direction for management of resources in response to climate change. Climate change has been shown to cause changes in temperature and rainfall patterns. Without management direction, climate change would directly affect forest water resources and indirectly affect resources they support, such as vegetation, wildlife, and habitat.

Adverse effects on water resources may include impairment of water quality, degradation of watersheds, loss of potential recreational uses, and loss of aquatic habitat and biota, any or all of which may result from higher velocity and greater quantities of surface runoff associated with extreme flooding and more intense storms; and lowered water yield and availability for wildlife, grazing, and human uses because of warmer and drier conditions/drought that decrease annual precipitation and snowpack.

Proposed Action

The revised plan (the proposed action) includes specific water resources management direction, including:

- Desired conditions that water quality meet or exceed State of Arizona, State of New Mexico, and/or Environmental Protection Agency standards for designated uses.
- Desired conditions that the quantity of water available on the Coronado be appropriate to meet the needs of uses on and off the national forest and to keep channels and flood plains functional.

It also lists the following objectives:

- The Coronado will apply for at least 10 instream-flow water rights on creeks for the beneficial use of recreation and wildlife, including fish, every 10 years.
- Development of at least 3 springs to provide aquatic habitat for the recovery of plant species, animal species, or both every 10 years.
- Completion of 3 stream restoration project, development projects, or both to benefit aquatic species of conservation concern every 10 years.

While water quality trends would be expected to be static for the no-action alternative, trends for water quality under the proposed action would be toward attainment of desired conditions, based on revised plan direction that emphasizes total maximum daily load implementation and a focused, priority watershed treatment strategy. This direction helps align forest plan direction with the Clean Water Act.

Water quantity would continue to be largely controlled by weather events and climate. However, clear direction in the proposed action with regard to securing additional instream flow water rights, developing springs, and restoring streams would help meet the water needs on and off the Coronado and would keep channels and flood plains functional. This would help maintain watershed condition and the number of miles of perennial waters. A functional channel and flood plain improves water retention on the landscape and helps release water over a longer time period for uses on and off the Coronado. An indirect effect of functioning floodplains is the support of riparian habitat by maintaining natural disturbance cycles, which helps to recruit a diversity of plant species and age classes. This, in turn, benefits riparian wildlife species by having diverse forage and nesting locations.

Obtaining instream-flow water rights for the beneficial use of recreation and wildlife, including fish, results in protection of nonconsumptive water flow for the environment and recreation users. Existing water right certificates would be senior and take precedence over any new procured instream-flow water right obtained under this proposed action objective. Water not presently diverted for other beneficial uses would be the water these new junior instream-flow water rights are targeting. Indirect effects include numerous positive biological processes including riparian and wildlife habitat maintenance.

The development of springs and implementation of stream restoration projects provides aquatic habitat for plant and animal species dependent on these types of resources to function properly. Indirect effects include maintaining a more complex ecosystem and, thereby, improving viability of aquatic species and the climate resiliency of the system.

The proposed action alternative contains specific desired conditions for overall watershed condition, moving watersheds conditions toward properly functioning, and prioritizing treatments for watershed restoration. This alternative would focus treatments to improve the watershed functions where they are most needed, resulting in improved watershed function and water quality than would occur under the no-action alternative.

The proposed action recommends the Mount Graham, Ku Chish, Whetstone, and Chiricahua Addition North areas for wilderness designation. The official designation of areas as wilderness would prohibit

the use of mechanized and motorized equipment, except in special emergency circumstances as approved by the regional forester. This would reduce or eliminate potential adverse impacts from off-road vehicles, mechanized mining operations, and construction of new infrastructure such as roads or buildings.

Wilderness restrictions may slow the progress of upland watershed improvements, but with careful planning, such projects can be accomplished using nonmotorized and nonmechanized methods.

Unlike no action, the revised plan includes desired conditions and management approaches for the Coronado's response to climate change. Goals include having forest ecosystems that are resilient to rapidly changing natural disturbances, such as drought, wind, fire, insects, and pathogens, and vegetation communities of various structure and ages across the landscape that are adaptable to changing conditions. Toward achieving these goals, improved watershed function would help sustain vegetation that serves as a foundation of good quality forest habitat for a variety of species, including those having special status.

Complimenting desired conditions regarding climate change are plan components that recommend management approaches tiered from the climate change response strategies described in appendix A of the revised plan. These include incorporating engineered structures that minimize soil erosion and reduce the velocity and quantities of runoff caused by natural disturbances caused by climate change (e.g., wildfire, intense storms, and flooding). They also include identifying and implementing water conservation practices and policies, such as water rights acquisitions and integrated water planning with Federal, state, and local agencies, and planning for a reduction in upland water supplies, both of which would benefit losses in water yield and availability that may result from climate change.

This direction would reduce potential impairment of forest water quality, degradation of watersheds, loss of potential recreational uses, and loss of aquatic habitat and biota. any or all of which may result from higher velocity and greater quantities of surface runoff associated with extreme flooding and more intense storms; and lowered water yield and availability for wildlife, grazing, and human uses because of warmer, drier conditions and drought that decrease annual precipitation and snowpack.

Alternative 1

The consequences of implementing this alternative would include those listed above for the proposed action and additional effects associated with the proposed management of 16 parcels for wilderness character.

Wilderness restrictions on motorized and mechanized uses may slow the progress of upland watershed improvements, but with careful planning such projects can be accomplished using nonmotorized and nonmechanized methods. Because this alternative recommends more wilderness than any of the others, it would have the greatest impact among the alternatives on implementation of watershed improvement projects.

No surface waters in wilderness areas recommended by alternative 1 are ranked as either not attaining or impaired (category 4 or 5). One parcel in the Chiricahua Mountains is adjacent to a category 5 (impaired) stream (Cave Creek). Five other parcels are located within or contribute surface water flow to category 3 streams, which have water quality ranked as inconclusive. Monitoring will be necessary to ensure that the quality of this stream does not deteriorate, whether or not alternative 1 is implemented. In any case, activities on the wilderness parcels are not likely to contribute contaminants that would degrade the quality of adjacent surface waters.

Alternative 1 would provide the highest degree of surface water protection among all alternatives by imposing restrictions on new water extraction and developments. Therefore, those wilderness parcels that contribute to perennial surface water streams within the Coronado may accelerate the progress of water resources toward attaining desired conditions when compared with the other alternatives.

With regard to effects on watershed condition, eight recommended wilderness parcels are located in 6th hydrologic unit code watersheds that are class 1 (properly functioning), and eight others are within class 2 watersheds which are functioning at risk. Overall, designation as wilderness would provide additional protection to class 2 watersheds by virtue of its restrictions on activities and motorized and mechanical vehicles and equipment. The typical impairment in the class 2 watershed is related to overstocked vegetation. If wilderness restrictions impede the implementation of vegetation management projects, future conditions of the class 2 watershed may degrade. Careful planning would be necessary to accomplish such projects without mechanical or motorized methods at locations where overstocking is observed to be increasing.

Alternative 1 would provide the same direction for the management of resources in response to climate change as the proposed action. Therefore, it would have the same benefits to water resources affected by climate change as described above under the proposed action heading.

Alternative 2

Consequences from this alternative are very similar to those of the proposed action, except for those associated with its emphasis on motorized recreation. With regard to water quality, none of the proposed motorized recreation areas is located within an area where surface water quality is impaired (category 4 or 5).

With regard to water quality, none of the proposed motorized recreation areas is located within an assessed problem area for surface water quality (category 4 or 5). The Santa Rita Motorized Recreation Land Use Zone area contributes to Cienega Creek, a category 1 (attaining all uses) water quality area managed by the Bureau of Land Management. The Santa Catalina Motorized Recreation Land Use Zone contributes to Tanque Verde Creek, a category 3 (inconclusive) stream, and the Pinaleño Motorized Land Use Zone has not yet been assessed.

Increasing motorized recreation typically loosens or compacts soil and removes or damages vegetation ground cover, which may increase erosion and sedimentation. This may have an indirect effect on Cienega Creek's water quality category, and change it from attaining all uses to category 2 (attaining some uses). Such a change would not be a significant effect, but it would downgrade the resource instead of moving forward to attain desired conditions.

None of the Motorized Recreation Land Use Zone areas is within or in proximity to perennial streams. No direct effects to surface water quantity are anticipated.

With alternative 2, there is a potential for off-highway vehicle trails and other facilities to be built in support of motorized recreation. Direct effects to watersheds from these activities include vegetation removal, soil compaction, erosion, and sedimentation and indirect effects include more upland sediments entering the stream zone, higher peak flood flows, and hydrologic modifications, such as channelization. This could result in moving watershed condition classes to a lower state of functionality, such as from functioning (class 1) to functioning at risk (class 2). Both the Santa Catalina and Santa Rita Motorized Recreation Land Use Zones have slivers of 6th HUC watersheds that are class 2. All of the Pinaleño Motorized Recreation Land Use Zone is in class 1 watershed condition.

A positive benefit to surface water management under alternative 2 would be the potential increase of roads, which, in turn, may augment the feasibility of mechanical treatment of watersheds that are in need of treatment.

Progress of achieving desired conditions in watersheds and water resources under alternative 2 would likely be accomplished in a similar timeframe as the proposed action, less quickly than alternative 1, and faster than the no-action alternative.

Alternative 2 provides no plan components for management of water resources to achieve resiliency and adaptation to changes that may result from warmer, drier climate conditions, which scientists

currently believe will affect the Southwest as global warming occurs. It does, however, incorporate the strategies for management of climate change described in appendix A of the revised plan, which recommend approaches to address key climate change factors, such as insects, disease, and fire that exacerbate the effects of climate change. Because of this, adverse effects of climate change on water resources under alternative 2 would be slightly greater than those resulting from direction under the proposed action and alternative 1 and slightly less than those resulting from the lack of direction in the no-action alternative.

Cumulative Effects

The timeframe for assessing cumulative effects on water resources is 15 years and the spatial bounds of analysis is the 6th hydrologic unit code watersheds on and off-forest, the latter being those that are affected by forest actions.

Actions by other entities that may contribute to cumulative effects include livestock grazing, prescribed and natural fires, wildfire suppression, recreation, mining, farming, wildlife management, watershed management, and activities associated with rural residential communities. These occurrences have contributed incrementally to effects that have changed ecological conditions on and off the Coronado, impacting water quality, water quantity, and watershed condition. Cumulative effects described in this section are common to all alternatives.

Historic heavy livestock grazing across the Coronado and in the region around the turn of the 20th century resulted in a reduction in native grasses and an increase in shrubs. In some areas, removal of vegetation by grazing resulted in soil loss and degraded watershed function. Best management practices to mitigate grazing effects have since been implemented, with a general improvement in conditions. The forest will manage livestock grazing on National Forest System lands to continue the trend of improving watershed conditions. Thus, while grazing by other non-forest entities may adversely impact the watersheds from offsite, these effects would not be exacerbated by increments contributed by Forest Service actions.

Historic fuelwood harvesting in the late 19th and early to mid-20th centuries has had similar effects to degrading watersheds by contributing to soil loss and an increase in shrubs. Best management practices for these activities have also had the effect of reversing this historic trend. Fuelwood harvest on the Coronado would continue to be managed according to plan direction that requires the use of best management practices. Therefore, with the application of best management practices, adverse effects on soils and shrub encroachment will be managed to minimize effects on the watershed. Thus, while fuelwood harvest outside the Coronado may adversely impact watersheds, these effects would not be exacerbated by increments contributed by Forest Service actions under any of the alternatives.

Wildfire suppression activities since the establishment of the national forest (circa 1908) have contributed to a trend of increased shrubs and overstocked trees. This trend incrementally has a negative effect on watershed function by altering hydrologic processes, such as water absorption, retention, and release of water in the watershed. Also, watershed stability can be reduced after uncharacteristic wildfires. The forest would manage future shrub encroachment and overstocking under each of the action alternatives, and to a lesser extent, prescriptions in the 1986 plan. Management of wildfire rather than suppression is also an option. This would decrease the potential for adverse effects on watershed function associated with the effects of suppression. Because impacts from forest management would be minimal, there is little potential for them to contribute significantly to cumulative effects.

Clearing brush and thinning overstocked trees on the Coronado in combination with the same activities off-forest may be a source of cumulative effects to water resources. These activities may include the use of mechanical treatment methods, chemical treatment methods that have been authorized based on a site-specific environmental analysis of the effects of such treatment, and fire. Short-term cumulative effects, such as fugitive dust emissions and erosion and sedimentation, would result from the ground-disturbing activities of mechanical clearing. It is possible, however to minimize

or mitigate these effect by using best management practices. In the long term, this action would encourage growth of vegetative ground cover, which would correspondingly improve watershed conditions. Because of this, forest management would not contribute to cumulative effects to watersheds.

Minerals exploration and mining activity have occurred on and adjacent to the Coronado during the last few centuries. Historic surface and underground mining is a ground-disturbing activity by definition and causes many effects, some irreversible, to the environment. Historic mining activity can have adverse effects on water quality caused by excess sediment and pollutants from areas of waste rock dumps or processed ore. Water quantities may also be impacted since large volumes of water are generally necessary for present day commercial mining activities. However, because the Coronado has numerous historic mining districts with historic mineral production, there is a potential that within the next few decades renewed exploration and extraction could occur. In combination with off-forest mining activity, mining on the Coronado may have cumulative adverse effects on water quality, water quantity, and watershed.

Rural development in the watersheds, such as homesteads and private developments, continues to result in vegetation loss, increased sedimentation, and runoff from roads and disturbed areas, and increased groundwater use. These actions contribute effects on the watersheds of the Coronado. Direction in the forest plan under all alternatives is designed to conserve vegetation and soils and manage groundwater withdrawals without depleting the resource. Therefore, although other agencies and entities may cause adverse effects to the watershed, they are not exacerbated by effects caused by forest management.

Offsite farming by multiple individuals may cumulatively affect the quality and quantity of water resources and watershed condition. Farming is not a valid use of National Forest System land. In areas adjacent to the Coronado in the upper portion of the Coronado watersheds, farming is uncommon. However, it is very substantial in the lower portions of the watershed outside the Coronado National Forest boundary. Farming impacts water quantity because irrigation uses large volumes of groundwater and diverted surface water. Farming also impacts water quality since agricultural chemicals and irrigation return flow can pollute surface and groundwater. Sedimentation from agricultural fields impacts the drainages downstream. In a cumulative sense, effects on groundwater and perennial streams would primarily result from off-forest actions, and any effects on watersheds from Coronado National Forest actions are unlikely to result in a cumulative effect.

Activities associated with a shared border between the United States and the Republic of Mexico is increasing impacts on watersheds. Undocumented immigrants crossing back and forth between the two countries have used the watersheds of the Coronado. They create foot trails, which impact soils, leave trash and debris, inadvertently start large wildfires, and leave gates open or cut fences, which allow livestock to drift to pastures that are resting. Border Patrol agents who seek and detain undocumented persons regularly use double-track roads or trails in large four-wheel-drive vehicles and off-highway vehicles in locations that have historically had little use. Future activities could include construction of lookout towers, fences or barriers, and new roads, using new or existing roads as drag roads, and other activities surrounding surveillance techniques. These disturbances adversely affect soils in the watershed, causing sedimentation in streams and loss of or damage to vegetation. Forest management of surface waters would not contribute to the cumulative effects on watersheds that result from border management.

Off-forest motorized recreation impacts watersheds and water resources when vehicles are driven on unpaved roads. Loose soils eventually deposit as sediment in stream channels. Off-road motorized recreation also damages soils and vegetation, which contributes to watershed health. Direction in the revised forest plan focuses motorized recreation in a land use zone in previously disturbed areas to prevent impacts on soils, vegetation, and watershed. As this outdoor recreation activity grows in popularity, irresponsible use will lead to the creation of more unauthorized roads, which can have a negative impact on select portions of watersheds. Because of management direction for motorized

recreation, the Coronado's contribution to cumulative effects on watersheds caused by motorized recreation will be relatively low.

Air Quality – Affected Environment

Standards and Regulations

The Clean Air Act of 1963 (Public Law 88-2006) authorized the Public Health Service, in the Federal Health and Welfare Department, to set standards for auto emissions, expanded local air pollution control programs, established air quality control regions, set air quality standards and compliance deadlines for stationary source emissions, and authorized research on low emissions fuels and automobiles.

In 1970, amendments to the Clean Air Act required the recently created Environmental Protection Agency (EPA) to establish national ambient air quality standards (NAAQS) to protect public health. The standards are dynamic in that they change with the emergence of new pollution prevention and monitoring technology and scientific knowledge about effects. Today, there are six criteria pollutants for which standards have been set:

1. Carbon monoxide
2. Lead
3. Nitrogen dioxide [32]
4. Particulate matter less than 10 micrometers in diameter (PM_{10}) and particulate matter smaller than 2.5 micrometers in diameter ($PM_{2.5}$)
5. Ozone
6. Sulfur dioxide

These are known as "primary" national ambient air quality standards, and they establish the maximum average volume (concentration) of each pollutant acceptable for inhalation by sensitive populations, such as people with asthma, young children, and the elderly, over a given period of time. "Secondary" standards have also been established for certain criteria pollutants to protect the "public welfare from adverse effects to visibility, building integrity, plants, and animals" (U.S. EPA 2011).

Subsequent amendments to the Clean Air Act (1977 and 1990) established prevention of significant deterioration regulations that apply to designated pristine natural areas nationwide; pollutants that contribute to regional haze and visibility impairment, especially sulfates and nitrates; and wet and dry deposition of chemical elements and compounds that can adversely affect natural resources in forest ecosystems (acid precipitation).

Natural events that decrease visibility include volcanic and seismic activity, wildfires, high winds, tornadoes, and hurricanes, among others. Natural visibility conditions and efforts to attain the national visibility goal of "no anthropogenic (manmade) impairment" by 2064 are defined in the Regional Haze Rule (40 CFR Part 51) and further documented in state implementation plans.

States are in the process of developing milestones for visibility improvements to reach natural conditions. Both Arizona and New Mexico have established Regional Haze State Implementation Plans (ADEQ 2011 and NMED 2010) designed to remediate current impairments of visibility, including smoke and smog, and to prevent future impairment. The State implementation plans establish acceptable levels of criteria pollutants that affect visibility, such as particulate matter, and

[32] Nitrogen dioxide is an ozone precursor, meaning it breaks down into ozone over time.

other chemical elements and compounds, such as mercury, sulfates, and nitrates. Both plans are under review and pending approval by the Environmental Protection Agency.

The Coronado's responsibility with regard to visibility involves coordination with the Environmental Protection Agency and State, county, and tribal air regulatory agencies in managing and mitigating the emissions of air pollutants resulting from Forest Service activities, such as the application of planned fire ignitions.[33] If conditions prescribed by the Regional Haze Rule and Arizona and New Mexico regional haze implementation plans (when approved by the Environmental Protection Agency) are met, visibility is expected to improve over time on, and outside, the Coronado.

Climate

The Coronado National Forest has a unique range of climates induced by the complex topography of southeastern Arizona. The generally arid region is punctuated by discrete mountain ranges (the sky islands). Precipitation and temperature values vary considerably between the low desert areas and the subalpine environments of the mountain ranges. Temperature decreases with elevation on average in the lower atmosphere; therefore, higher elevation areas will experience lower average temperatures than the low desert areas.

Precipitation typically increases with elevation in mountainous areas because of orographic lifting (upslope flow) of moisture-containing air masses. The average total annual precipitation for the region is 15.6 inches (39.5 centimeters) while the annual average temperature is 62.4 degrees Fahrenheit (16.9 degrees Celsius). These values represent the average conditions for Pima, Cochise, Santa Cruz, and Graham Counties in southeast Arizona and Hidalgo County in southwest New Mexico.

The role of topography in controlling surface climate is well illustrated in examining climate data from two weather stations located close to each other, but at different elevations. Weather stations at Tucson International Airport and at Palisades Ranger Station on the Coronado are within 25 miles of each other, but differ by 5,000 feet in elevation. This difference accounts for the dramatic differences in temperature and precipitation shown in table 70.

Table 70. Climatic data from Tucson International Airport and Palisades Ranger Station on the Coronado National Forest

Location	Elevation	Average Maximum Temperature	Average Minimum Temperature	Average Total Precipitation	Average Total Snowfall
Tucson Airport	2,562 feet (780 m)	82 °F (28 °C)	55 °F (13 °C)	12 inches (30 cm)	1 inch (3 cm)
Palisades Ranger Station	7,959 feet (2,426 m)	59 °F (15 °C)	34 °F (1 °C)	31 inches (79 cm)	78 inches (197 cm)

Class I, Sensitive Areas

The 1977 Clean Air Act amendments established provisions to facilitate the prevention of significant deterioration of air quality in areas currently attaining the national ambient air quality standards. They also contained requirements pertaining to pollution sources in nonattainment areas for the standards. A nonattainment area is a geographic area that does not meet one or more of the Federal air quality standards. Initial classifications of attainment areas were either class I or class II. Class I areas include international parks, national wilderness areas exceeding 5,000 acres in size, national memorial parks

[33] See the Arizona Department of Environmental Quality website: http://www.azdeq.gov/environ/air/smoke/download/prules.pdf

exceeding 5,000 acres in size, and national parks exceeding 6,000 acres. Class II areas comprise all the remaining areas that are not class I.

The Clean Air Act affords class I areas the highest level of protection from air quality degradation. It requires that projects with the potential to affect class I areas be designed to minimize or avoid deterioration of ambient air quality and air quality related attributes. The 1977 amendments established major permit review requirements for new pollutant sources to ensure the future attainment and maintenance of the national ambient air quality standards in class I areas.

Visibility is a highly important attribute of class I areas, and the reduction of haze is a management objective for improving and maintaining visibility in these areas. Such areas in and near the Coronado are the Galiuro Wilderness, Chiricahua Wilderness, Chiricahua National Monument Wilderness, and Saguaro National Park (see figure 4). Two other class I areas, the Superstition Wilderness and the Gila Wilderness, are farther away from the Coronado but close enough that activities on Coronado National Forest lands could affect their air quality. The Superstition Wilderness is on the Tonto National Forest approximately 50 miles to the north and the Gila Wilderness is on the Gila National Forest approximately 80 miles to the northeast.

Air Quality Conditions and Trends

The Arizona Department of Environmental Quality defines 11 geographical areas having similar hydrology, topography, and localized meteorological conditions as smoke management units or airsheds (figure 4). Ranger districts of the Coronado National Forest are in four airsheds: Upper Gila River (7), Mexico Drainage (8), Gila River (9), and Lower Colorado (11). Wildfires regularly impact airshed 7, 8, and 9, and less frequently, 11.

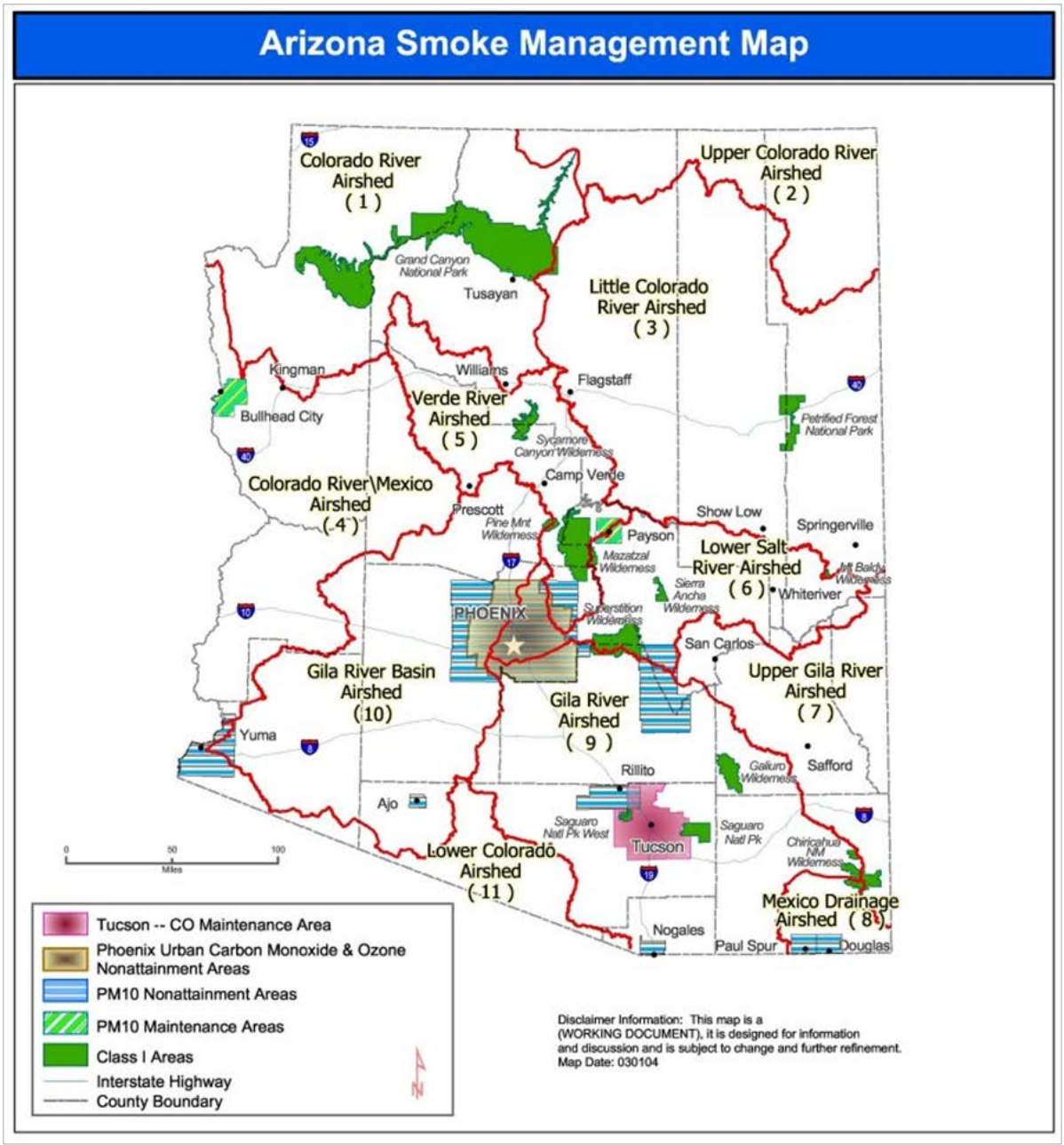

Figure 4. Airsheds, nonattainment areas, and class I areas in Arizona
(Source: Arizona Department of Environmental Quality[34])

Nonattainment Areas

An area for which monitoring of ambient air indicates a violation of one or more primary national ambient air quality standards is labeled as "nonattainment." "Maintenance areas" are those that were at one time classified as nonattainment and currently meet the standards. A strategy to ensure continued maintenance of their attainment status is prescribed in an EPA-approved planning document

[34] http://www.azdeq.gov/environ/air/smoke/download/burn_inst.pdf

unique to each maintenance area. All other areas are either "attainment" or listed as "unclassified" because of a lack of monitoring data.

The Environmental Protection Agency reports nonattainment areas annually in the Federal Register (40 CFR 81 – Designation of Areas for Air Quality Planning Purposes) and on its website. State and local air monitoring stations measure ambient concentrations for all primary pollutants. In Arizona, particulate matter (PM_{10}) nonattainment areas are Paul Spur/Douglas in Cochise County, Rillito in Pima County, and Nogales in Santa Cruz County, which is a nonattainment area for $PM_{2.5}$. In New Mexico, one PM_{10} nonattainment area is the Anthony PM_{10} in the southeastern corner of Doña Ana County, along the border with Mexico. Air quality there is influenced by two nearby urban areas to the east at Ciudad Juárez, Mexico, and El Paso, Texas (U.S. EPA 2012). The New Mexico PM_{10} nonattainment area is not near enough to be affected by management activities on the Coronado under most circumstances. There are no nonattainment areas for the other criteria pollutants in the Arizona and New Mexico areas near the Coronado.

Because it is highly urbanized relative to other Arizona counties in which the Coronado is located (Cochise, Santa Cruz, Graham, Pinal), Pima County has the most significant sources of air pollutants that contribute to cumulative effects in the planning area. Real-time monitoring data are available at the "Air Info Now" website of the Pima County Department of Environmental Quality (PDEQ).[35]

Air quality standards are largely attained in Pima County, although ambient ozone concentrations are very close to maximum levels. The $PM_{2.5}$ standard has not been exceeded in Pima County since monitoring began in 1999. Nitrogen dioxide concentrations average about 30 percent of the standard, and sulphur dioxide concentrations average about 7 percent of the standard in Pima County. There has been little change in their concentrations over 15 years. Carbon monoxide concentrations have been declining in Pima County and are currently about 20 percent of the standard (PDEQ 2009). The Santa Catalina Motorized Recreation Land Use Zone proposed by alternative 2 is directly east of the carbon monoxide maintenance area in Pima County. The sulphur dioxide maintenance area of Morenci is located approximately 30 miles to the northeast of the Pinaleño Motorized Recreation Land Use Zone proposed by alternative 2.

Hidalgo County in New Mexico, in which a small part of the Coronado is located, is very rural in nature and does not have its own air monitoring Web site. Typical pollutants here include windblown dust (particulate matter) and emissions from agricultural and vehicle activities. Real-time data for ozone, nitrogen oxides, and particulate matter concentrations are collected east of Hidalgo County near Deming, New Mexico, in Luna County. Ozone and sulphur dioxide are measured to the northeast near Hurley, New Mexico. Data are reported on the Internet[36] by the New Mexico Environment Department.

Visibility and Acid Rain

One of the most basic forms of air pollution—haze—degrades visibility and aesthetic vistas in many American cities and scenic areas. Haze results when sunlight encounters tiny pollutant particles in the air, which reduce the clarity and color of what we see, particularly during humid conditions. Chemical compounds in fine particles that most impair visibility are sulfates, nitrates, organic compounds, elemental carbon (or soot), and soil dust. Fine particles ($PM_{2.5}$) are more efficient at impairing visibility than coarse particles (PM_{10} and larger) (USDA FS 2002). Because of the arid climate in the Southwest and the lack of industrial sources of pollutants, visibility is generally better than in most other areas of the U.S. Nevertheless, with population growth and more vehicles on the road, the

[35] http://www.airinfonow.org/html/data.html

[36] http://air.nmenv.state.nm.us/stationStatus.php?stationNo=90

natural range of visibility in the western U.S. has decreased from 140 miles to a range of 35 to 90 miles.[37]

Wildfires and windblown dust are natural sources of emissions that affect visibility. Windblown dust originates from motor vehicle travel (especially on dirt roads), agriculture, off-highway vehicle use, and planned fire ignitions. Wildland fires are the result of natural ignitions (lightning) or human-caused ignitions. Depending on its severity, timing, duration, and type and condition of vegetation consumed, wildfires of extreme intensity often increase smoke and haze well above natural levels.

Pollutants that contribute to visibility impairment, especially sulfates and nitrates that deposit in the ecosystem, cause acidification of lakes and streams, nutrient enrichment of coastal waters and large river basins, soil nutrient depletion and decline of sensitive forests, agricultural crop damage, and impacts on ecosystem biodiversity. Policy makers, land managers, and/or regulatory agencies establish "target loads" of various pollutants to protect sensitive ecosystem components in specific areas. A target load is defined by a calculated "critical load"—the maximum deposition of visibility-related pollutants below which significant harmful ecological effects are not expected to occur. The critical load is established in consideration of the expected ecosystem response to a given deposition level. A target load may be higher or lower than the critical load, depending on the economic cost of emissions reductions, timeframe, and other considerations. Critical loads have been calculated for many ecosystems in the United States, including northeastern forests and high elevation lakes in the mountain west.[38]

In response to amendments to the Clean Air Act in 1977, which required the development of Federal and state implementation plans for the protection of visibility in class I areas, an Interagency Monitoring of Protected Visual Environments (IMPROVE) network[39] was established in 1985. IMPROVE implemented an extensive long-term monitoring program to define current visibility conditions, track changes in visibility, and determine causal mechanism for visibility impairment in national parks and wilderness areas. Visibility-related data is collected by IMPROVE at two monitoring stations in southeastern Arizona: Chiricahua National Monument and Saguaro National Park.[40] There are no IMPROVE sites in Hidalgo County, New Mexico; however, the Chiricahua site in Arizona is in close proximity to the county.

Another group of agencies, academic institutions, private companies, and nongovernmental organizations collaborate in the National Atmospheric Deposition Program (NADP) National Trends Network (NTN),[41] which monitors ambient precipitation chemistry nationwide. One NADP station is located at the Chiricahua National Monument next to the Coronado National Forest. There are no stations in the portion of the Coronado in southwest New Mexico; however, data from the Chiricahua site may be relevant there because of its close proximity to New Mexico. One New Mexico monitoring site is located north of Hidalgo County.

Sulfate concentrations in precipitation have decreased nationwide over the past 2 decades, especially in the eastern U.S., where many industrial sources have been subject to emissions control established by the Environmental Protection Agency under the Acid Rain Program.[42] While sulfur emissions have

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[37] http://www.epa.gov/visibility/what.html

[38] http://www.nrs.fs.fed.us/clean_air_water/clean_water/critical_loads/faq/#5

[39] Members include the EPA, National Park Service (NPS), USDA Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), and State and Territorial Air Pollution Program Administrators (STAPPA). See http://www.epa.gov/ttnamti1/visdata.html

[40] See http://vista.cira.colostate.edu/improve/Overview/IMPROVEProgram_files/frame.htm

[41] http://nadp.sws.uiuc.edu/nadp/

[42] Lynch et al. 1995.

declined in the eastern United States, especially in the northeast, nitrogen deposition has continued to increase in the West (Potter and Huber 2007).

In 2009 (the most recent available data), the precipitation-weighted mean concentration of nitrates at the Chiricahua site was 0.85 milligrams per liter (mg/L) and 0.60 milligrams per liter for sulfate. In 2009, the site had nitrate and sulfate concentrations that were 0.02 milligrams per liter and 0.17 milligrams per liter above 2008 data, respectively. However, these concentrations are relatively low when compared to those reported in the Midwest and Northeast, which are well over 10 milligrams per liter and there is insufficient data available for scientists to predict a trend.

Air Quality – Environmental Consequences

Sources of Emissions

The following section compares the potential effects to air quality from direction given in the 1986 plan (no action) and direction under the proposed action and alternatives. Potential sources of emissions on the Coronado may result from the following activities.

Vehicle and heavy equipment operation, including on- and off-road travel and recreational vehicle use, release combustion gases (exhaust) and particulates to the air, both of which contribute to ambient concentrations of pollutants regulated by the national ambient air quality standards. While most emissions are confined locally and are temporary, large road or facility construction projects and sizeable mining operations, such as the Rosemont Copper Project, will contribute enough particulates over extensive periods of time to negatively affect ambient concentrations. Quantifiable concentrations of pollutant emission would be calculated during every site-specific environmental review of future proposed actions.

Mechanical treatment of vegetation is used to reduce high concentrations of fuels in the forest understory, which, in turn, lowers the risk of severe wildfire and its effects on the health and safety of fire management personnel, and improves habitat for a variety of species. It is often used in advance of planned fire ignitions to remove the woody debris and plant material on the forest floor. Operation of chainsaws and chippers releases exhaust and particulates to the air, and burning the larger branches, twigs and other woody debris, referred to as “slash” generates smoke, the effects of which are discussed below.

Planned fire ignitions are conducted on the Coronado to achieve land and resource management objectives. Planned ignitions are used to mimic natural reference (pre-European settlement) fire conditions and move the ecosystem toward a desired vegetation condition that supports recurring wildland fire.

Both planned and unplanned fire ignitions release smoke in amounts relative to the amount of fuels consumed, type of fuels, moisture, area burned, and duration, and in which combustion gases and various diameter particulates are released to ambient air. The predominant pollutant in smoke is fine particulate matter, both PM_{10} and $PM_{2.5}$. Studies indicate that 90 percent of all smoke particles from wildfires is PM_{10}, and that 90 percent of the PM_{10} is $PM_{2.5}$ (Ward and Hardy 1991).

$PM_{2.5}$ in smoke is of paramount importance because these fine particles are known to lodge deep in the human respiratory system and are quite difficult to expel (USDA FS 2002). Consequently, they can have significant impacts on the health and well-being of sensitive populations, such as the elderly, young children, and persons with lung disease or compromised immune systems. Carbon monoxide released by combustion generates localized increments to ambient air, which present a health and safety concern for fire personnel; and nitrogen oxides, which are chemical precursors to the formation of ozone.

Smoke is managed by the Coronado National Forest in accordance with Arizona Department of Environmental Quality and New Mexico Environmental Department regulations established under the

Clean Air Act (e.g., visibility and criteria pollutants). Wildfires are considered “natural events” and, as such, are exempt from Clean Air Act regulations.

Coronado staff coordinate with the Arizona Department of Environmental Quality, New Mexico Environmental Department, or both before planned fire ignitions are applied to the landscape to ensure that various factors that influence the volume of smoke emissions are addressed appropriately by mitigation or avoidance to minimize adverse effects (USDA FS 2002). In general, every planned fire ignition is planned to emit pollutants in concentrations that will not adversely impact air quality by defining the size of the burn area and weather conditions under which burning is acceptable, with the Arizona Department of Environmental Quality and New Mexico Environmental Department approval.

Effects Common to All Alternatives

The 1986 forest plan requires that every Coronado National Forest action be designed to comply with the national ambient air quality standards and any other applicable air quality regulations. It also specifies best management practices be applied to activities that generate air pollutants to reduce or mitigate potential adverse impacts. The three action alternatives propose equivalent air quality protection. Therefore, there is no difference among the alternatives with regard to protection of ambient air quality and effects on human health.

Given the mandate of the 1872 Mining Act, the Forest Service must consider all proposals for minerals exploration and mining on public land. Regardless of which alternative is implemented, large-scale mining actions on the Coronado, such as the Rosemont Copper Project, will be managed to mitigate or avoid adverse impacts to air quality and to maintain target loads for pollutants that impair visibility and adversely affect ecosystem resources by acid deposition.

Under all alternatives, wildland fires will continue to occur on the Coronado and will be managed according to policy and guidance set forth under the alternative. Smoke from wildland fires may travel large distances, impairing local and regional visibility, and degrading air quality far from their point of origin, depending on topography and atmospheric conditions—in particular, wind speed and direction. In the case of uncharacteristic wildfire, ambient concentrations of criteria pollutants may increase beyond the national ambient air quality standards in the local and possibly regional airshed, regardless of which revised forest plan is in effect. Thus, any adverse health effects on sensitive populations would be equal for all alternatives.

Application of planned and unplanned ignitions will adhere to the protocols required by the 1986 plan, which are reiterated in the action alternatives. Therefore, there would be no difference among the alternatives in effects on regional haze and visibility in designated class I attainment areas.

No Action

The 1986 plan includes standards and guidelines that require all site-specific actions to be planned to continue to attain local, State, and Federal ambient air quality standards. It also includes guidelines for mitigating fugitive dust during ground-disturbing activities, including motor vehicle travel on and off roads.

The plan, however, does not establish goals or objectives (i.e., desired conditions) related to air-quality values; for example, it lacks a goal to “achieve high quality visual conditions for class I attainment areas.” The 1986 forest plan does not provide direction on approaches to future management of air quality.

The no-action alternative does not provide direction to address management of resources in response to climate change. Climate change and air pollution are closely coupled. Climate change does not affect air quality, but deterioration of air quality exacerbates climate change. Just as air pollution may have adverse effects on ecosystems and human health, it may also affect the earth’s climate. This occurs when atmospheric greenhouse gases like carbon dioxide and methane trap solar energy that is not absorbed by the planet and is typically radiated back into space. The result is climate change,

which affects temperature and rainfall patterns. The close connection between climate and air quality is also reflected in the impacts of climate change on air pollution levels. Ozone and particle pollution are strongly influenced by shifts in the weather (e.g., heat waves or droughts). Without forest plan direction that manages air quality relative to its potential exacerbation of greenhouse gas emissions, Coronado National Forest activities and uses would add an increment of pollutants that contribute to global warming.

Proposed Action

The revised forest plan includes specific direction toward achieving desired conditions. For example, "air quality above the Coronado National Forest meets State air quality standards, including visibility and public health. Air quality-related values, including high quality visual conditions, are maintained within the class I airsheds in the Galiuro and Chiricahua Wildernesses."

The revised forest plan identifies the following approaches to managing future air quality:

- Participating with the states of Arizona and New Mexico in the air quality regulatory process by reviewing air permit applications for new and modified industrial facilities to ensure that their air emissions do not adversely impact air quality-related values, such as visibility, ozone exposure, and atmospheric deposition, in wilderness areas.
- Considering class I and class II airsheds when determining an appropriate response to wildfire.
- Managing and coordinating the timing, duration, and frequency of planned fire ignitions across the forest to minimize impacts to regional air quality.

In contrast to the status quo supported by the 1986 plan, the proposed action provides direction that emphasizes public health and visibility as desired conditions. This better aligns forest management with the goals and objectives of the Clean Air Act and its amendments, the Regional Haze Rule, and Arizona and New Mexico state implementation plans.

The proposed action recommends designation of four wilderness areas on the Coronado (Ku Chish, Whetstone, Mount Graham, and Chiricahua Addition North) and reiterates the 1986 plan recommendation for designation of the Mount Graham Wilderness Study Area as wilderness. Restrictions on the use of internal combustion engines on vehicles and equipment would not change for the Mount Graham Recommended Wilderness Area, because it is already managed to preserve wilderness characteristics. Thus, the effects of the no-action alternative and the proposed action on air quality would remain the same with regard to Mount Graham.

Although wilderness management is not currently required at Ku Chish, Whetstone, Mount Graham, and Chiricahua Addition North, the ruggedness of the area makes the use of vehicles and equipment difficult, if not impossible. Thus, air quality in this area is currently quite good, and with the wilderness recommendation by the proposed action, no measurable change in emissions is likely to result from application of new restrictions on vehicle and equipment use.

Wilderness restrictions on motorized and mechanized uses may affect the progress of upland watershed improvement projects (fuel treatments). In this case, there would be a very minimal increase in the probability of uncharacteristic wildfire occurring within these areas. The smoke and airborne pollutants from fires may cause short-term visibility impacts in nearby class I areas, including the Chiricahua and Galiuro Wilderness areas on the Coronado and the Gila Wilderness and Saguaro National Park. However, dispersion and dilution would reduce ambient concentrations of criteria pollutants to levels that would not compromise attainment.

As discussed under the "No Action" heading above, climate change and air pollution are closely linked. Climate change does not affect air quality, but deterioration of air quality exacerbates climate change. The revised forest plan under the proposed action provides direction for the management of air quality to minimize emissions of pollutants from forest actions and uses that contribute to global warming and, hence, climate change. It also recommends designation of four new wilderness areas,

where restrictions on motorized and mechanized uses would decrease the contribution of vehicle and equipment exhaust emissions, which include greenhouse gases, to global warming.

The proposed action recommends the new Finger Rock Canyon Research Natural Area, where climate change signs and effects will be monitored, along with other unrelated research and studies. The data and information gained by monitoring climate-change influences and effects will contribute to the identification and effectiveness of new approaches to foster adaptation and resiliency in Coronado National Forest resources.

Alternative 1

Alternative 1would have the same effects on air quality as the proposed action and would result in additional beneficial effects from managing 16 additional parcels for wilderness character. Direct effects on air quality caused by the use of internal combustion engines, vehicle travel, construction and maintenance of roads, and other ground-disturbing activities, such as mechanical treatments of fuels, would decrease because of wilderness restrictions. These direct benefits would more than offset the very small indirect effect from restricted access and equipment use that may increase the probability of uncharacteristic wildfire and adverse effects from smoke on ambient air quality and visibility. Therefore, qualitatively, alternative 1 is more likely than the other alternatives to move the air quality in the forest ecosystem toward desired conditions.

Alternative 1 provides the same direction as the proposed action with regard to management of pollutant emissions that contribute to global warming and a recommendation for designation of the Finger Rock Canyon Research Natural Area. In addition, alternative 1 recommends designation of approximately 255,908 acres of the Coronado as new wilderness, where restrictions on motorized and mechanized uses would greatly decrease the contribution of vehicle and equipment exhaust emissions, which include greenhouse gases, to global warming. Because of this recommendation, alternative 1 would be the most effective among the alternatives at reducing the incremental contribution from the Coronado to global warming.

Alternative 2

Effects on air quality from alternative 2 would be the same as those of the proposed action, with a few exceptions. The primary difference between alternative 2 and the others with regard to effects on air quality is that emissions of fugitive dust and exhaust from recreational vehicle use and construction of related facilities, including off-highway vehicle trails, would increase with alternative 2, because it proposes to allocate 40,255 acres more to the Motorized Recreation Land Use Zone than the proposed action and alternative 1.

None of the proposed Motorized Recreation Land Use Zones in the Santa Catalina, Santa Rita, and Pinaleño Ecosystem Management Areas (see figure 2, page 7) are within either a nonattainment or maintenance area. Class I areas are within the area of potential effect of all three Motorized Recreation Land Use Zones. While emissions are expected to degrade local ambient air quality over temporary periods of activity, quantification of the increments of pollutants that would be emitted is not possible. Given the localized nature of emissions, it is unlikely that increments of pollutants would exacerbate ambient concentrations to the extent that national ambient air quality standards are violated. Site-specific environmental reviews would be used to evaluate potential effects on nonattainment, maintenance, and class I areas at the time individual projects are proposed.

Because alternative 2 recommends only the Mount Graham Wilderness Study area (61,315 acres) for wilderness, the decrease in vehicle and equipment exhaust emissions expected under the proposed action and alternative 1 would be less than under alternative 2. This would result in a minimal increase in emissions from these sources that is not quantifiable at the programmatic level. Site-specific emissions will be addressed after projects are proposed in the future. Effects of emissions and consequent effects on air quality related to wilderness designations would be equivalent for no action

and alternative 2 because both propose the continued management of the Mount Graham Recommended Wilderness Area for wilderness values.

Potential benefits of alternative 2 could be that forest vegetation treatments using vehicles and mechanized equipment would not be restricted, and the very slight increase in the probability of uncharacteristic wildfire occurrence, with associated smoke and visibility impacts, would not result. Effects of emissions and consequent effects on air quality related to wilderness designations would be equivalent for no action and alternative 2 because both propose the continued management of the Mount Graham Recommended Wilderness Area for wilderness values.

Indirect effects on ambient air quality would result from airborne dust generated by wind erosion of land and vegetation cleared for development of motorized recreation trails and facilities. Temporary, localized increases in exhaust pollutants, including particulates, from construction vehicle and equipment use would result. An increase of roads and trails in the Motorized Recreation Land Use Zone may improve access to currently inaccessible areas that are in need of fuels treatment.

Because of the adverse effects that motorized recreation would have on ambient air quality, alternative 2 would move the forest ecosystems toward desired conditions more slowly than the proposed action and alternative 1, and about equally if no action is taken.

Alternative 2 provides the same direction as the proposed action with regard to management of pollutant emissions that contribute to global warming. However, because it recommends specific areas on the Coronado for motorized recreational use, vehicle exhaust emissions of greenhouse gases would likely be more than any of the other alternatives. The newly designated zones would make land available for facilities that support motorized vehicle use as well as additional trails and courses. Therefore, it is highly unlikely that motorized use would not increase if motorized use zones are designated and would continue at its current level. Alternative 2 also does not recommend designation of the Finger Rock Canyon Research Natural Area, where climate change research is anticipated.

Cumulative Effects

The following text provides a qualitative assessment of the potential cumulative effects of forest plan direction for each alternative over a 15-year plan lifetime, inclusive of Coronado and nearby airsheds and class I areas. Sources of pollutant emissions from the Coronado were listed above.

Non-Forest Sources of Emissions

Off-forest sources of emissions that may contribute additively to cumulative effects are those that would disturb soils, such as residential and commercial development, mining, minerals exploration projects, and road construction. Vehicle travel on adjacent roads and highways and agricultural activities (which produce exhaust gases and fugitive dust), industrial facilities from which point-source (e.g., smokestack) pollutant emissions are released, and smoke from fires on land under private or other agency jurisdiction also contribute to cumulative effects. Of these, the activities most likely to contribute to cumulative air quality, when considered additively with forest actions, are mining, road construction, and vehicle travel.

Population growth in the Southwest is expected to continue over the life of the forest plan. Areas adjacent to the Coronado, especially the Tucson metropolitan area, would continue to be very attractive to those wishing to relocate to a warmer climate. With projected growth, new construction of residential and commercial developments and roads is likely, and new ground disturbances would contribute additional fugitive dust to the ambient air. Likewise, an influx of more people would trigger more vehicle travel on local roads, increasing exhaust and dust emissions in the area impacts. Future proposed actions on the Coronado would be evaluated to determine if, when added to nonforest sources, they would exacerbate attainment or increase haze and decrease visibility in both the local airshed and in class I areas

Mining and minerals exploration are expected to increase over the life of the plan, as the market value of copper and other mineral resources rises. Mining and exploration on public lands must be considered for approval under the Mining Act of 1872. Many currently undeveloped areas of locatable mineral deposits on and off the national forest may be explored and/or mined, including those in the Santa Rita, Dragoon, and Huachuca Ecosystem Management Areas. New mining activities may release large quantities of fugitive dust during the life of the plan from vehicle and equipment travel, ground disturbance for construction of processing facilities, and blasting, drilling, and mechanical extraction of ore. Minerals exploration activities would affect air quality from fugitive dust from vehicle and equipment use. Because both exploration and mining proposals would be evaluated on a site-specific basis for potential effects on local air quality and class I areas, there is no difference among the alternatives with regard to their cumulative effects.

Grazing on and off the Coronado would continue to add increments of greenhouse gases to the ambient air. Greenhouse gas contributions from grazing include methane gas released by livestock; managed livestock waste used as an amendment for crops emits methane and nitrous oxide; and nitrous oxide released by soils on grazed lands, as constituents in unmanaged waste and forage legumes affect the nitrogen cycle (USDA FS 2011a). However, agricultural activities on and off the Coronado are not expected to expand significantly during the analysis period. Therefore, while the listed emissions would continue, cumulative effects on the environment would not likely increase.

Industrial sources of air pollutants near the Coronado include power plants, factories, a smelter, and other facilities that release pollutants from a single point. Air emissions from each of these are regulated under permits by the state and local environmental agencies. Therefore, if new significant sources of this kind are proposed, the increment of criteria pollutants, greenhouse gases, and hazardous substances would be reviewed by regulators. Mitigation and monitoring would be required to ensure continued attainment of the national ambient air quality standards. No sources of industrial emissions are generated by forest activities. Therefore, the Coronado would not contribute to adverse impacts if new or expanded industrial sources are developed.

Planned and unplanned fire ignitions may produce smoke, from which primary, secondary, and hazardous pollutants are released to the atmosphere. Planned ignitions are applied under the direction of a Federal, state, or local land management agency after consideration of variables such as weather, acreage to be treated, type and condition of fuels, and duration, among other factors. Authorization for planned ignitions by the States of Arizona or New Mexico is based, in part, on consideration of the potential for cumulative effects from smoke with other activities planned during a concurrent timeframe. Therefore, the potential for significant cumulative effects from planned ignitions is largely avoided or in some cases, mitigated by adherence to the enhanced smoke management program in the State implementation plan.

The occurrence and extent of wildfire are not predictable, and when uncharacteristic fires occur, their high intensity may result in temporary violations of the national ambient air quality standards in the affected airshed(s). The effects of wildfires are not considered additive with planned forest activities because they are unplanned events.

Conclusion

Both nonforest and forest actions would release criteria pollutants to ambient air. Direction requiring compliance with all air quality regulations is given in each of the alternatives and the 1986 plan. Therefore, there would be no difference among them with regard to their future additive effects on air quality, when other sources of emissions are considered. The alternatives identify goals and approaches for managing air quality related values in class I areas. The 1986 plan does not. Generally, the three action alternatives would better provide for management of air quality than the 1986 plan.

Alternative 2 provides for an expanded Motorized Recreation Land Use Zone, which is relatively small (45,117 acres or about 3 percent) relative to the 1.7 million-acre Coronado National Forest National Forest. While increased vehicle exhaust emissions and fugitive dust would contribute to

short-term local increases in ambient concentrations of criteria pollutants, their contribution would not be measurable at the national forest scale. Although the increase would be minimal and have little impact on the Coronado, these small increases, when combined by off-forest emissions of the same, would additively affect local concentrations of greenhouse gases, adding an increment to one of the stressors that exacerbate climate change.

Climate Change – Affected Environment

Climate change has become one of the biggest issues of this generation. The major scientific agencies of the United States—including the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA)—agree that climate change is occurring and that humans are contributing to it.[43] In tandem with efforts in the private and public sector, the Forest Service has been proactive in adopting strategies for managing National Forest System resources to increase their ability to adapt and become resilient to the effects of climate change. Examples of this are thinning extremely dense stands of trees and managing each unit's fleet to reduce greenhouse gas emissions.

The following discussion describes the potential effects of climate change on forest resources, briefly assesses potential changes in greenhouse gas emissions from forest activities, and evaluates how well the direction under each of the alternatives fosters adaptation and resiliency in resources vulnerable to climate change related effects. More information may be found in the Southwestern Region Climate Change Trends and Forest Planning (USDA FS 2010c) and the ecological sustainability report (USDA FS 2009b), as well as an edited summary document from the Climate Assessment for the Southwest (CLIMAS; Lenart 2007).

Climate scientists agree that the earth is undergoing a warming trend ("global warming," one aspect of climate change), and that human-caused elevations in atmospheric concentrations of carbon dioxide and other greenhouse gases are among the causes of global temperature increases. This trend is expected to increase. Carbon dioxide is released during natural processes and human activities, such as combustion of fossil fuels. It is considered an atmospheric emission (source) as well as an input to ecological functions (sinks). The role of carbon dioxide is as a contribution to storage of carbon or a release of carbon, depending on a complicated and interrelated set of chemical and physical processes. These processes are essential to the forest ecosystem, because they provide energy for plants and wildlife and recycle nutrients during decomposition and disturbances such as fire. Carbon dioxide emissions from human sources are not regulated under the Clean Air Act.

Climate change is not just a predicted future event—it is happening now—having been documented extensively in the literature. However, the state of knowledge needed to address climate change at the national forest scale is still evolving, and there are both certainties and uncertainties about it. What is certain, based on real-time data and model agreement by climatologists, is that:

1. there is and will continue to be an increase in mean annual temperature;
2. there is and will continue to be a decrease in mean annual precipitation during the winter and spring rainy season; and
3. there will be an overall increase in rate of evapotranspiration (loss of water through the atmosphere) (Lenart 2007).

These certainties are among the reasons for recent repeated winter drought cycles.

The primary uncertainty with regard to climate in the American Southwest is what will happen during the second, generally more substantial, rainy season. Regarding the monsoon of Arizona and New Mexico (the summer rainy season marked by a shift in winds), recent data are widely variable, and

[43] http://epa.gov/climatechange/facts.html

predictions of the amount of rainfall during future monsoons is largely speculative. Models cover the gamut, and year-to-year predictions are variable and not necessarily consistent with global weather patterns, such as El Niño and La Niña.

Even though summer rains may be substantial, they are more widely scattered and more intense than winter rains, causing heavy surface runoff, which erodes soils and vegetation. Several models predict an increase in annual precipitation during future monsoons, but it is uncertain whether summer rains can offset the effects of a dry winter. During late winter, melting snowpack recharges groundwater, which supports the success of spring plant communities.

Managing resources during climate change is challenging, but by reducing stressors and applying adaptive management principles, the Coronado can minimize overall effects. Most Federal land management agencies are fully aware of the potential effects of climate change on natural resources, and many are conducting research and coordinating management responses with each other, often with partner organizations.

Multiple branches of the Forest Service are engaged in developing tools and strategies for addressing climate change. For example, as part of its 2010 to 2015 strategic plan, the Forest Service launched a National Roadmap for Responding to Climate Change (USDA FS 2010g), which guides efforts to ensure resource sustainability during climate change. The roadmap focuses on three activities: (1) assessing current risks, vulnerabilities, policies, and gaps in knowledge; (2) engaging internal and external partners in seeking solutions; and (3) managing for resilience in ecosystems as well as in human communities.

More recently, the Forest Service published another guidebook intended to help develop options for adapting to climate change (USDA FS 2011a). All national forests must now complete an annual "climate change scorecard," which specifies elements with which each forest must comply by 2015 to decrease resource effects. Examples of these include sustainable operations (recycling, reducing carbon emissions through fleet management, teleworking), employee education, viability assessments, and working with partners on solutions.

Current Conditions and Future Trends

Regional drying and temperature trends have occurred twice during the 20th century (the 1930s Dust Bowl and 1950s Southwest drought) and may have been even more severe during what is known as the Medieval Climate Anomaly, an interval of warm, dry conditions with regional variability, which lasted from A.D. 900 to 1350. According to modeled scenarios, the slight warming trend observed in the last 100 years in the Southwest may continue into the next century, with the greatest warming occurring during winter. Climate models predict that temperatures will rise approximately 4 to 5 degrees Fahrenheit (approximately 2 to 3 degrees Celsius) by 2030 and between 7 and 12 degrees Fahrenheit (4 and 7 degrees Celsius) by 2090. This trend would increase pressure on the region's already limited water supplies, increase energy demand, alter fire regimes and ecosystems, create risks for human health, and have negative effects on agriculture.

Climate variability influences the frequency, intensity, timing, and spatial extent of natural stressors on forest resources, such as insect infestation, disease, introduced species, fire, droughts, landslides, wind storms, and ice storms. These stressors, in turn, affect the distribution and abundance of plant and animal species because they affect resource availability, fecundity, and survivorship.

The potential ecological implications of climate change trends in the Southwest indicate:

- more extreme disturbance events, such as wildfires, floods, and heavy winds;
- greater vulnerability to invasive species, including insects, plants, fungi, and vertebrates;
- greater vulnerability to disease in plants and animals;
- long-term shifts in vegetation patterns (cold-tolerant vegetation moving upslope or disappearing in some areas and migration of some tree species to the more northern portions of their existing range);
- potential decreases in overall forest productivity that results from reduced precipitation;
- decrease in biodiversity of native species (extirpation or extinction);
- shifts in the timing of snowmelt (already observed) and increases in summer temperatures affecting the survival of fish species and efforts to reintroduce species into their historic range; and
- effects on phenology and changes in the date of flowering and associated pollination and food chain disruptions.

While some of these effects may be minimized by management strategies that promote adaptation and resilience of forest resources to variations in temperature and rainfall patterns, newly emerging stressors may emerge to offset any progress that has been achieved toward meeting the challenge of climate change.

Climate Change – Environmental Consequences

Effects Common to All Alternatives

Vegetation treatments under all alternatives, including, but not limited to, vegetation removal and planned fire ignitions, would improve the net carbon balance on the Coronado especially those in higher elevation vegetation types carried out under the proposed action, alternative 1, and alternative 2. Although treatments would likely release carbon, they would improve the long-term sustainability of the ecosystem as a carbon sink (Hurteau et al. 2008). Studies have shown that fire risk reduction and restoration treatments release less carbon than high-severity fire (Finkral and Evans 2008; Hurteau et al. 2008). Improved ecological conditions resulting from restoration of vegetation toward desired conditions and maintenance of a fire regime consistent with historical fire return intervals would reduce carbon dioxide emissions and improve the sustainability of carbon sequestration by soils on the forest.

The five key climate change factors that are most likely to be a potential concern for the Southwest include: (1) extreme weather events; (2) wildfire and human-caused risks; (3) insects, diseases, and invasive species; (4) water use and demand; and (5) increased socioeconomic demands. Under all alternatives, the effects of the key factors would be addressed directly or indirectly on the Coronado based on the strategies described in appendix A of the revised forest plan. They include:

- enhancing adaptation by anticipating and planning for disturbances from intense storms;
- using a suite of adaptation options to manage ecosystems in the face of uncertainty;
- increasing water conservation and planning for reductions in upland water supplies;
- anticipating increased forest recreation use; and
- monitoring climate change influences and the effectiveness of adaptation approaches.

These strategies focus on how best to incorporate changes from disturbances into managed forests and enhance ecosystem resilience. Under all alternatives, management activities that would improve ecosystem function would likely improve the resiliency of those ecosystems to withstand changes from common stressors, such as fire, flood, and drought, for which frequency, intensity, timing, and

spatial extent can vary as a result of climate change. However, shifts in vegetation and habitat ranges that result from long-term climatic changes are beyond Forest Service control and not fully addressed by any plan alternative.

Although forest plan monitoring programs under all alternatives do not include components to specifically monitor climate change, they would incorporate provisions that will help in the understanding of interrelationships between key plan components and climate change. For example, by monitoring the scale and severity of stressors, such as wildfire, insects, and disease, and assessing their effects on progress of various resources toward desired conditions, a forest gathers input to the development of strategies to deal with hotter and drier conditions and the vulnerability of resources to these stressors.

Under all alternatives, the Forest Service would have to comply with national standards, including compliance with the 2015 climate change scorecard.

No Action

The no-action alternative lacks plan components that provide direction for management of resources during climate change. For the most part, management of vulnerable resources would continue to be governed by resource-specific plan direction and relevant laws and regulations.

Despite the lack of climate change direction in the 1986 plan, the Forest Service is required to manage resources in accordance with the guidebook for national forests to develop adaptation options to respond to climate change (USDA FS 2011). Therefore, while the plan itself would not encourage the development of adaptation and resiliency in forest resources, climate change direction at the national level would help the Coronado in this regard.

Because no action lacks desired conditions and other plan components to direct management of ecosystem health and progress toward desired conditions, those resources would be increasingly vulnerable to the natural stressors whose effects are exacerbated by climate change. This may cause resource conditions to depart further from desired conditions.

Proposed Action

Climate change direction in the revised forest plan under the proposed action establishes specific plan components, including desired conditions and management approaches that are applicable to vegetation, water, soil, air, wildlife, invasive species, motorized transportation, recreation, scenic quality, range management, and wilderness. The components build upon the climate change strategies that are described in appendix A of the revised forest plan for the five key climate change factors recognized as likely to have adverse effects on resources in the Southwest.

By specifying desired conditions in the revised forest plan, the proposed action directs management actions toward the attainment of reference conditions for each resource. For example, in the revised forest plan, the desired condition for all vegetation types is stated as follows: “[v]egetation conditions are resilient to the frequency, extent, and severity of disturbances, under a changing climate, especially fire.” Desired conditions, regardless of current or changing conditions, allow forest resource management actions to adapt as necessary to continue moving a resource or ecosystem toward ecological and social desired conditions.

Overall, desired conditions and other revised plan guidance under the proposed action provide a framework to:

- restore and maintain the structure, composition, and function of ecosystems;
- move highly departed ecosystems toward desired conditions;
- reduce the threat of uncharacteristic fire while promoting natural fire occurrence on the landscape;
- promote interconnectedness of continuous blocks of habitat to allow for adaptation, including genetic and behavioral interactions; and
- maintain the abundance and distribution of habitats to support recovery or stabilization of federally listed and other species.

Management of ecosystems in times of uncertainty benefits from adaptive, flexible, and innovative approaches that are, for the most part, reversible and should be applied incrementally so that approaches may be modified with changing circumstances (Millar et al. 2007). The proposed action offers guidance regarding a variety of management tools and action, as well as an opportunity for climate change research in a newly proposed research natural area (Finger Rock), which would be dedicated to climate-related studies.

Alternative 1

Alternative 1 proposes the same direction for climate change as the proposed action. Because of its recommendation of 255,908 acres of new wilderness on the Coronado, it may further increase ecosystem resiliency in the face of climate change. This is because lands managed to retain wilderness values and characteristics are better protected from development, fragmentation, and human-caused disturbances than those that are not. Wilderness areas allow primarily low-disturbance activities, which do not compromise migration of species and range shifts. Intact, unaltered habitat is extremely important to the retention of biodiversity and to provide a buffer to climate change, because plants and animals that are allowed to persist in slowly changing landscapes are much more likely to succeed that those in rapidly changing, altered environments.

Although new wilderness recommendations may benefit resources in light of climate change, the positive effects of alternative 1 may be less evident in areas where resources are highly departed from reference conditions. In high elevation forests where this departure is characterized by overly dense conditions, the increase in wilderness areas under alternative 1 may inhibit resiliency if forests become overstocked and are unable to adapt to the added stressors of climate change.

Alternative 2

Alternative 2 has no plan components that establish desired conditions for resources during a period of climate change, as do the proposed action and alternative 1, nor does it recommend new wilderness and research natural areas. This makes the effects of plan direction on management of climate change somewhat less effective than those of the proposed action and alternative 1. However, direction under alternative 2 incorporates the strategies that are described in appendix A of the revised forest plan for addressing the five key climate change factors that are of concern in the Southwest and encourages their implementation (see “Effects Common to All Alternatives”).

Because alternative 2 would designate at least ten times more forest acres for motorized recreational uses than the other alternatives, it has the potential to result in an increased increment of greenhouse gas emissions, which are major contributors to climate change (see Affected Environment), above the other alternatives. Alternative 2 would recommend no new wilderness; thus, the benefits of wilderness management described under alternative 1 would not be realized by alternative 2. In addition, because alternative 2 would not recommend the Finger Rock Canyon Research Natural Area, an additional research natural area for climate change research would not be added on the Coronado.

Cumulative Effects

Climate change is a global phenomenon that may dramatically affect the natural resources found on the Coronado over the long term, as well as the social and economic amenities—such as recreation, livestock grazing, and forest products—that are dependent on those natural resources.

Other state, municipal, and industry efforts, including Arizona's adoption of a renewable portfolio standard that promotes generation of electricity by renewable energy sources by 2025, are aimed at reducing greenhouse gas emissions and associated effects of climate change over the long term. These combined efforts would have a positive effect on management for climate change in the local area. However, given the projected trends and persistence of climate change effects over the long term, effects of climate change on the Coronado would still occur.

The proposed action and alternative 1 are consistent with approaches of other national forests that are also revising their forest plan direction with respect to climate change. By using consistent approaches for addressing this issue, management of ecosystems and species that depend on them will have a higher likelihood of resiliency over the long term.

Another positive cumulative effect may result from management of large land areas to accommodate low-disturbance activities by other agencies, including the National Park Service, Department of Defense, Bureau of Land Management, and the States of New Mexico and Arizona, Together their actions would contribute to broader scale ecosystem resiliency in the Southwest. This is especially true under alternative 1, which would manage the greatest area of wilderness of all alternatives. Areas with restricted activities like wilderness frequently influence the surrounding patterns of development (e.g., urban, energy sources), which, in turn, may reduce certain threats to native plant and animal species. In such areas, biodiversity is expected to be maintained and to buffer the effects of climate change, because plants and animals that are allowed to persist in slowly changing landscapes are much more likely to persist that those in rapidly changing altered environments.

Alternative 2 provides for an expanded Motorized Recreation Land Use Zone, which is relatively small (45,117 acres or about 3 percent) relative to the 1.7 million-acre Coronado National Forest. Increased emissions of greenhouse gases contributed by motorized recreation, when combined by off-forest emissions of the same, would additively affect local concentrations of greenhouse gases.

Species Diversity and Viability – Affected Environment

This section discloses the potential environmental consequences on species and habitat that may result from direction under three action alternatives and no action. It describes species viability assessments conducted as part of the planning process and reports potential effects of plan direction on federally listed[44] species and designated critical habitat; species and habitat proposed for listing; Forest Service, Region 3 sensitive species, migratory birds, eagles, forest management indicator species, and other planning species for the Coronado.

An assessment of species diversity for the Coronado was completed as part of the Coronado Ecological Sustainability Report (USDA FS 2009b). The coarse-filter approach of the 1982 Planning Rule guided the forest plan revision team in prescribing management direction necessary to conserve the diversity of forest plant and animal communities.

In general, a coarse filter is used to evaluate the relative effectiveness of proposed management approaches to mitigate the risk to species viability from specific threats. Where proposed resource management options fail to provide a high likelihood of maintaining ecological conditions that support

[44] These are listed under the authority of the Endangered Species Act.

viable populations, specific fine-filter (species-specific) standards or strategies are developed (Haufler et al 1982).

From an initial list of 1,400 species, 437 species (terrestrial, aquatic, and plant) were determined to have a potential viability concern. Designated as "forest planning species," they include: 36 mammals, 32 birds, 8 amphibians, 19 reptiles, 73 insects, 4 other invertebrates, 16 fish, 56 mollusks, 7 fungi-lichen, 5 mosses-liverworts, and 181 plants. Species viability assessments for those 437 species have been prepared according to Forest Service policy (Forest Service Manual 2670) and documented in three specialist reports: the Coronado Population Viability Assessment Report and the biological assessment and biological evaluation for the draft environmental impact statement.

The following factors provided input into the assessment of viability risk to forest planning species:

- availability and current conditions of the habitat or habitat features with which the species are typically associated
- population occurrences and distribution
- threats from Forest Service management actions expected to occur within the planning area

Considering these factors, forest specialists developed plan components to guide management toward attaining desired conditions specific to terrestrial, riparian, and aquatic species and their habitat. If plan components were sufficient to meet or maintain desired habitat conditions, risk to a species' viability was determined to be "low" or "none." For those species having "some" potential viability risk, specialists developed additional standards and guidelines (fine-filter or species-specific plan components) for inclusion in the revised forest plan to manage resources against threats to these species. This was done in accordance with direction in the 1982 Planning Rule. Most often, species requiring fine-filter plan components are local, endemic species. These species require ecosystem-specific plan components, and components that respond to certain natural history traits or human features that support population viability.

Of the 437 species indicating a potential viability concern, 362 species were found to have no or low risk to their viability (these are "coarse-filter" species) and 75 species were found to have some risk ("fine-filter species") to their population viability, requiring more plan components than coarse-filter species to ensure their sustainability. A detailed description of the viability analysis process is reported in the population viability report filed in the administrative records of the forest plan revision process and this National Environmental Policy Act review and the ecological sustainability report (USDA FS 2009b). Table 146 in appendix F lists all species evaluated in this process.

Habitat – Affected Environment

The Coronado is believed to have the highest biological diversity of any national forest in the western United States because it is located at a convergence zone of ecological regions and vegetation communities. To the west is the Sonoran Desert; to the southeast is the Chihuahuan Desert; to the north are the Central Arizona Mountains; and to the south is Mexico's Sierra Madre Occidental. Elevations on the Coronado range from about 3,000 feet to nearly 11,000 feet above mean sea level. Along this gradient, vegetation communities range from deserts to subalpine forests. Despite this diversity, most of the Coronado comprises desert grasslands, Madrean encinal woodlands, and Madrean pine-oak woodlands. Biodiversity is reinforced by a long growing season, a dual rainy season, and the evolutionary isolation of the "sky island" mountain ranges.

The following discussions summarize the quantity and distribution of various vegetation communities on the Coronado with which specific coarse-filter and fine-filter species are associated, the quality of each habitat, and the risk factors that may affect the sustainability of the community and various species it supports. The effects of management under each alternative on specific vegetation communities are discussed in detail in topic 1 of this chapter and summarized below in the "Environmental Consequences" discussion.

Desert Communities

Quantity and Distribution – The Coronado manages only a fraction of desert plant communities compared with surrounding land ownership entities. However, these lands make up 175,452 acres, or about 10 percent of the Coronado and 17 percent of desert communities represented by Southwestern Region national forests (USDA FS 2009).

Relatively few species are associated with terrestrial habitats of desert communities because the Coronado is on the fringe of these arid habitats, which are largely managed by other agencies. Buffelgrass is a prevalent invasive nonnative species in this community. There are 17 fine-filter species[45] associated with both the Chihuahuan and Sonoran Desert communities: 3 mammals (1 endangered, 2 sensitive), 1 reptile (sensitive), 1 bird (sensitive), 1 amphibian (sensitive), 3 fish (2 endangered, 1 sensitive), 8 plants (2 endangered, 5 sensitive, and 1 other forest planning). In addition, there are 142 coarse-filter species associated with this community: 7 mammals, 3 birds, 2 amphibians, 5 reptiles, 2 insects, 2 mollusk, 1 fungi-lichen, and 26 plants. Coarse-filter species are identified in appendix F as F1 in the "Associated Habitat" column.

Habitat Quality – Current conditions in desert communities on the Coronado reflect a greater proportion of grasses than reference conditions, and these are mostly invasive nonnative species, which contribute to an increased threat of uncharacteristic wildfire. To make matters worse, fire destroys native plants and encourages the growth of invasive grasses.

Nonnative grasses also out-compete native plants, even in the absence of fire. Current trends indicate that desert plant communities may be at risk for conversion to nonnative grasslands.

Risk Factors – Populations of invasive, nonnative grasses are increasing in desert communities in spite of concerted efforts to restrict them. The vegetation condition class (VCC) analysis for desert communities indicates an overall moderate departure (vegetation condition class 2) from reference conditions (see "Vegetation Communities" section) for composition and structure, which is likely a result of increased shrub encroachment and invasive species. The presence of buffelgrass alters the desert ecosystem as a whole (Olsson et al. 2012), likely resulting in reductions in native wildlife habitat quantity and quality, including habitat for desert bighorn sheep and the Sonoran desert tortoise (Gray and Steidl 2012).

Grassland Communities

Quantity and Distribution – Grasslands are a predominant vegetation community on the Coronado (407,477 acres). The Forest Service manages a fraction of grasslands in southeastern Arizona compared with other Federal and private land owners, but this 407,477 acres is 25 percent of grasslands on National Forest System lands in Arizona and New Mexico (USDA FS 2009). Details about grasslands on the Coronado are presented in the "Vegetation Communities," section under topic 1 of this chapter.

Coronado grasslands support valuable valley and foothill habitats for plants and animals, supporting biodiversity that is second only to that of the Coronado's Madrean encinal woodlands. There are 30 fine-filter species associated with forest grasslands: 3 mammals (2 endangered, 1 sensitive), 1 bird (sensitive), 3 amphibians (1 endangered, 1 threatened, 1 sensitive), 2 reptiles (1 candidate, 1 sensitive), 7 fish (3 endangered, 1 threatened, 3 sensitive), 12 plants (2 endangered, 9 sensitive, 1 other), and 2 mollusks (1 candidate, 1 other). In addition, there are 99 coarse-filter species, including: 17 mammals, 6 birds, 2 amphibians, 6 reptiles, 8 insects, 10 mollusk, 1 fungi-lichen, and 49 plants. Coarse-filter species are listed in appendix F and identified in the "Associated Habitat" column.

[45] These species may be associated with other habitat elements as well. Therefore, the number of associated species by habitat element adds up to more than 69 fine-filter species.

Management of grasslands using plan components that promote open grasslands would improve habitat for grassland-dependent species, such as pronghorn (Wyoming Game and Fish Department 2002) and Montezuma quail, and herbaceous cover for both livestock and wildlife.

Habitat Quality – Grasslands within the historic range of variation are typically open with low shrub canopy cover. In southeastern Arizona, these communities are trending from open grasslands with low shrub canopy cover toward higher shrub canopy cover. Factors such as precipitation patterns, grazing history, soil, and fire all interact to influence non-uniform changes in grassland composition and structure across the region (USDA FS 2009).

Risk Factors – Desert grasslands, plains, and savanna grasslands cover 26 percent of the national forest, most of which are desert grasslands. The departure of vegetation structure and composition, invasive species, and overgrazing are primary risk factors in grassland habitat. Currently, composition and structure of forest grasslands are highly departed (vegetation condition class 3) from the reference conditions (see "Vegetation Communities"). On private lands surrounding the Coronado, ex-urban development has led to the loss and fragmentation of grasslands and the disruption of natural processes, primarily low-intensity wildfire, that have historically maintained grasslands. Natural succession in grasslands encourages increased shrub cover unless these areas are treated. Because of threats beyond Forest Service control, such as urban development, the risk to sustainability of desert grasslands is moderate to high.

Interior Chaparral

Quantity and Distribution – Interior chaparral comprises 151,181 acres or 9 percent of the national forest, which is a fraction of chaparral managed by other agencies in the region and 11 percent of total interior chaparral on National Forest System lands in Arizona and New Mexico (USDA FS 2009).

Interior chaparral has few species associations, and the sole chaparral specialist on the Coronado is Ball's monkey grasshopper. Species in chaparral are fire-adapted, because the ecosystem has historically experienced frequent fires. Eight fine-filter species are associated with the interior chaparral community: 3 mammals (2 endangered, 1 sensitive), 1 bird (sensitive), 1 reptile (candidate), 1 fish (sensitive), 1 plant (sensitive), and 1 mollusk (other). In addition, there are 27 coarse-filter species associated with the grassland habitat type: 9 mammals, 2 insects, 2 mollusk, and 14 plants. Coarse-filter species are listed in appendix F and are identified in the "Associated Habitat" column as F3.

Habitat Quality – Fire and drought are primary disturbances in interior chaparral. From 1982 to 2003, fires occurred in 21 of 22 years. An average of 790 acres or less than 1 percent burned per year, with the largest fire being about 4,000 acres. Large fires occur infrequently in this community. Historic fire-return interval ranges from 20 to 100 years. Historic data indicate that fire frequency and severity in interior chaparral was lower than in recent years.

The distribution of interior chaparral structural classes for reference and current conditions is displayed in table 35 on page 114. It indicates that fire occurs more often today in interior chaparral than it has historically. This trend toward recently burned and open canopy is expected to continue. However, the overall structure of chaparral as shrub land has been stable over the historical record and is expected to persist, although changes at the species level may be occurring with more frequent fire (USDA FS 2009).

Risk Factors – The Coronado's interior chaparral is highly departed (vegetation condition class 3) given its surplus of both open and closed structure. Because of this, approximately 50 percent of the Coronado's interior chaparral vegetation community has a high probability of uncharacteristic fire, and the remainder has a higher than historic probability of the same. The project trend for interior chaparral is toward a more frequent occurrence of wildfire and an increasingly open canopy cover. However, interior chaparral is a fire-adapted ecosystem, and the basic structure as a shrub-dominated type is not expected to change. Management practices that may cause disturbance in interior chaparral

are road construction, recreation management, fire management, livestock grazing, and grassland restoration actions. Given these factors, the risk to sustainability of interior chaparral is low (USDA FS 2009).

Madrean Encinal Woodlands

Quantity and Distribution – Madrean encinal woodland is the most abundant and widespread vegetation community on the Coronado, covering approximately 738,693 acres (or 43 percent). The forest manages the second highest quantity of this community (11 percent) relative to other land owners in Arizona and New Mexico and the greatest quantity under a single management entity. The Coronado's Madrean encinal woodland is about 26 percent of the total community on Southwestern Region national forests (USDA FS 2009).

Not surprisingly, Madrean encinal woodlands have more species associations than any other vegetation community. Many are more common in Mexico than elsewhere in the U.S. All physical attributes, including riparian, aquatic, rock, and cave habitats, support characteristic species in this vegetation community. There are 37 fine-filter species associated with the Coronado's Madrean encinal woodlands community: 4 mammals (2 endangered, 2 sensitive), 2 birds (sensitive), 6 fish, (2 endangered, 1 threatened, 3 sensitive), 2 amphibians (1 threatened, 1 candidate), 2 reptiles (1 candidate, 1 sensitive), 16 plants (1 endangered, 13 sensitive, 2 other), 1 insect (candidate), 1 other invertebrate (other), 2 mollusks (1 candidate, 1 other) and 1 lichen (other). In addition, there are 125 coarse-filter species associated with the Madrean encinal woodlands: 15 mammals, 4 birds, 2 amphibians, 6 reptiles, 14 insects, 27 mollusk, 3 fungi-lichen, and 54 plants. Coarse-filter species are listed in appendix F and identified in the "Associated Habitat" column as F4.

Habitat Quality – Fire and drought are natural disturbances in Madrean encinal woodland. Fires occurred every year from 1982 to 2003, with an average of 6,000 acres burned per year (less than 1 percent). The area burned during this period ranged from 61 to more than 40,000 acres. Large fires occur infrequently, however. In the past 22 years, only 3 fires affected more than 10,000 acres.

Vegetation composition and structure of the Madrean encinal woodland reflects low to moderate departure (vegetation condition class 2) overall. Its lack of open canopy and late-seral conditions may reflect less frequent low- and mixed-severity fires. Conversely, the abundance of post-fire (early-seral) structure reflects recent wildfire disturbance. In Madrean encinal woodland, the historic fire-return interval ranges from 2.5 to 10 years. Historic data indicate that fire frequency may have been higher and severity may have been lower than current conditions (USDA FS 2009). Projected trends are toward reference conditions.

Risk Factors – Thirty-eight percent of the Coronado's Madrean encinal woodland is at risk of uncharacteristic wildfire. A moderate degree of domestic livestock grazing is a widespread use of the Coronado's Madrean encinal woodlands. Well-managed livestock grazing is a sustainable disturbance in these woodlands that can be used as a management tool to reduce the risk of wildfire. Other disturbances that affect the risk of adverse effects on Madrean encinal woodland are road construction, recreation management, fire management, and ecosystem restoration activities (USDA FS 2009).

Madrean Pine-Oak Woodlands

Quantity and Distribution – The Coronado manages 142,047 acres of Madrean pine-oak woodland, which comprises 8 percent of the national forest. This is a fraction of the Madrean pine-oak woodlands in the region that are managed by other agency and private land owners, but about 17 percent of Madrean pine-oak woodlands on National Forest System lands in Arizona and New Mexico (USDA FS 2009).

Vegetation management often combines this community with Madrean encinal woodland under the designation as Madrean evergreen woodland. Many species are common to both encinal and pine-oak woodlands. A commonly assumed distinction between the two is that Madrean species that require grassy openings are present in encinal, but not pine-oak woodlands.

Nevertheless, this is a highly diverse habitat, especially for invertebrates and plants, and it is associated with all physical attributes (i.e., rock, cave, terrestrial, aquatic). There are 27 fine-filter species associated with Madrean pine-oak woodland: 3 mammals (1 endangered, 2 sensitive), 3 birds (1 threatened, 2 sensitive), 2 amphibians (1 threatened, 1 candidate), 1 fish (sensitive), 5 mollusks (1 candidate, 1 sensitive, 3 other), 11 plants (1 endangered, 8 sensitive, 2 other), 1 insect (sensitive), 1 lichen (other). In addition, there are 90 coarse-filter species: 11 mammals, 6 birds, 2 amphibians, 6 reptiles, 7 insects, 24 mollusk, 2 fungi-lichen, and 32 plants. Coarse-filter species are listed in appendix F and are identified in the "Associated Habitat" column as F5.

Habitat Quality – The Madrean pine-oak woodland on the Coronado is moderately departed (vegetation condition class 2) from reference conditions, having a surplus of closed canopy structure and deficit of open canopy relative to reference conditions. This is likely the result of the infrequency of low-severity fire, which historically maintained the open structure (Schussman and Gori 2006, USDA FS 2009).

Fire and drought are the primary natural disturbances in Madrean pine oak woodland. Fires occurred in 18 of 22 years from 1982 to 2003, with an average of 1,800 acres burned per year (about 1 percent). The largest fire affected more than 24,000 acres. However, in the 22-year period of reference, this community had only 6 fires greater than 1,000 acres in size.

Risk Factors – Some domestic livestock grazing at light to moderate levels occurs in the Madrean pine-oak woodlands on the Coronado. Other habitat disturbances in the community are road construction, recreation management, fire management, and ecosystem restoration activities.

The fire-regime condition class for Madrean pine-oak woodland indicates that current fire frequency and severity are altered and the probability of uncharacteristic fire is high. The historic fire-return interval in Madrean pine oak woodland ranges from 3 to 8 years. Historic data indicate fire frequency may have been higher and severity may have been lower than current conditions (USDA FS 2009).

Most (99 percent) of the Madrean pine-oak woodlands community has either an elevated or high probability of experiencing uncharacteristic wildfire, which in combination with the high percentage of departure from reference conditions and projected trends for further departure from reference conditions, presents a high degree of risk to the sustainability of the Coronado's Madrean pine-oak woodland.

Ponderosa Pine-Evergreen Shrub

Quantity and Distribution – About 39,477 acres (2 percent of the national forest) of ponderosa pine-evergreen shrub are found on the Coronado. Few pure, large stands of ponderosa and Apache pine are present. Stands are mostly transitional between other types or in small patches. The Coronado manages a fraction of ponderosa pine-evergreen shrub in the region compared to other agency and private land owners.

Most of the species associated with this habitat are plants. There are 16 fine-filter species associated with this community: 1 mammal (sensitive), 3 bird (1 threatened, 2 sensitive), 5 mollusks (2 sensitive, 3 other), and 7 plants (5 sensitive, 2 other). In addition, ponderosa pine-evergreen shrub has 59 coarse-filter species: 10 mammals, 3 birds, 2 reptiles, 3 insects, 10 mollusk, and 31 plants. Coarse-filter species are listed in appendix F and are identified in the "Associated Habitat" column as F6.

Habitat Quality – The ponderosa pine-evergreen shrub community on the Coronado is highly departed (VCC 3) from reference conditions, because the historically dominant late-seral open structure comprises only 5 percent or less of it. Departure is also reflected in the increased proportions of early-seral and mid-development structure where wildfire has occurred the past few decades. Other areas on the Coronado contribute to the overall departure with an abundance of late-seral closed structure.

The historic fire-return interval in ponderosa pine-evergreen shrub ranges from 2 to 17 years. Historic data indicate that fire frequency may have been higher and severity may have been lower than current conditions (USDA FS 2009). The distribution of ponderosa pine structural classes for reference and current conditions is displayed in table 47 on page 136. The 50- and 100-year projections under current management show increasing amounts of closed-canopy ponderosa pine of all ages, as well as increasing amounts of uncharacteristic grassland and shrub land. Substantial deviations from reference for all other stages are expected under current management.

Other disturbances in the ponderosa pine-evergreen shrub community are the result of road construction, recreation management, fire management, and ecosystem restoration activities.

Risk Factors – Climate change is expected to cause warmer and drier conditions in the Southwest over an indefinite period of time. Because of this, ponderosa pine-evergreen shrub ecosystems are at risk for decreased plant productivity, increased insect attacks, colonization of invasive species, longer and more severe fire seasons, and altered frequency, intensity, timing, and spatial extent of disturbance events (droughts, flash floods, landslides, and wind storms).

Fire and drought are the primary natural disturbances in the ponderosa pine-evergreen shrub community. From 1982 to 2003, fire occurred in 7 years, burning an annual average of 390 acres (less than 1 percent). Large fires occur infrequently in this community; only 2 fires larger than 1,000 acres have occurred over the last 22 years, while in 18 of those years less than 100 acres burned.

The high proportion of the ponderosa pine-evergreen shrub community having an elevated or high probability of uncharacteristic fire (99 percent), its currently high departure from reference conditions, projected trends further from reference conditions, and threats beyond Forest Service control (legacy of fire suppression and climate change), all indicate a high risk to the sustainability of the Coronado ponderosa pine-evergreen shrub community.

Mixed-conifer Forest (Wet and Dry)

Quantity and Distribution – The Coronado manages 55,451 acres of mixed-conifer vegetation (3 percent of wet and less than 1 percent dry), only a fraction of the mixed-conifer managed by other land owners in the region.

This habitat is restricted to the highest elevations of the sky islands and tends to have boreal flora and fauna. There are 18 fine-filter species associated with the Coronado's mixed-conifer forest community: 2 mammals (1 endangered, 1 sensitive), 3 birds (1 threatened, 2 sensitive), 3 mollusks (2 sensitive, 1 other), and 10 plants (7 sensitive, 3 other). There are also 71 coarse-filter species in mixed-conifer: 12 mammals, 3 birds, 2 reptiles, 8 insects, 15 mollusks, 1 fungus, and 30 plants. Coarse-filter species are listed in appendix F and are identified in the "Associated Habitat" column as having biotic habitat component 7.

Habitat Quality – Vegetation composition and structure of dry mixed-conifer are moderately to highly departed (vegetation condition class 3) and for wet mixed-conifer are moderately departed (vegetation condition class 2) from reference conditions. There is a slight trend toward an increase in the under- and mid-story components of both wet and dry mixed-conifer. However, this does not negate an increasing trend in the mature component of this vegetation type, which is moving toward reference conditions.

The distribution of mixed-conifer structural classes for reference and current conditions is displayed in table 47 and table 48. With current management, the 50- and 100-year projections show increasing amounts of closed-canopy mixed-conifer, particularly in the mature and old forest class. There will be declines in the amount of open canopy mid-aged and mature and old mixed-conifer forest.

Risk Factors – Disturbances that affect the quality of mixed-conifer habitat on the Coronado include road construction, recreation management, fire management, and ecosystem restoration activities. The historic fire-return interval ranges from 10 to 22 years. Historically, fire frequency may have been

higher and severity may have been lower than current conditions (USDA FS 2009). Given a high proportion of mixed-conifer with an elevated or high probability of uncharacteristic fire (92 percent), its moderate to high departure from reference conditions, projected trends of its further departure from reference conditions, and threats beyond Agency control (the legacy of fire suppression and climate change), there is a high risk to the sustainability of the Coronado mixed-conifer vegetation community.

Spruce-fir Forest

Quantity and Distribution – The Coronado manages 3,014 acres of spruce-fir forest, a fraction of that which is managed by other land owners in the region, and less than 1 percent of forest vegetation. This habitat type has relatively few species, most of which are cold adapted and more typical of boreal forests. Spruce-fir habitat is found only in the Pinaleño Mountains on the Safford Ranger District.

Most spruce-fir species are terrestrial, rather than riparian or aquatic, and many of these are rock-associates. Three fine-filter species are associated with spruce-fir on the Coronado: 1 mammal (endangered) and 2 plants (sensitive). There are also 29 coarse-filter species associated with the spruce-fir forest habitat: 4 mammals, 3 birds, 1 reptile, 4 insects, 3 mollusks, and 14 plants. Coarse-filter species are listed in appendix F and are identified in the "Associated Habitat" column as having biotic habitat component 8.

Habitat Quality – The reference status of spruce-fir is distributed over the following structural classes, with current distribution included for reference (table 55, page 145). Vegetation composition and structure of spruce-fir habitat is characterized by low to moderate departure (vegetation condition class 2) from reference conditions. A stand-replacing insect outbreak occurred in this community between 1999 and 2001. In addition, 1 fire (Nuttall-Gibson Complex) has occurred in the 23 years from 1982 to 2005. This was stand replacing over 40 percent of spruce-fir that remained after the insect outbreak (USDA FS 2009).

A fire history study of the Pinaleño Mountains suggests a fire-return interval for this forest type of 300 to 400 years because of the lack of trees older than this age and evidence of a catastrophic fire in 1685 (USDA FS 2009).

Risk Factors – Disturbance of the spruce-fir vegetation community may result from road construction, recreation management, fire management, and ecosystem restoration activities. The very small amount of spruce-fir vegetation on the Coronado, along with threats beyond Forest Service control (i.e., the legacy of climate change and nonnative insects, such as the spruce aphid) and limited management options to reduce them, indicate a high risk to the sustainability of the Coronado spruce-fir community.

Montane Meadows, Wetlands, and Riparian Areas

Quantity and Distribution – The Coronado manages only a fraction of montane meadows, wetlands, and riparian habitat when compared to other land owners in the region. These lands together comprise 5,142 acres or less than 1 percent of the Coronado. The forest manages 27 percent of cottonwood-willow and 12 percent of montane-willow riparian forests on National Forest System lands in Arizona and New Mexico (USDA FS 2009).

Riparian areas support a wide variety of plant associates that vary by elevation and other factors. Because riparian areas offer a mesic and aquatic interface in an otherwise xeric landscape, species diversity is extremely high, and conservation issues are great. The fine-filter species associated with these three types of habitat are four plants (sensitive). There are also 109 coarse-filter species in this habitat: 16 mammals, 16 birds, 3 amphibians, 6 reptiles, 16 insects, 9 mollusks, 1 lichen, and 42 plants. Coarse-filter species are listed in appendix F, and are identified in the "Associated Habitat" column as all species that have either the physical habitat component indicator A (riparian) or the biotic habitat component 9 (montane meadow).

Habitat Quality – Fire frequency varies by vegetation type. Based on data from 1982 through 2003, no fires have occurred in coniferous riparian habitat, wetlands, or cienegas. Fires in mixed-broadleaf deciduous riparian vegetation have occurred 5 times in the last 22 years, burning from 1 acre up to approximately 300 acres. Fires are more frequent in montane-willow and cottonwood-willow riparian forests, occurring 14 and 15 times respectively over the past 22 years, and burning a relatively small annual acreage (51 to 66 acres).

Monitoring of riparian conditions is ongoing, but it is problematic because survey protocols and rating criteria are applied uniformly to riparian areas having very different vegetation potential. Preliminary results indicate that of the 7 ecosystem management areas for which trend data is available, 33 to 87 percent of transects indicate an upward or stable trend in species composition, age classes, and tree regeneration. Mature and sapling trees have been lost to drought, and bank protection is low in some areas; however, most sites had excellent canopy closure and plant vigor. The general trend is upward or within the expected range of variability for channel characteristics.

Risk Factors – Montane meadows, wetlands, and riparian areas may be affected by road construction, recreation management, fire management, and livestock grazing. Riparian areas are of very limited extent on the Coronado and they acquire the risk to sustainability of adjacent vegetation communities. Currently, montane meadows, wetlands, and riparian areas have moderate departure (vegetation condition class 2) from reference conditions. In addition, these areas are subject to threats beyond Forest Service control (i.e., the legacy of climate change, illegal activities related to the border with Mexico, and water rights disputes). Given these considerations, the risk to sustainability of riparian areas ranges from low to high, depending on the nature and condition of surrounding vegetation.

Rocks and Talus Rock Features (Rock/Talus/Cliff)

Quantity and Distribution – Rock, talus, and cliff habitats are components of the "Biophysical Features" section in the revised forest plan. Because these features are not mapped or addressed in the 2009 ecological sustainability report, the following description is more qualitative than what has been presented for vegetative habitat elements.

All ecosystem management areas have rock features and most have endemic species associated with this habitat element. Many of the rock outcrops, hillsides, and cliffs have characteristic or endemic forest planning plant species. Cliffs are not a particularly common feature on the Coronado, but some cliff-associated species (e.g., American peregrine falcon) are present in all ecosystem management areas. They are particularly well represented in the Dragoon and Chiricahua Ecosystem Management Areas at all elevations. High-elevation talus slopes, in particular, are biologically diverse and well represented with forest planning species, including talus snails, mountain snails, and the small Madrean montane rattlesnakes. Talus occurs as discrete rockslides, especially in the Chiricahua, Santa Rita, Huachuca, Pinaleño, and Whetstone Ecosystem Management Areas.

There are 28 fine-filter species associated with the rock/talus/cliff habitats on the Coronado: 1 mammal (sensitive), 1 bird (sensitive), 1 amphibian (candidate), 19 plants (4 sensitive, 15 other), 4 mollusks (2 sensitive, 2 other), and 2 lichen (other). In addition, there are 82 coarse-filter species associated with the rock/talus/cliff habitat type: 6 mammals, 1 bird, 1 amphibian, 3 reptiles, 3 insects, 34 mollusks, 5 fungi-lichen, and 29 plants. Coarse-filter species are listed in appendix F and are identified in the "Associated Habitat" column as all species that have the physical habitat component indicator E (cliff/rock).

Habitat Quality – Although this habitat element was not assigned a trend ranking in the ecological sustainability report (USDA FS 2009b), the population viability assessment (USDA FS 2011) used a ranking of "stable" under both current and projected habitat trends. This is because there are currently no large quarries or mines on the Coronado, and local, native rock is not generally used in the construction of roads or other structures.

Risk Factors – Any action that results in the loss of naturally occurring rock features is a threat to the sustainability of rock-associated species. These include large mines, quarries, and other harvesting of native rock. In some areas, talus slopes are intentionally bisected to gather road building materials for the local road system, even though talus is considered important because of its biological resources (Herrington 1988).

Removal of tree cover from the margins of talus slopes is also a threat to native species, because the vegetation-covered edges provide moist microclimates for many species, especially during hot, dry periods. Currently, there are no active large mines on the Coronado and several small minerals exploration projects. Recreation (rock climbing) can be a threat to cliff-associated species if it is unmanaged.

Cave and Adit Features

Quantity and Distribution – Cave and adit habitats are components of the "Biophysical Features" section in the revised forest plan. These features were not mapped or addressed in the ecological sustainability report (USDA FS 2009b); therefore, this description is more qualitative than what has been reported for vegetative habitat elements.

According to an unpublished source, there are at least 219 named caves or cave entrances on the Coronado. Most of the caves are located on the larger and better-explored ecosystem management areas, such as the Chiricahua and Huachuca, and those that have geology-encouraging development of karst features, such as the Whetstone Ecosystem Management Area (Kartchner Caverns).

Adits and shafts have not been inventoried on the Coronado, but many of them were important to past minerals exploration and extraction activities. More than 1,500 abandoned mines are documented forestwide, with new sites being recorded every year. Although the biology of caves on the Coronado is poorly defined, it includes endemic forest planning species, such as bats. Caves and adits may function similarly as biological resources, but caves are natural features, while adits and shafts are not, and there are distinct differences in habitat quantity, quality, and risk factors.

There are five fine-filter species associated with the cave and adit habitat: 4 mammals (2 endangered, 2 sensitive) and 1 other invertebrate (other). In addition, there are 6 coarse-filter species associated with this habitat: 3 mammals, 2 other invertebrates, and 1 mollusk. Coarse-filter species are listed in appendix F and are identified in the "Associated Habitat" column as all species that have the physical habitat component indicator G (cave).

Habitat Quality – Although this habitat element was not assigned a trend ranking in the ecological sustainability report (USDA FS 2009b), the population viability assessment (USDA FS 2011) used a ranking of "declining" for current habitat trend and "stable to improving" for projected habitat trends, based on limited information and uncertainty about future trends.

In general, cave habitat trends are expected to decline because human use degrades their sensitive microclimates. The future trend is projected to improve because the Forest Service has a cave management strategy and program in development, many caves are being considered for gating or fencing, and precautionary measures to guard against white-nose syndrome, a devastating disease of bats, will likely decrease future human disturbances to caves. It is difficult to predict the future of adits. In some cases they will be closed because of safety concerns and, in others, they will be treated like important refugia for bats and other animals.

Risk Factors – As mentioned previously, the primary threats to caves and adits are from human entry. This falls into two general categories: entry by recreationists (spelunkers), or illegal entry by illegal border crossers and drug traffickers. Generally, as natural features, caves are more attractive to spelunkers. Adits, on the other hand, are unnatural features and are more likely to be used for illegal purposes.

Another threat to native species is loss of the feature itself. Adits may be permanently closed (fenced, gated, or even filled) with or without surveys for bats (several species of which are forest planning species). Some adits and tailings can be acid producing and groundwater or surface seepage can be toxic in terms of pH or heavy metal contaminants.

Aquatic Habitat

Quantity and Distribution – Aquatic habitat is a component of the "Biophysical Features" section in the revised forest plan. These features are not mapped or addressed in the ecological sustainability report (USDA FS 2009b); therefore, the following description is more qualitative than those provided for vegetative habitat elements.

Southeastern Arizona is an arid environment that has experienced a historic "type conversion" of water resources. Before European settlers arrived, all aquatic habitat elements were natural—springs, seeps, cienegas, streams, and even some long, perennial river reaches in the valleys below the Coronado. Lentic habitats were limited to small ponds or pools; lakes were not present. Today, most of the region's natural surface waters have been lost, diverted, or temporally diminished (changed from perennial to ephemeral or continuous to intermittent). Currently, there are a few perennial streams flowing down from the higher elevations that are often spatially intermittent during spring low flow or times of drought. Only a few perennial streams are significant enough, and intact enough, to harbor aquatic species. Most of the available surface water is now found in constructed waters (stock tanks, drinkers, wildlife waters) across the Coronado, especially in places where livestock grazing is permitted. There are a few small artificial lakes (Peña Blanca, Parker Canyon, Rose Canyon, Riggs Flat) in the Tumacacori, Santa Catalina, Huachuca, and Pinaleño Ecosystem Management Areas, as well as adjacent valleys.

There are 18 fine-filter species that are associated with an aquatic community: 13 fish (7 endangered, 2 threatened, 3 sensitive, 1 proposed), 2 amphibians (1 threatened, 1 sensitive), 2 insects (1 candidate, 1 sensitive), and 1 other invertebrate (other). There are also 87 coarse-filter species associated with aquatic habitat type: 5 mammals, 13 birds, 3 reptiles, 3 fish, 4 amphibians, 31 insects, 7 mollusks, and 21 plants. Coarse-filter species are listed in appendix F and are identified in the "Associated Habitat" column as having physical habitat component A, B, C, or D. Additionally, species that benefit from plan components for natural water sources were included, although they may not be water obligates.

Habitat Quality – Although this habitat element was not given a trend ranking in the ecological sustainability report (USDA FS 2009b), the population viability assessment (USDA FS 2011) used a ranking of "declining" for both current and future habitat trends. Virtually all remaining waters on the Coronado are degraded from reference conditions. There has been nearly a categorical decline of aquatic species (USDA FS 2011). Most aquatic vertebrates that rely on perennial waters (i.e., fishes and many frogs) are federally listed as threatened, endangered, or candidates for listing; or they are Forest Service sensitive species. Both the range and occupied habitat of native fishes have declined, partly because existing habitats are of such poor quality that they cannot sustain native fish populations (AGFD 2001). Some species, including federally listed leopard frogs and Sonora tiger salamander, have adapted to constructed waters, but because of a serious introduced fungal disease of fish called chytridiomycosis, many populations of leopard frogs in stock tanks have plummeted.

Risk Factors – Species that are dependent upon aquatic habitats are threatened by numerous risk factors (Rinne and Minkley 1991). The most all-encompassing risk is loss of surface water through diversion, groundwater pumping, and drought (Jones and Sredl 2005; Lenart 2007). Habitat alteration and degraded water quality are also risk factors. Invasive species have had a heavy toll on not only survival of native species, but also attempts to reestablish populations. American bullfrogs, northern crayfish, nonnative tiger salamanders, and a variety of warm water fishes are nonnative invasive species that have caused most problems. Although the Coronado cannot control diseases or climate change, there are stressors and environment conditions that can be managed.

Federally Listed Species – Affected Environment

Federally listed threatened and endangered species, species proposed for listing, designated critical habitat, and habitat proposed for designation are those formally listed by the U.S. Fish and Wildlife Service (USFWS) under authority of the Endangered Species Act (ESA) of 1973, as amended. Pursuant to Section 7 (2)(a) of the ESA, the Forest Service will prepare a biological assessment to determine the potential effects of an alternative selected as the revised forest plan

All federally listed, proposed, and candidate species and designated and proposed critical habitats for the Southwestern Region were considered in this species viability analysis. Table 71 lists federally listed species whose viability was shown to be at risk after a coarse-filter analysis. These species require fine-filter components and analysis to determine their viability. Table 72 provides codes used in table 71 and throughout this wildlife analysis.

Certain threatened and endangered species occur in the area surrounding the Coronado but are not known to occur within its boundaries (such as masked bobwhite quail). Such species were not carried forward as forest planning species for analysis.

Habitat estimates reported in table 71 are based upon the extent of potential natural vegetation types, or biophysical habitat elements that meet the life history requirements of the species limited by the ecosystem management areas where the species is known to occur. They may overestimate habitat extent for some species that use microsites too small to map accurately or that fluctuate on the landscape over time within the associated habitat element. For instance, the Sonora tiger salamander has an estimated habitat extent of 92,186 acres but occupies only aquatic areas (primarily stock tanks) within the associated habitat elements and ecosystem management areas that have adequate water levels during the frog's breeding season. Acres or stream miles of designated critical habitat are those determined by the U.S. Fish and Wildlife Service and published in the Federal Register.

Table 71. Federally listed species and occupied critical habitat on the Coronado National Forest[1]

Common Name	Scientific Name	Status	Habitat Extent on the Coronado (acres)	Critical Habitat on Forest	Critical Habitat (acres/ stream miles)	Habitat Associa-tions	Associated Ecosystem Manage-ment Areas (EMAs)
Mammals							
Jaguar	*Panthera onca*	E	562,705	Yes, Designated	488,812 acres	TER, RIA: ENC, PIO, PON, WMC, DMC	PEL, CHI, TUM, RIT, HUA, WHE
Ocelot	*Leopardus pardalis*	E	559,689	No	NA	TER: ENC, PIO, PON, WMC, DMC	PEL, CHI, TUM, RIT, HUA, WHE
Mexican gray wolf	*Canis lupus baileyi*	E, Ep	0	No	NA	TER: ENC, PIO, PON, WMC, DMC	NA
Mount Graham red squirrel	*Tamiasciurus hudsonicus grahamensis*	E	18,120	Yes, Designated	1,921 acres	TER:WMC, SPR	PIN
Lesser long-nosed bat	*Leptonycteris yerbabuenae*	E	1,526,216	No	NA	TER, CAV: DES, GRA, CHA, ENC	ALL

Common Name	Scientific Name	Status	Habitat Extent on the Coronado (acres)	Critical Habitat on Forest	Critical Habitat (acres/ stream miles)	Habitat Associa-tions	Associated Ecosystem Manage-ment Areas (EMAs)
Mexican long-nosed bat	*Leptonycteris nivalis*	E	1,537,768	No	NA	TER, CAV: GRA, CHA, ENC, PIO, PON	PEL
Birds							
Mexican spotted owl[2]	*Strix occidentalis lucida*	T	236,718	Yes, Designated	793,243 acres	TER: PIO, PON, DMC	ALL
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	T	1,281,433	Yes, Proposed	150 acres	TER, RIA: GRA, ENC, PIO	ALL
Northern Aplomado falcon	*Falco femoralis septentrionalis*	Ep	0	No	NA	TER: GRA	NA
Amphibians							
Sonora tiger salamander	*Ambystoma mavortium stebbinsi*	E	92,186	No	NA	RIA, AQU: GRA	HUA
Chiricahua leopard frog	*Lithobates chiricahuensis*	T	960,047	Yes, Designated	263 acres, 54 stream miles	RIA, AQU: GRA, ENC, PIO	PEL, CHI, DRA, TUM, RIT, HUA, GAL
Reptiles							
New Mexico Ridge-nosed rattlesnake	*Crotalus willardi obscurus*	T	50,657	No	NA	RIA, ROC, TER: CHA, ENC, PIO	PEL
Northern Mexican gartersnake	*Thamnophis eques megalops*	T	524,762	Yes, Proposed	93,565 acres	RIA: GRA, CHA, ENC	TUM, RIT, HUA
Fish							
Gila chub	*Gila intermedia*	E	208,191	Yes, Designated	8.7 stream miles (907 acres buffered)	AQU: DES, GRA	HUA, CAT
Yaqui chub	*Gila purpurea*	E	201,388	No	NA	AQU: GRA, ENC	CHI
Yaqui catfish	*Ictalurus pricei*	E	0	No	NA	AQU: GRA	NA
Gila topminnow	*Poeciliopsis occidentalis*	E	486,736	No	NA	AQU: DES, GRA, ENC	HUA, CAT, GAL
Sonora chub	*Gila ditaenia*	T	154,413	Yes, Designated	6.5 stream miles (47 acres buffered)	AQU: GRA, ENC	TUM
Desert pupfish	*Cyprinodon macularius*	E	0	No	NA	AQU: DES, GRA	NA

Common Name	Scientific Name	Status	Habitat Extent on the Coronado (acres)	Critical Habitat on Forest	Critical Habitat (acres/ stream miles)	Habitat Associa-tions	Associated Ecosystem Manage-ment Areas (EMAs)
Gila trout	*Oncorhynchus gilae*	T	37,141	No	NA	AQU: PIO, PON, WMC, DMC, SPR	PIN
Apache trout	*Oncorhynchus gilae apachae*	T	37,141	No	NA	AQU: PIO, PON, WMC, DMC, SPR	PIN
Spikedace	*Meda fulgida*	E	0	No	NA	AQU: DES, GRA, CHA, ENC	NA
Loach minnow	*Tiaroga cobitis*	E	0	No	NA	AQU: DES, GRA, CHA, ENC, PIO, PON, DMC, WMC	NA
Roundtail chub	*Gila robusta*	P	0	No	NA	AQU: GRA, CHA, ENC	NA
Plants							
Pima pineapple cactus	*Coryphantha scheeri* var. *robustispina*	E	171,788	No	NA	TER: DES, GRA	RIT, HUA
Huachuca water umbel	*Lilaeopsis schaffneriana* var. *recurva*	E	250,351	Yes, Designated	8.3 stream miles	RIA, SPG, AQU: DES, GRA, ENC, PIO	HUA
Canelo Hills ladies' tresses	*Spiranthes delitescens*	E	230,066	No	NA	RIA, SPG: GRA, ENC	HUA

1. Codes for status, habitat associations, and associated ecosystem management area can be found in table 72.
2. More acres of critical habitat have been designated for this species than acres of the forest that have the primary constituent elements for Mexican spotted owl. That is why the acres of habitat extent on the forest are less than acres of critical habitat.

Table 72. Explanation of codes used throughout the wildlife section

Status Codes
E = Endangered
T = Threatened
P = Proposed for listing
C = Candidate
Ex = Extirpated
Ep = Nonessential, experimental population
SS = Forest Service Southwestern Region sensitive species
O = Forest planning species or other status
D = Delisted
Habitat Association Codes
RIA = Riparian
SPG = Spring
AQU = Aquatic
ROC = Cliff/Rock
TER = Terrestrial
CAV = Cave
OTH = Other
Forest Plan Component Codes
DC = Desired Condition
VO = Vegetation Objectives
G = Guidelines
S = Standard
O = Objective
MA = Management Approach
Vegetation Community Descriptions
VDC = Vegetation-Desert Communities
VGC = Vegetation-Grassland Communities
VIC = Vegetation-Interior Chaparral
VMP = Vegetation-Madrean pine-oak woodland
VME = Vegetation-Madrean encinal woodlands
VWM = Vegetation-Wet Mixed-conifer
VDM = Vegetation-Dry Mixed Confer
VPP = Vegetation-Ponderosa pine-evergreen oak
VSF = Vegetation-Spruce fir

Vegetation Community Descriptions
ALL = All communities
DES = Desert communities
GRA = Valley grasslands
CHA = Interior chaparral
ENC = Madrean encinal/PJ
PIO = Madrean pine-oak
PON = Ponderosa pine
WMC = Mixed-conifer forest – wet
DMC = Mixed-conifer forest - dry
SPR = Subalpine forest (spruce-fir)
MOM = Montane meadow
Ecosystem Management Area (EMA) Codes
ALL = All EMAs
CHI = Chiricahua
DRA = Dragoon
GAL = Galiuro
HUA = Huachuca
PEL = Peloncillo
PIN = Pinaleño
CAT = Santa Catalina
RIT = Santa Rita
STE = Santa Teresa
TUM = Tumacacori
WHE = Whetstone
WIN = Winchester
Forest Plan Resource Codes
ARP = Animals and Rare Plants
BIP = Biophysical Features
COW = Constructed Waters
ISM = Invasive Species Management
MIN = Minerals
MTS = Motorized Transportation
NWS = Natural Water Sources
RAM = Range Management
RIA = Riparian
WET = Wetlands

Jaguar

Status – The jaguar was listed as an endangered species in the U.S. portion of the species' range on July 22, 1997 (USFWS 1997a), without critical habitat. The U.S. Fish and Wildlife Service proposed to designate critical habitat for the jaguar on August 20, 2012 (USFWS 2012a), and on July 1, 2013 (USFWS 2013), they announced revisions to proposed critical habitat for the jaguar. In March 2014, the Service announced the final designation of approximately 764,207 acres of critical habitat for the jaguar (USFWS 2014). The Service and the binational Jaguar Recovery Team released a draft recovery plan for the jaguar in December 2016 (USFWS 2016c).

Distribution – Currently, individual jaguars occasionally occur in the southwestern U.S. and are from established populations in Mexico. The most northern recently documented breeding population of jaguars is now known to be centered in (but not restricted to) east-central Sonora, about 130 miles south of the U.S.-Mexico border. The Arizona and New Mexico jaguars reported from 1996 through 2016 almost certainly belong to the northernmost population known in Mexico. Recent U.S. jaguar sightings (after 1963) have been of males, suggesting possible dispersal of individuals originating in northern Mexico. Based on finding jaguars in their study area "frequently, continuously, and year round," researchers asserted that adult jaguars might be resident (in very low numbers) in the Arizona-New Mexico borderlands shared with Mexico. Recent sightings of jaguar have been in the Peloncillo Mountains of southwestern New Mexico near the Arizona border, in the Baboquivari Mountains west of the Coronado, and in the Animas Mountains of southwestern New Mexico, and in the Santa Rita and Huachuca Mountains. Prior to these sightings, the last confirmed report of a jaguar in Arizona was in 1986 when one was killed in the Dos Cabezas Mountains (USDA FS 2011).

On February 18, 2009, the Arizona Game and Fish Department captured and radio collared a jaguar southwest of Tucson at approximately 4,000 feet elevation, in a transition between desert grassland and oak woodland. By 2009, monitoring efforts confirmed occurrence of four different adult male jaguars (possibly as many as six) since 1996 in the borderlands of southern Arizona and southwestern New Mexico. By 2016, two additional adult males had been documented in southeastern Arizona. No females or subadult males were documented during that period. The last documented female jaguar occurrence in Arizona was in 1963. The monitoring data are not sufficient to determine if jaguars are continuously present in the U.S.

The Arizona-New Mexico Jaguar Conservation Agreement focused conservation efforts in a priority geographic area that includes all or parts of Santa Cruz, Pima, Pinal, Graham, Greenlee, and Cochise Counties in Arizona and all or parts of Catron, Sierra, Luna, Grant, and Hidalgo Counties in New Mexico. The Coronado participates in the remote camera census program for jaguar detection along the international border with Mexico. The jaguar is known to occur in the Peloncillo, Tumacacori, Santa Rita, and Huachuca Mountains with at least three individuals repeatedly documented (USDA FS 2011). From September 2012 to September 2015, there were hundreds of documented photographs of the same jaguar occurring on the Coronado National Forest, either within or near proposed critical habitat. Based on this new information, it seems probable that this single resident male jaguar that had a home range or territory that included most of the Santa Rita Mountains and likely the Whetstones (USDA FS 2013). In December 2016, a male jaguar, an individual not previously seen in Arizona, was photographed in the Huachuca Mountains (USFWS 2016a).

Habitat – The jaguar is found in Sonoran desertscrub up through subalpine conifer forest from elevations of 1,600 to 9,000 feet. Habitat includes a wide variety of situations, such as tropical and subtropical forests, lowland scrub and woodland, thorn scrub, pampas/llanos, desert, swampy savanna, mangrove swamps, lagoons, marshland, and floating islands of vegetation. At the southern extreme of the range, this cat inhabits open savanna, flooded grasslands, and desert mountains; at the northern extreme it may be found in chaparral and timbered areas (NatureServe 2012).

Designated Critical Habitat Within the Coronado National Forest – The U.S. Fish and Wildlife Service finalized critical habitat for the jaguar in March 2014 (USFWS 2014). Approximately 764,207 acres of critical habitat for the jaguar were designated in Pima, Santa Cruz, and Cochise Counties in Arizona, and Hidalgo County in New Mexico. A total of 488,812 acres of designated critical habitat occurs on the Coronado National Forest. The primary constituent elements (PCEs) of designated critical habitat for the jaguar are as follows (U.S. Fish and Wildlife Service 2014:12587):

> Expansive open spaces in the southwestern United States of at least 100 square kilometers (38.6 square miles) in size which:
>
> 1. provide connectivity to Mexico;
> 2. contain adequate levels of native prey species, including deer and javelina, as well as medium-sized prey such as coatis, skunks, raccoons, or jackrabbits;
> 3. include surface water sources available within 20 kilometers (12.4 miles) of each other;
> 4. contain from greater than 1 to 50 percent canopy cover within Madrean evergreen woodland, generally recognized by a mixture of oak (*Quercus* spp.), juniper (*Juniperus* spp.), and pine (*Pinus* spp.) trees on the landscape, or semidesert grassland vegetation communities, usually characterized by *Pleuraphis mutica* (tobosagrass) or *Bouteloua eriopoda* (black grama) along with other grasses;
> 5. are characterized by intermediately, moderately, or highly rugged terrain;
> 6. are below 2,000 meters (6,562 feet) in elevation; and
> 7. are characterized by minimal to no human population density, no major roads, or no stable nighttime lighting over any 1-square-kilometer (0.4-square-mile) area.

Risk Factors – In the past, the primary threat to jaguars in the U.S. was from shooting and possibly the reduction in understory vegetation density in riparian areas. In Arizona, the decline of the species was concurrent with the predator control associated with land settlement and development of the livestock industry. To date, shooting still remains a threat to jaguars. At least 64 jaguars have been killed in Arizona since 1900, one as recently as 1986. Other impacts include clearing of preferred habitat, alteration and destruction of riparian areas, habitat fragmentation or blocking of corridors that jaguars may use to move between Mexico and the U.S., and any trapping or animal control activities that target jaguars or other large predators (USDA FS 2011). Human population growth and development have both direct and indirect impacts on jaguar populations because they fragment habitat and isolate populations of jaguars and other wildlife (Jaguar Recovery Team and USFWS 2012a). Further, roads may directly impact jaguars and their habitat, resulting in mortality caused by vehicles, disturbance, habitat fragmentation, changes in prey numbers or distribution, and provision of increased access for legal or illegal harvest.

Ocelot

Status – The ocelot was listed as an endangered species in the U.S. portion of its range on July 21, 1982 (USFWS 1982), without critical habitat. A recovery plan was originally completed for the ocelot in 1990. A draft revised recovery plan was prepared in 2010 by a binational recovery team from Mexico and the U.S. The States of Texas and Arizona are active participants on the team. The first revision of the Recovery Plan for the Ocelot was published in July 2016 (USFWS 2016d). While the recovery plan considers the ocelot throughout its range, its major focus is on two cross-border management units: the Tamaulipas Management Unit in the Lower Rio Grande Valley in southern Texas, and the Arizona-Sonora Management Unit in southeast Arizona, which includes the Coronado National Forest.

Distribution – Currently, the ocelot ranges from extreme southern Texas and southern Arizona through the coastal lowlands of Mexico to Central America, Ecuador, and northern Argentina. The ocelot also is known from Trinidad and Isla de Margarita, Venezuela. Southern Arizona represents the northernmost distribution of the species and recent documentation of the ocelot in Arizona is sparse. Currently, the ocelot is listed as endangered throughout its range. In recent years the ocelot has been documented in two counties (Cochise and Gila), but the range also includes Pima and Santa Cruz Counties. The U.S. contains only a small proportion of the ocelot's range and habitat. At least six ocelots have been documented as occurring in Arizona since 2009 (USFWS 2016d). In November 2009, an ocelot was documented in Arizona with the use of camera traps for the first time since 1964, when the last known ocelot in Arizona was legally shot. The remote camera image was from Cochise County. In 2010, an ocelot was found dead on a road near Globe, Arizona (AGFD 2011) and, beginning in February 2011, ocelots have been documented in the Huachuca, Whetstone, and Santa Rita Mountains (USDA FS 2011; Tim Snow, Arizona Game and Fish Department, pers. comm., November 7, 2016).

Habitat – Little is known about ocelot habitat use in Arizona; however, ocelots are typically associated with areas of dense cover. In habitats with good cover, ocelots tend to keep hidden in dense brush when active by day. Ocelot habitat occurs in humid tropical forests, mangrove forests, swampy savannas, brushland, and riverine scrub in deserts. Dens are in caves, hollow trees, thickets, or the spaces between the closed buttress roots of large tree (USDA FS 2011). Researchers found that 27 of the 36 records (75 percent) of ocelots in Sonora were associated with tropical or subtropical habitat, namely subtropical thorn scrub, tropical deciduous forest, and tropical thornscrub. Only males (11.1 percent of the total records) were recorded in temperate oak and pine-oak woodland (USFWS 2016d). Recent detections of ocelots in Arizona were located in the semidesert grassland (46 percent), Madrean evergreen woodland (46 percent), and Great Basin grassland (8 percent) biotic communities (Culver et al. 2016). On average, these ocelot locations had 23 percent tree cover, were found at an elevation of 6,010 feet, were 1.5 miles from perennial water sites, and 4 miles from major roads.

Risk Factors – In the past, the primary threat to ocelots in the U.S. was from shooting and possibly the reduction in understory vegetation density in riparian areas. In Arizona, the decline of the species was linked to predator control and fur trapping, as well as habitat fragmentation and loss associated with land development. To date, both impacts remain threats to ocelots, though fur trapping and shooting have declined as protections for this species increase: the ocelot is protected from hunting and live collection in Arizona where it is listed as a species of special concern. Habitat conversion, fragmentation, and loss, comprise the primary threats to the ocelot today. Other impacts include roads, border issues, low genetic diversity, herbicides/pesticides, and climate change. All of these impacts have the potential to adversely affect ocelots and their habitats.

Mexican Gray Wolf

Status – Gray wolf subspecies or populations by region were originally listed individually. On April 28, 1976, the Mexican gray wolf subspecies was listed as endangered in the southwestern United States and Mexico (Federal Register 41:17736). On March 9, 1978, the gray wolf was listed as an endangered population at the species level (Federal Register 43:9607, March 9, 1978), reflecting changes in understanding in wolf taxonomy and the fact that wolves in the wild often disperse across subspecies boundaries; however, the 1978 rule made clear that subspecies would continue to be maintained and conserved (USFWS 2015). The U.S. Fish and Wildlife Service proposed a rule on June 13, 2013 (Federal Register 78:35664), to delist the gray wolf and maintain protections to the Mexican gray wolf, listing it as an endangered subspecies. On February 17, 2015, the Mexican gray wolf subspecies was listed as endangered under the Endangered Species Act (USFWS 2015), and the U.S. Fish and Wildlife Service finalized revisions to the regulation for the nonessential experimental population of the Mexican gray wolf (USFWS 2015c).

Distribution – Historically, Mexican gray wolves occurred in Arizona, New Mexico, Texas, and in a large portion of Mexico. By 1942, breeding populations of Mexican gray wolves were thought extirpated from the United States as a result of government and private efforts to kill predators such as wolves, though reports of wolves crossing into the United States from Mexico persisted into the 1960s. By the time the Mexican gray wolf was listed in 1976, no wild populations were known to remain in the United States or Mexico. Several Mexican wolf individuals captured in the wild in Mexico became the basis for the captive breeding program (USFWS 2015). In 1998, the U.S. Fish and Wildlife Service established the Mexican Wolf Experimental Population Area in central Arizona, New Mexico, and a portion of Texas, and 11 wolves from the captive-breeding program were released into the Blue Range Wolf Recovery Area within the Mexican Wolf Experimental Population Area (USFWS 2015b). Additional releases and translocations have occurred and by 2014, a population count indicates that at least 109 Mexican gray wolves inhabit the Mexican Wolf Experimental Population Area (USFWS 2015a). A single pair with pups is known to occur in the San Luis Mountains in Mexico just south of the international border, and more releases are planned for the future.

Historically, in southern Arizona this subspecies occurred in the Santa Rita, Tumacacori, Atascosa-Pajarito, Patagonia, Chiricahua, Huachuca, Pinaleño, and Catalina Mountains, west to the Baboquivari Mountains, but was extirpated by 1976. Currently at least 109 individuals occur in the Mexican Wolf Experimental Population Area that straddles Arizona and New Mexico (USFWS 2015). In 2015, the U.S. Fish and Wildlife Service revised the regulations for the nonessential experimental population of this subspecies by expanding the boundaries of the 10J area south of Interstate 10 in Arizona, modifying the regulations that govern release, translocation, removal, and take of this subspecies, and issuing a permit for management of this subspecies both inside and outside the Mexican Wolf Experimental Population Area (USFWS 2015c).

There are no known occurrences of this species on the Coronado. The nearest U.S. population is nearly 100 miles northeast of the Coronado, and the Mexican population is approximately 30 miles southwest of the Coronado (USFWS 2015c). However, the regulations for the nonessential experimental population of the Mexican gray wolf were recently revised to allow greater area for the population to achieve necessary population growth and distribution to become self-sustaining, allow for wolves from Sonora and Chihuahua, Mexico, to disperse into the United States, and increase the flexibility of management of the experimental population of Mexican gray wolves (USFWS 2015 & 2015c). The term Blue Range Wolf Recovery Area has been discontinued, and the action area has been placed into Zone 2 of the Mexican Wolf Experimental Population Area. In Zone 2, Mexican gray wolves will be allowed to naturally disperse into and occupy, and they may be translocated into in the future in a phased approach. There is no critical habitat designation for the wolf.

Habitat – Historically, Mexican gray wolves were associated with montane woodlands, consisting of evergreen oaks (*Quercus* spp.), pinyon (*Pinus edulis*), or juniper (*Juniperus* spp.) to higher elevation pine (*Pinus* spp.) or mixed conifer forests and adjacent grasslands at elevations of 4,000 to 5,000 feet above mean sea level. Mexican gray wolves likely selected these vegetation communities based on the availability of ungulate prey, water, cover, and den sites; these wolves were thought to avoid desert scrub and semidesert grasslands. Currently, Arizona wolves inhabit pine-oak woodlands, pinyon-juniper woodlands, and mixed conifer forest. Historical diet probably consisted of white-tailed deer (*Odocoileus virginianus*), mule deer (*O. hemionus*), elk (*Cervus elaphus*), collared peccaries (*javelina*) (*Tayassu tajacu*), pronghorn (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), jackrabbits (*Lepus* spp.), cottontails (*Sylvilagus* spp.), and small rodents. In Arizona, they show a strong preference to elk, compared with other ungulates, though deer and small animals are also preyed upon (USFWS 2015).

Risk Factors – Human-caused mortalities continue to be the primary cause of death for released Mexican gray wolves. In the Blue Range Wolf Recovery Area, illegal shooting is the single greatest

source of wolf mortality in the reintroduced population. Between 1998 and June 1, 2009, 31 of 68 deaths were due to illegal shooting of wild wolves. In several years, illegal shooting resulted in Blue Range Wolf Recovery Area population declines of close to or exceeding 10 percent. Threats related to the destruction, modification, or curtailment of habitat, disease, and predation are not currently considered significant threats to the Mexican wolf reintroduced population (USFWS 2010d).

Mount Graham Red Squirrel

Status – The Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) was listed as endangered in June 1987 (USFWS 1987), and critical habitat was designated in February 1990 (USFWS 1990). A recovery plan for the species was completed in 1993 (USFWS 1993d).

Distribution – The Mount Graham red squirrel is the southernmost subspecies of *Tamiasciurus hudsonicus.* This squirrel occurs in high elevation (typically above 8,000 feet) mixed-conifer and spruce-fir forests of the Pinaleño Mountains in Graham County, Arizona (USFWS 2011). The squirrel may inhabit drainage bottoms where mixed forests occur at lower elevations (USFWS 1993d). The entire current range of the species is in the Pinaleño Mountains (Safford Ranger District of the Coronado National Forest).

Historically, the Mount Graham red squirrel was common above 8,500 feet in elevation but is now seldom observed below 9,200 feet. As recently as the 1960s, the species possibly ranged as far east as Turkey Flat and as far west as West Peak, but currently is found as far west as Clark Peak. It is believed a local extinction occurred on West Peak, possibly as a result of a fire in the mid-1970s that caused loss of habitat and isolation of the West Peak subpopulation from the rest of the range (USFWS 1993d).

Midden surveys have been conducted in red squirrel habitat since 1986. In 1986, the potential habitat for the red squirrel was estimated to be 22,436 acres. This estimate included ponderosa pine forests, and surveys in 1986 did not locate any middens in this forest type. In 1988, the amount of potential habitat was revised to exclude ponderosa pine stands, and the amount of red squirrel habitat was estimated to be 11,733 acres (USFWS 1993d).

Between 1986 and 1991, 85 percent of the suitable habitat within the range of the red squirrel was surveyed (USFWS 1993d). Results of 1991 midden surveys showed that over 90 percent (510 out of 549) of middens occurred above 9,000 feet in elevation. Most middens occurred in spruce-fir vegetation types (203 out of 549, or 37 percent) or in the mixed-conifer/spruce-fir transition (268 out of 549, or 49 percent). Only 78 middens (14 percent) occurred in mixed-conifer vegetation (USFWS 1993d).

As of spring 2009, the technical subgroup of the Mount Graham red squirrel recovery team determined that only fall survey data will be taken. Analysis found that data acquired during spring surveys are inconsistent due to the difficulty of detecting squirrels during this time of year (they are foraging far and wide and not yet caching cones), especially when compared to data collected during fall surveys (when squirrels are actively caching cones, thereby making it much easier to determine if a midden is occupied) (USFWS 2011).

Based on 1991 survey data, the U.S. Fish and Wildlife Service estimated the habitat capability for the red squirrel at 650 individuals. In 200 years, assuming no catastrophic habitat loss, the habitat capability would increase to 900 red squirrels (USFWS 1993d and 2011).

Habitat – The red squirrel inhabits the spruce-fir (*Picea engelmannii*), corkbark fir (*Abies lasiocarpa* var. *arizonica*), and mixed-conifer forest types at high elevations of 8,500 feet or higher. Old-growth mixed-conifer stands dominated by Douglas-fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*) also provide habitat. Overall habitat suitability for the species depends on the ability of the

forest to produce reliable and adequate conifer cone crops for food and suitable microclimate conditions for storage of closed cones (USFWS 2011).

Designated Critical Habitat Within the Coronado National Forest – Critical habitat for the Mount Graham red squirrel was designated in January 1990 (USFWS 1990). All designated critical habitat for this species is within the Pinaleño Mountains on the Safford Ranger District of the Coronado National Forest. The area designated is composed of three large areas covering approximately 1,921 acres on Mount Graham and are named as the Hawk Peak/Mount Graham, Heliograph Peak, and Webb Peak critical habitat blocks. These areas were determined to contain the largest contiguous stand of good to excellent habitat and densest concentration of red squirrel middens, providing the best existing habitat components for the survival of the species. The primary constituent elements of critical habitat is dense spruce-fir forests. The Coronado National Forest does not conduct any activities that would diminish habitat quality, midden concentrations, or red squirrel survival within critical habitat (USFWS 2011).

Risk Factors – Past threats to the red squirrel were direct loss of habitat by human activities, and indirect consequences of this habitat loss or alteration. Actions that directly altered habitat suitability for the red squirrel were logging and associated road construction, road construction for residential and recreation access, and conversion of land to uses other than forest (recreational and residential development). Actions that directly affected the quantity of red squirrel habitat also affected the quality of the remaining habitat. Fragmentation from timber harvest, road construction, and land use conversion resulted in alteration of forest microhabitats (USFWS 2011).

Current threats facing Mount Graham red squirrel include predation; loss of habitat due to native and exotic insect infestations; direct mortality and loss of habitat and middens due to large-scale wildfires; loss of habitat due to human factors (such as disturbance; conversion to roads, trails, and/or recreation sites; or permitted special uses); loss or reduction of food sources due to drought; and apparent dietary and territory competition with Abert's squirrel, which were introduced in the 1940s by the Arizona Game and Fish Department (USFWS 2008d). Some preventative actions have been taken by the Forest Service and the Arizona Game and Fish Department. The Forest Service has stopped all harvesting of timber, fuelwood, and Christmas trees, and has restricted campfire wood gathering in some areas. Abert's squirrels are now hunted year-round in the pine forest through the spruce-fir zones (AGFD 2013). Another factor possibly affecting the species' existence is risk of extinction due to genetic and demographic problems associated with small population sizes (USFWS 2008d).

Lesser Long-nosed Bat

Status – The lesser long-nosed bat was listed as endangered in September 1988 (USFWS 1988) without critical habitat. A recovery plan for the species was developed in May 1994 (USFWS 1995a). In January 2017, the U.S. Fish and Wildlife Service proposed delisting the lesser long-nosed bat (USFWS 2017).

Distribution – The lesser long-nosed bat is a seasonal migrant on the Coronado National Forest. The species occurs in Arizona generally from May to September, but significant numbers of bats are found on the Coronado National Forest only after leaving low-elevation maternity colonies. Occurrence on the Coronado coincides with the blooming of paniculate agaves between July and September.

Habitat – Several post-maternity roosts, which house from thousands to only a few individuals, are known from various locations on or near the Coronado, but only four are monitored on a priority basis during the simultaneous roost surveys. They are Patagonia Bat Cave, Lone Star Mine, New Catalina Cave, and Papago Cave. Two roost locations on the Coronado that used to be included in the simultaneous roost surveys were the Kasper and Hilltop Mines. These two sites are no longer surveyed because they are now active mines. In 2009 and 2010, New Catalina Cave and Papago Cave were added to the simultaneous roost surveys. There are also post-maternity roosts close to the

Coronado National Forest where roosting lesser long-nosed bats most certainly forage on the Coronado. There are no known maternity colonies on the Coronado National Forest (USDA FS 2011).

These bats exhibit roost-switching behavior, therefore, it is difficult and perhaps inappropriate to determine population trends based on the number of bats detected at select roosts from year to year. It appears that known roosts are still being used, and new roosts and newly discovered roosts continue to be documented on and around the Coronado National Forest (USDA FS 2011).

Risk Factors – The primary threat to this species comes in the form of roost site disturbance or loss. The colonial roosting behavior of this species, where high percentages of the population can congregate at a limited number of roost sites, increases the likelihood of significant declines or extinction due to impacts at roost sites (USFWS 2016e). Potential impacts to roost sites may occur due to: border activities, recreation, vandalism of potential roost sites, mine closures, and spread of disease. Other risk factors to this species include reduction of habitat (loss of saguaros and agaves as food sources), grazing, and fire suppression.

Some of the most numerous and dense agave clusters on the Coronado National Forest are in areas with rocky slopes where there is poor livestock grazing potential. Thus, effects of livestock grazing on agave would likely be limited to the relatively few locations where permanent water is available. In addition, many grazing allotments on the Coronado National Forest are grazed only during the winter and are rested during the summer growing season when agaves are bolting. On year-round grazing allotments, grazing is managed under strategies that insure periodic rest or deferment during the growing season, thus ensuring that only a percentage of pastures supporting flowering agaves are grazed during any single growing season.

There is little information available on the effects of fire on agaves and bats; however, wildfire may result in impacts to roost sites. The fire itself can result in short-term impacts from smoke and heat. More lasting impacts can result if the microclimate of the roost is affected by the impact of the fire (removal of vegetation, change in air currents, alteration of hydrology, etc.). Slauson and Dalton (1998, in USFWS 2007a) concluded that the short-term effects of fire on flowering agaves were limited. In fact, they found that burned plants produced significantly more nectar and had higher sugar concentrations than unburned plants. Pollen production and seed set were also unaffected by burning. Predation of lesser long-nosed bats by owls and snakes occurs but is not significant. Drought and climate change have also been identified as threats to the species (USDA FS 2015).

Mexican Long-nosed Bat

Status – The Mexican long-nosed bat was listed as endangered in September 1988 (USFWS 1988) without critical habitat. A recovery plan for the species was developed in September 1994 (USFWS 1994).

Distribution – The Mexican long-nosed bat is not believed to occur in Arizona; however, there are historic confirmed occurrences of the species on the Coronado National Forest from 1963 and 1967 in the Peloncillo Mountains. There is also currently one known Mexican long-nosed bat roost on the Coronado in a crevice in the Peloncillo Mountains. Therefore, it is speculated that this species forages on the Douglas Ranger District of the Coronado National Forest (Scott Richardson, U.S. Fish and Wildlife Service, pers. comm., August 2016).

Habitat – This species depends largely on caves for roosting and agave flowers and cacti for food (USFWS 1988). Potential roosts are surveyed for long-nosed and other bat species on a project-by-project basis. Roost surveys are also coordinated with research personnel and include southwestern New Mexico and the Peloncillo Mountains (USDA FS 2011).

Risk Factors – Risk factors are identified as disturbance of roosts; loss of food sources through clearing of land for agriculture and human exploitation of agaves. Long-nosed bats are thought to be

negatively affected by reductions in acreage of native agaves over large areas of their wintering grounds in Mexico due to excessive harvesting for local manufacture of mescal and tequila. This threat to the Mexican long-nosed bat food resource is beyond the control of national forests. Another possible threat to native agaves is wildfire, prescribed burns, or both; however, threats to long-nosed bats from grazing on food plants, the tequila industry, and prescribed fire are likely not as severe as once thought (USFWS 2007a).

Mexican Spotted Owl

Status – The Mexican spotted owl was listed as threatened in March 1993 (USFWS 1993b) and critical habitat was designated in August 2004 (USFWS 2004a). A recovery plan for the species was developed in December 1995 (USFWS 1995b) and revised in September 2012 (USFWS 2012f).

Distribution – The Coronado National Forest lies completely within the Basin and Range–West Recovery Unit for the Mexican spotted owl. The Forest Service estimates 241,659 acres of protected habitat are present on the Coronado National Forest outside of protected activity centers and 78,524 acres of restricted habitat. Biologists have delineated 108 protected activity centers within the boundaries of the Coronado (USDA FS 2015). Occupancy of monitored protected activity centers varied between 69 and 87 percent over a period of 3 years (2007 to 2009). Surveys within recent years have identified additional areas that may be appropriate for protected activity center delineation, and the Coronado is working with the U.S. Fish and Wildlife Service to delineate new protected activity centers. Coronado National Forest protected activity centers have been monitored sporadically since 1989; it is not possible to infer any trends related to the population of owls on the Coronado.

Habitat – Mexican spotted owls are widely distributed on the Coronado National Forest. Mexican spotted owls are most common in mixed-conifer forests dominated by Douglas-fir and/or white fir as well as Madrean encinal woodlands, ponderosa pine-Gambel oak, and canyons with varying degrees of forest cover including riparian.

Designated Critical Habitat Within the Coronado National Forest – Approximately 8.6 million acres of critical habitat for the Mexican spotted owl was designated on Federal lands in Arizona, Colorado, New Mexico, and Utah in August 2004, of which 793,243 acres are on the Coronado (USFWS 2004a). Within the critical habitat boundaries, critical habitat includes only Protected and Restricted habitats as defined in the original recovery plan (USFWS 1995b). Protected areas include all known owl sites (protected activity centers), all areas in mixed-conifer and pine-oak types with greater than 40 percent slopes where timber harvest has not occurred in the past 20 years and administratively reserved lands, such as wilderness areas or research natural areas. Restricted habitat includes mixed-conifer forest, pine-oak forest, and riparian areas adjacent to or outside of protected areas. The primary constituent elements essential to the conservation of the owl include those physical and biological features that support nesting, roosting, and foraging.

The primary constituent elements identified in the 1995 and 2012 recovery plans are as follows:

1. Primary Constituent Elements Related to Forest Structure:
    - A range of tree species, including mixed-conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30-45 percent of which are large trees with a trunk diameter of 0.3 meters (12 inches) or greater when measured at 1.4 meters (4.5 feet) from the ground;
    - A shaded canopy created by the tree branches and foliage covering 40 percent or greater of the ground; and,
    - Large, dead trees (snags) with a trunk diameter of at least 0.3 meters (12 inches) when measured at 1.4 meters (4.5 feet) from the ground.

2. Primary Constituent Elements Related to Maintenance of Adequate Prey Species:
    - High volumes of fallen trees and other woody debris;
    - A wide range of tree and plant species, including hardwoods; and,
    - Adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration.
3. Primary Constituent Elements Related to Canyon Habitat (one or more of the following):
    - Presence of water (often providing cooler air temperature and often higher humidity than the surrounding areas);
    - Clumps or stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation;
    - Canyon walls containing crevices, ledges, or caves; and,
    - High percentage of ground litter and woody debris.

Part or all of 11 critical habitat units[46] (BR-W-7, BR-W-8, BR-W-9, BR-W-10, BR-W-11, BR-W-12, BR-W13, BR-W-14, BR-W-15, BR-W-16, and BR-W-18) occur within the boundaries of the Coronado. The critical habitat units encompass approximately 209,138 acres of protected habitat and approximately 62,622 acres of restricted habitat. Within the critical habitat boundaries, only areas that fit the definition of restricted or protected habitat in the recovery plan for the Mexican spotted owl are critical habitat. The areas (acres) listed above represent estimated critical habitat within the critical habitat units and not the total area for the critical habitat unit itself.

Risk Factors – Threats to the U.S. population have transitioned from commercial-based timber harvest to stand-replacing wildfire. Recent forest management has moved from a commodity focus and now emphasizes sustainable ecological function and a return toward presettlement fire regimes, both of which have potential to benefit the Mexican spotted owl. Southwestern forests have experienced larger and more severe wildfires from 1995 to present. Climate variability combined with dense forest conditions may also synergistically result in increased negative effects to habitat from fire. The intensification of natural drought cycles and the ensuing stress placed upon overstocked forested habitats could result in even larger and more severe fires in Mexican spotted owl habitat. Several factors have been identified as particularly detrimental to the Mexican spotted owl, including predation, starvation, accidents, disease, and parasites (USFWS 2012). In addition to stand-replacing fires, improper livestock grazing (use levels and seasons), land development of facilities or structures and roads (including road maintenance) and recreation activities (often associated with motor vehicles such as all-terrain vehicles) have contributed noise and disturbance to Mexican spotted owls and have been a threat to Mexican spotted owls and their habitat on the Coronado (USDA FS 2015).

Western Yellow-billed Cuckoo

Status – On October 3, 2013, the western yellow-billed cuckoo was proposed for listing as threatened under the Endangered Species Act (USFWS 2013b), and effective October 3, 2014, it was listed as threatened under the Act (USFWS 2014b). In August 2014, designation of critical habitat for the species was proposed (USFWS 2014a).

Distribution – Historical accounts postulate that the western yellow-billed cuckoo was formerly widespread and locally common in California and Arizona, more narrowly distributed but locally common in New Mexico, Oregon, and Washington and uncommon along the western front of the

[46] The full documentation for designation of critical habitat can be found here: http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/MSO/FR_MSO_CH_8_31_04.pdf

Rocky Mountains north to British Columbia (USFWS 2016). The species may be extirpated from British Colombia, Washington, and Oregon. The western yellow-billed cuckoo is now very rare in scattered drainages in western Colorado, Idaho, Nevada, and Utah, with single, nonbreeding birds most likely to occur. The largest remaining breeding areas are in southern and central California, Arizona, along the Rio Grande in New Mexico, and in northwestern Mexico.

Habitat – Habitat for the species in the eastern United States consists of parks, riparian woodlands, and other deciduous woodlands. This is in contrast to habitat west of the Continental Divide, where suitable habitat is limited to narrow, and often widely separated, riparian cottonwood-willow galleries (salt cedar is also used by the cuckoo). Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California. The species is usually found at elevations less than 2,011 meters (6,600 feet) (USFWS 2001).

Losses of riparian habitats from historic levels have been substantial in Arizona; however, Arizona probably contains the largest remaining cuckoo population among states west of the Rocky Mountains, and the species is still found in all counties in Arizona (USFWS 2016). Recent surveys have found that, in addition to gallery riparian forest and mesquite woodlands, yellow-billed cuckoos are also using, and likely breeding in, more xeroriparian drainages in the foothills and mountains of southeastern Arizona. This kind of habitat is more typical of habitat where cuckoos are found in Sonora, Mexico. Many drainages throughout southeastern Arizona have not been thoroughly surveyed, however, and as surveys continue to occur, it is likely that additional yellow-billed cuckoo locations will be discovered.

Proposed Critical Habitat Within the Coronado National Forest – The U.S. Fish and Wildlife Service proposed 546,335 acres of critical habitat in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah and Wyoming for the western yellow-billed cuckoo on August 15, 2014 (USFWS 2014a). Of the 245,000 acres of critical habitat proposed in Arizona, approximately 150 acres occur on the Coronado on the Santa Rita Ecosystem Management Area in critical habitat unit-45: AZ-37, Florida Wash. Approximately 700 acres of proposed critical habitat occur in streams and major drainages adjacent to the Coronado. Primary constituent elements specific to the western yellow-billed cuckoo are (USFWS 2014a).

1. Riparian woodlands. Riparian woodlands with mixed willow cottonwood vegetation, mesquite-thorn forest vegetation, or a combination of these that contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are greater than 325 feet (100 meters) in width and 200 acres (81 hectares) or more in extent. These habitat patches contain one or more nesting groves, which are generally willow dominated, have above average canopy closure (greater than 70 percent), and have a cooler, more humid environment than the surrounding riparian and upland habitats.
2. Adequate prey base. Presence of a prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies) and tree frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas.
3. Dynamic riverine processes. River systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g. lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). This allows habitat to regenerate at regular intervals, leading to riparian vegetation with variously aged patches from young to old.

Risk Factors – The loss, degradation, and fragmentation of riparian woodland habitat, and degradation of the invertebrate communities they support, have been identified as the primary factors

causing yellow-billed cuckoo declines in the western United States. Estimates of riparian habitat losses include 90 to 95 percent for Arizona, 90 percent for New Mexico, 90 to 99 percent for California, and more than 70 percent nationwide. Distribution, population, and trend data indicate that, although regional declines have occurred, the yellow- billed cuckoo is relatively common as a breeding bird in much of the eastern United States (USFWS 2001).

Northern Aplomado Falcon

Status – The northern Aplomado falcon was listed as endangered in January 1986 (USFWS 1986) without critical habitat.

Distribution – Historically, in the U.S., this species was limited to southeastern Arizona (Cochise and Santa Cruz Counties, Arizona), southern New Mexico, and southern Texas. It was also found throughout most of Mexico south to Tierra del Fuego. Currently there is very limited distribution, with no confirmed sightings in the U.S. between 1952 and 1997. In 1887, five nests were located in Arizona; these are the only known nests ever found in the state. A small population has been confirmed in northern Chihuahua and Tamaulipas Mexico, and several confirmed sightings have been made in the U.S. in New Mexico and Texas since 1995 (USFWS 2001a).

A nonessential experimental population (10 (j)) for the northern Aplomado falcon was established in 2006 to include both Arizona and New Mexico. The action allowed for the reintroduction of up to 150 northern Aplomado falcons annually for 10 or more years into New Mexico. Currently, reintroduction sites are only on lands within New Mexico, but falcons would be allowed to disperse into Arizona as part of the 10(j) population (USDA FS 2011).

The northern Aplomado falcon does not occur on lands administered by the Forest Service Southwestern Region. Currently, potentially suitable nesting and/or foraging habitat occurs within National Forest System lands on the Lincoln, Coronado, Gila and Cibola National Forests. These national forests are located approximately 200 miles (Lincoln), 60 miles (Coronado), and 50 miles (Gila) from the recently successful nest site near Deming, New Mexico. Therefore, it is conceivable that Aplomado falcons could use suitable nesting or foraging habitat found on Coronado National Forest lands over a period of time (USDA FS 2011).

No recovery efforts have been implemented by the Coronado National Forest specifically for the northern Aplomado falcon. The recovery plan for the species or recent Federal Register notices related to the species do not identify Southwestern Region national forests anywhere as having any connection with species recovery. An active and ongoing release effort of Aplomado falcons is currently ongoing in New Mexico on private lands and areas managed by the Bureau of Land Management and Department of Defense. The U.S. Fish and Wildlife Service began reintroducing Aplomado falcons into historical habitat in southern New Mexico in 2006 to establish a viable resident population in New Mexico and Arizona. This action is part of a series of reintroductions and other recovery actions that the U.S. Fish and Wildlife Service, Federal and State agencies, and other partners are conducting throughout the specie's historical range. Therefore, the number of Aplomado falcons in New Mexico will increase over the next 5 to 10 years, and falcons may eventually disperse into suitable habitat on the Coronado National Forest in New Mexico and Arizona. The fact that potentially suitable habitat does exist on National Forest System lands within the Coronado suggests that Forest Service activities could impact this species in the future (USDA FS 2011).

Habitat – Habitat for this species consists of open grassland terrain with scattered trees, relatively low ground cover, an abundance of small to medium sized birds, and a supply of suitable nesting platforms, particularly yuccas and mesquite. Typical habitat ranges in elevation from 1,189 to 2,743 meters (3,500 to 9,000 feet). Woody vegetation, fence posts, and telephone poles serve as perches (USFWS 2001a).

Moderately suitable habitat (mapped in 2005) for nesting, foraging, or both exists within National Forest System lands in the Peloncillo Mountains of the Coronado National Forest in New Mexico. The habitat suitability mapping effort did not include lands in Arizona, but the "Coronado National Forest Ecological Sustainability Report" prepared for the forest plan revision states that desert grasslands make up 26 percent of the Coronado National Forest (USDA FS 2009b). Around 27 percent of these lands are currently in an open, native condition, similar to the reference condition. Another 42 percent have been invaded by shrubs, but have the potential to be restored to an open, native condition through appropriate management actions. Some species such as the Aplomado falcon are considered locally rare and on the fringe of their normal range, so the Coronado National Forest probably provides suboptimal habitat. Habitat for the falcon also occurs in the Chiricahua Mountains (USDA FS 2011).

Risk Factors – The Aplomado falcon is at the northern limits of its continental range in southeastern Arizona, southern New Mexico, and western and southern Texas; and, therefore, possibly vulnerable to small changes in habitat quality in this region (USFWS 2006a). Prior to the mid-1940s severe overgrazing, by domestic livestock, fire suppression and resultant brush encroachment in the Southwest has been most frequently implicated as the principal cause for the species' decline. Direct adverse effects of livestock grazing on potential falcon prey species have also been suggested as a possible cause. In southern Texas, relatively high numbers of falcon eggs and specimens were collected by professional collectors during the early-1900s and possibly contributed to the disappearance of Aplomados in that region. In portions of the Aplomado's former desert range, large tracts of native grassland have been converted to pasturelands and croplands, thereby further reducing the extent and quality of Aplomado falcon habitat. Other threats include direct loss of habitat from various forms of human development, secondary lead poisoning through ingestion of game birds (doves and quail), electrocution by improperly designed electrical transmission lines, and human disturbance in breeding areas, although falcons appear to be tolerant to some disturbance.

Sonora Tiger Salamander

Status – The Sonora tiger salamander was listed as endangered in January 1997 (USFWS 1997) without critical habitat. A recovery plan for this species was released in October 2002 (USFWS 2002c).

Distribution – Based on collections and observations of salamanders, and the distribution of plains grassland and adjacent Madrean evergreen woodlands (Brown 1994) in which the salamander has been found, the range of the subspecies and its occupied and potentially occupied habitat is thought to extend from the crest of the Huachuca Mountains west to the crest of the Patagonia Mountains, including the San Rafael Valley and adjacent foothills from its origins in Sonora north to the Canelo Hills.

All confirmed historic and extant aquatic populations are found in tanks, ponds, or impounded cienegas within 31 kilometers (19 miles) of Lochiel, Arizona. This region lies between the Patagonia and Huachuca Mountains, is bordered on the north end by the Canelo Hills, and stretches from Santa Cruz County in Arizona south into Sonora, Mexico. Cattle ponds or tanks are the primary habitat for Sonora tiger salamanders, but there are several observations of unidentified salamanders away from cattle ponds. Periodic surveys have been conducted on public lands throughout the Arizona portion of the San Rafael Valley from 1979 to 2007.

A single terrestrial Sonora tiger salamander was found near Oak Spring in Copper Canyon of the Huachuca Mountains (USFWS 1997). Tiger salamanders have also been reported from a cave, a vertical mining shaft at the northwestern edge of the San Rafael Valley, and one spring-fed well, which have yet to be confirmed (Ziemba et al. 1998). In the past, salamanders were collected from a cienega at Rancho Los Fresnos in the San Rafael Valley, Sonora, and they were likely *A. m. stebbinsi*. However, surveys during 2006 and 2007 failed to locate additional salamanders, and most waters on

the ranch were occupied by nonnative bullfrogs, crayfish, green sunfish, black bullhead, or some combination of those species (USFWS 2009).

More data are needed to make definitive statements about the long-term viability of Sonora tiger salamanders in the San Rafael Valley. About half of the 58 Sonora tiger salamander populations have been discovered in the last 5 years, and only in the last 5 years were ponds with salamanders sampled consistently, making it difficult to determine long-term trends in the proportion of ponds occupied by salamanders and suitability of those ponds for salamander breeding habitat. Also, more data on the ecology of Sonora tiger salamanders (lifespan, proportion of adults breeding each year, frequency and distance of dispersal events) are required to develop a suitable population viability analysis.

Habitat – Historically, the Sonora tiger salamander probably inhabited springs, cienegas, and possibly backwater pools of the Santa Cruz River and streams in the San Rafael Valley where permanent or nearly permanent water allowed survival of mature branchiates. Erosion and arroyo cutting in the late 19th and early 20th centuries caused the San Rafael Valley to dry and natural standing water habitats to disappear (Hendrickson and Minckley 1984, Hadley and Sheridan 1995). The Sonora tiger salamanders are no longer found in these rare habitats. Arizona Game and Fish Department (1993) estimated that up to 90 percent of the riparian habitat along Arizona's major desert watercourses has been lost, degraded, or altered. The Sonora tiger salamander apparently has opportunistically taken advantage of available stock tank habitats as natural habitats disappeared (Hendrickson and Minckley 1984) or were invaded by nonnative predators with which the salamander cannot coexist (U.S. Fish and Wildlife Service 2002a).

The most important habitat requirement for Sonora tiger salamanders is the availability of standing water for breeding from January through June. This gives the salamanders enough time to breed, grow as larvae, and metamorphose before the pond dries. Permanent bodies of water can be good breeding sites, except they often contain introduced fish and bullfrogs (Snyder 1998). As a result, ponds created by ranchers for watering their cattle are now almost the only suitable breeding sites remaining. However, there are still areas, such as Scotia Canyon in the Huachuca Mountains, that may be suitable breeding sites.

Risk Factors – The restricted distribution of Sonora tiger salamanders makes them vulnerable to relatively small-scale environmental disturbances and land use changes. The primary threats to the Sonora tiger salamander include predation by nonnative fish and bullfrogs, diseases, catastrophic floods and drought, illegal collecting, introduction of other subspecies of salamanders that could genetically swamp *A. m. stebbinsi* populations, and stochastic extirpations or extinction characteristic of small populations (USFWS 2009).

Currently, Sonora tiger salamanders breed almost exclusively in these cattle ponds. The fact that Sonora tiger salamanders breed in human-constructed cattle ponds instead of natural habitats does not necessarily threaten persistence of the taxon. Sonora tiger salamanders have successfully bred in cattle ponds for decades, but salamanders are now dependent on humans to maintain the habitat. In particular, cattle ponds require occasional re-excavation because they fill in with silt, and pond dams also require occasional maintenance. Unfortunately, the maintenance required to maintain these ponds also adversely affects the Sonora tiger salamander. Cattle pond habitats are also vulnerable to extreme weather conditions. Long-term drought could dry many of the ponds, and if ponds remained dry for several years, lack of breeding could lead to local extirpation of the salamander population.

Chiricahua Leopard Frog

Status – The Chiricahua leopard frog was listed as endangered in June 2002 (USFWS 2002b), and critical habitat was designated in March 2012 (USFWS 2012e). A recovery plan for this species was drafted in April 2006 (USFWS 2006) and finalized in April 2007 (USFWS 2007).

Distribution – The Coronado National Forest occurs in three recovery units identified in the Chiricahua leopard frog recovery plan. In recovery unit 1 (Tumacacori-Atascosa-Pajarito Mountains, Arizona and Mexico), there are several populations or metapopulations on the Coronado. Sycamore Canyon is the only significant site with moving water in recovery unit 1 to support breeding Chiricahua leopard frogs. Most other sites are livestock tanks or impounded springs.

Recovery unit 2 (Santa Rita-Huachuca-Ajos Bavispe, Arizona and Mexico) also hosts several population sites on the Coronado National Forest. The Florida Canyon site was augmented with frogs from elsewhere in the Santa Rita Mountains in 2009. The site was enhanced in 2010 with the addition of a steel tank for breeding. The eastern slope of the Santa Rita Mountains is another population site that includes two metal troughs in Louisiana Gulch, Greaterville Tank, Los Posos Gulch Tank, and Granite Mountain Tank complex. The Granite Mountain Tank complex includes two impoundments and a well. All but Los Posos Gulch Tank are currently occupied breeding sites.

Recovery unit 3 (Chiricahua Mountains-Malpai Borderlands-Sierra Madre, Arizona, New Mexico, and Mexico) includes the Chiricahua Mountains and its aquatic habitats where Chiricahua leopard frog populations occur or have occurred in Ash Creek and the Peloncillo Mountains and its aquatic habitats where Chiricahua leopard frog populations occur or have occurred in Geronimo, Javelina, State Line, and Canoncito Ranch Tanks; Maverick Spring; and pools or ponds in the Cloverdale Cienega and along Cloverdale Creek below Canoncito Ranch Tank. Breeding occurs in State Line and Canoncito Ranch Tanks, and possibly other aquatic sites.

In recovery unit 4 (Pinaleño-Galiuro-Dragoon Mountains, Arizona) a few Chiricahua leopard frog populations are in the Galiuro Mountains (Deer Creek and High/Ash Creek) and the Dragoon Mountains with existing populations at Shaw Tank, Tunnel Spring, and Halfmoon.

Habitat – The Chiricahua leopard frog is an inhabitant of montane and river valley cienegas, springs, pools, cattle (stock) tanks, lakes, reservoirs, streams, and rivers. The species requires permanent or class-permanent pools for breeding and water characterized by low levels of contaminants and moderate pH. Prior to the invasion of perennial waters by predatory, nonnative species (American bullfrog, crayfish, fish species), the frog was historically found in a variety of aquatic habitat types. Today, leopard frogs in the Southwest are so strongly impacted by harmful nonnative species, which are most prevalent in perennial waters, that their occupied niche is increasingly restricted to the uncommon environments that do not contain these nonnative predators, and these now tend to be ephemeral and unpredictable. This increasingly narrow realized niche is a primary reason for the threatened status of the Chiricahua leopard frog (USFWS 2012).

Designated Critical Habitat within the Coronado National Forest – The U.S. Fish and Wildlife Service designated critical habitat for the Chiricahua leopard frog on April 19, 2012. Approximately 263acres and 54 stream miles were designated on the Coronado in 13 separate units. Activities on the Coronado that may warrant special management for the Chiricahua leopard frog include, but are not limited to, introduction of predators, such as bullfrogs, crayfish, sportfishes, and barred tiger salamanders; introduction or spread of chytridiomycosis; recreational activities; livestock grazing; water diversions and development; construction and maintenance of roads and utility corridors; fire suppression, fuels management, and prescribed fire; and various types of development. The areas of designated critical habitat for the Chiricahua leopard frog, grouped by recovery unit, are listed below:

Recovery Unit 1 (Tumacacori-Atascosa-Pajarito Mountains, Arizona and Mexico)

- **Critical Habitat Unit 4 (Bonita, Upper Turner, and Mojonera Tanks)**. This unit includes 201 acres of Coronado National Forest lands in the Pajarito and Atascosa Mountains. In this unit, bullfrogs are a continuing threat.
- **Critical Habitat Unit 5 (Sycamore Canyon)**. This unit includes 262 acres of Coronado National Forest land and 7 acres of private lands along Atascosa Canyon through Bear

Valley Ranch in the Pajarito and Atascosa Mountains. Sycamore Canyon is designated a research natural area and is closed to livestock grazing. Critical habitat is designated for the Sonora chub (*Gila ditaenia*) in Sycamore Canyon. Much of this unit also lies within the Pajarita Wilderness area. Bullfrogs have been a continuing problem in this unit; other threats are sedimentation and erosion upstream, illegal border activity, and trampling.

- **Critical Habitat Unit 6 (Pena Blanca Lake/Spring and Associated Tanks)**. This unit includes 202 acres and is all on National Forest System lands. There is a continuing threat of reinvasion or introduction of bullfrogs.

Recovery Unit 2 (Santa Rita-Huachuca-Ajos Bavispe, Arizona and Mexico)

- **Critical Habitat Unit 7 (Florida Canyon).** This unit includes 4 acres and is all on National Forest System lands in the Santa Rita Mountains. Water is a limiting factor in this system, particularly during drought.
- **Critical Habitat Unit 8 (Eastern Slope of the Santa Rita Mountains).** This unit includes 172 acres of National Forest System lands and 14 acres of private lands in the Greaterville area. Surface water is a primary limiting factor in this unit.
- **Critical Habitat Unit 11 (Scotia Canyon).** This unit includes 70 acres in Scotia Canyon, Huachuca Mountain. Bullfrog reinvasion is a significant, continuing threat. The proposed critical habitat designation for the Chiricahua leopard frog largely overlaps that of critical habitat for the endangered plant Huachuca water-umbel (*Lilaeopsis schaffneriana* var. *recurva*).
- **Critical Habitat Unit 13 (Carr Barn Pond).** This unit includes 0.6 acre of National Forest System lands in the Huachuca Mountains. The population has been eliminated after chytridiomycosis die-offs three times; twice the population has subsequently been reestablished through translocations. Largemouth bass have been introduced illegally into the pond and then removed, and bullfrogs periodically invade the site.
- **Critical Habitat Unit 14 (Ramsey and Brown Canyons).** This unit includes 44 acres of private lands in Ramsey Canyon and 58 acres of Coronado National Forest in Brown and Ramsey Canyons, Huachuca Mountains. The populations tend to experience epizootic chytridiomycosis outbreaks followed by declines or extirpation. Additional threats in this unit include nonnative species, drying, sedimentation, and fire.

Recovery Unit 3 (Chiricahua Mountains-Malpai Borderlands-Sierra Madre, Arizona, New Mexico, and Mexico)

- **Critical Habitat Unit 16 (Peloncillo Mountains).** This unit includes 366 acres of National Forest System lands. Periodic drought dries most of the aquatic sites completely or to small pools, which limits population growth potential.
- **Critical Habitat Unit 17 (Cave Creek).** This unit includes 234 acres of National Forest System lands. Scarcity of water can occur in drought years.

Recovery Unit 4 (Pinaleño-Galiuro-Dragoon Mountains, Arizona)

- **Critical Habitat Unit 20 (Deer Creek).** This unit consists of 17 acres of Coronado National Forest, 69 acres of Arizona State Land Department lands, and 34 acres of private lands in the Galiuro Mountains. The primary threat to Chiricahua leopard frogs and their habitats in this unit is periodic drought that results in breeding sites drying out.
- **Critical Habitat Unit 21 (Oak Spring and Oak Creek).** This unit consists of 27 acres of National Forest System lands in the Galiuro Mountains. The primary threat in this unit is extended drought during which all of the pools are subject to reduction or drying.

- **Critical Habitat Unit 22 (Dragoon Mountains).** This unit includes 74 acres of National Forest System lands. Threats to the Chiricahua leopard frog and its habitat are primarily scarcity of suitable breeding habitat and loss of that habitat during drought.

Risk Factors – The primary threats to this species are predation by nonnative organisms and die-offs caused by a fungal skin disease chytridiomycosis. Additional threats include drought, floods, degradation and loss of habitat as a result of water diversions and groundwater pumping, poor livestock management, altered fire regimes, mining, development, and other human activities; disruption of metapopulation dynamics, resulting from an increased chance of extirpation or extinction resulting from small numbers of populations and individuals, and environmental contamination (USFWS 2007, 2012e).

New Mexico Ridge-nosed Rattlesnake

Status – The New Mexico ridge-nosed rattlesnake was listed as threatened in August 1978 with critical habitat (USFWS 1978); however, no critical habitat was designated on the Coronado National Forest. A recovery plan for this species was developed in March 1985 (USFWS 1985).

Distribution – In New Mexico, the ridge-nosed rattlesnake is found only in the Animas and Peloncillo Mountains of Hidalgo County at elevations above 1,680 meters (5,000 feet). The subspecies also occurs in the Peloncillo Mountains of Arizona. Populations also exist in the Sierra de San Luis in northwestern Chihuahua/northeastern Sonora, Mexico (USFWS 2002a). The area occupied by this species in the Peloncillo Mountains on the Douglas Ranger District of the Coronado National Forest is approximately 1,128,739 acres. Within the Peloncillo Mountains, a total of 27 New Mexico ridge-nosed rattlesnake have been found in 13 general areas (USFWS 2011). The relatively low number (27 snakes) may be attributed to the difficulty in locating this subspecies in the Peloncillo Mountains. To date, there have been no effective methods developed for surveying the New Mexico ridge-nosed rattlesnake. Multiple lines of evidence suggest an exceptionally small population occurs in the Peloncillo Mountains, and the Peloncillo population tested positive for genetic bottlenecks in several statistical tests (USDA FS 2011).

Habitat – Found among rocks, bunchgrass, and leaf litter in steep rocky canyons in Madrean evergreen woodland and Petran montane conifer forests at elevations ranging from 5,000 to 8,500 feet) (USFWS no date).

Risk Factors – Some of the primary threats to the New Mexico ridge-nosed rattlesnake include high-severity wildfires, illegal collection, prescribed fires, excessive erosion and sedimentation into talus slides, some recreational activities, and use of pesticides that may impact the forage base for this species. New Mexico ridge-nosed rattlesnakes occur in three, small disjunct populations, so its viability is sensitive to natural events, habitat destruction or modification, and collection. Natural threats to the New Mexico ridge-nosed rattlesnake include predation, starvation, and disease. While disease is not known to limit wild populations of this species, the highly disjunct range of this subspecies increases its vulnerability to extinction due to disease and habitat loss (USDA FS 2015).

The largest threat to the New Mexico ridge-nosed rattlesnake is loss of habitat. The Animas Mountains in New Mexico are privately owned, and access to this range of the ridge-nosed rattlesnake is strictly controlled. However, most of the rattlesnake habitat in the Peloncillo Mountains is managed by the Coronado National Forest and BLM and, thus, open to public use. The Peloncillo Mountains are more accessible than the Animas or San Luis ranges, making illegal collection and other human activities more likely. Activities that may affect the New Mexico ridge-nosed rattlesnake in the Peloncillos include planned fire ignitions, wildfire, illegal collection, cattle grazing, commercial beargrass harvesting, excessive erosion and sedimentation into talus slides, some recreational activities, and use of pesticides that may impact the forage base for this species (USDA FS 2011).

Northern Mexican Gartersnake

Status – On July 10, 2013, the U.S. Fish and Wildlife Service proposed to list northern Mexican gartersnake as threatened and concurrently proposed to designate critical habitat (USFWS 2013a, 2013c). On July 7, 2104, the USFWS determined that threatened species status is warranted for this species in Arizona and New Mexico (effective August 7, 2014) (USFWS 2014d).

Distribution – In the United States, the northern Mexican gartersnake historically occurred predominantly in Arizona at elevations ranging from 40 to 1,875 meters (130 to 6,150 feet). It was generally found where water was relatively permanent and supported suitable habitat. The northern Mexican gartersnake historically occurred in every county within Arizona, within several perennial or intermittent drainages and lentic (still, nonflowing water) wetlands (USFWS 2012g). Current or potentially occupied habitat for the northern Mexican gartersnake occurs on Federal (65 percent), tribal (15 percent), State (10 percent), county (5 percent), and private lands (5 percent). Approximately 30 percent of occupied or potentially occupied habitat occurs on the Coronado National Forest.

On the Coronado, Scotia Canyon was the last area intensively resurveyed by Rosen et al. (as cited in USFWS 2012g). In 2008, a multiparty effort was initiated within Scotia Canyon, including the Peterson Ranch Pond and vicinity, to eradicate bullfrogs as well as record observations of Chiricahua leopard frogs or northern Mexican gartersnakes. After many surveys of herpetofauna in this area to identify the presence of bullfrogs for eradication, a single, large adult northern Mexican gartersnake was observed, the first in over 8 years of informal surveys at this site (USFWS 2012g). This observation suggests that the species continues to occur in the upper Scotia Canyon area but, given the extensive survey effort, it occurs in exceptionally low densities and no longer represents a stable population because of problems with reproduction and survivorship that exist with populations comprised of very low numbers of individuals.

Habitat – Throughout its rangewide distribution, the northern Mexican gartersnake occurs at elevations from 40 to 2,590 meters (130 to 8,497 feet) (USFWS 2012g). The northern Mexican gartersnake is a riparian obligate (restricted to riparian areas when not engaged in dispersal behavior) and occurs chiefly in the following general habitat types: (1) Source area wetlands (for example, cienegas) and stock tanks (small earthen impoundments); (2) large river riparian woodlands and forests; and (3) streamside gallery forests defined by well-developed broadleaf deciduous riparian forests with limited, if any, herbaceous ground cover or dense grass (USFWS 2012g).

Cienegas are particularly important habitat for the northern Mexican gartersnake and are considered ideal for the species (USFWS 2012g). Hendrickson and Minckley (as cited in USFWS 2012g) defined cienegas as “mid-elevation (3,281 to 6,562 feet (1,000 to 2,000 meters)) wetlands characterized by permanently saturated, highly organic, reducing (lowering of oxygen level) soils.” Many of these unique communities of the southwestern United States, Arizona in particular, and Mexico have been lost in the past century to streambed modification, improper livestock grazing, woodcutting, artificial drainage structures, streamflow stabilization by upstream dams, channelization, and streamflow reduction from groundwater pumping and water diversions (USFWS 2012g).

Proposed Critical Habitat Within the Coronado National Forest – On July 10, 2013, the U.S. Fish and Wildlife Service proposed to designate critical habitat for the northern Mexican gartersnake (USFWS 2013a). The proposed critical habitat occurs in 14 subunits and totals approximately 421,423 acres in Greenlee, Graham, Apache, La Paz, Mohave, Yavapai, Navajo, Gila, Coconino, Cochise, Santa Cruz, Pima, and Pinal Counties in Arizona and Grant and Catron Counties, New Mexico. Approximately 93,585 acres of critical habitat on the Coronado is proposed for this species.

Primary constituent elements essential to the conservation of northern Mexican gartersnakes in areas occupied at the time of listing have been identified and include the following (USFWS 2013a):

1. aquatic or riparian habitat
2. adequate terrestrial space adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation
3. a prey base consisting of viable populations of native amphibian and native fish species
4. an absence of nonnative fish species of the families Centrarchidae and Ictaluridae, bullfrogs (*Lithobates catesbeianus*), and/or crayfish (*Orconectes virilis*, *Procambarus clarkii*, etc.), or occurrence of these nonnative species at low enough levels such that recruitment of northern Mexican gartersnakes and maintenance of viable native fish or soft-rayed, nonnative fish populations (prey) is still occurring

Risk Factors – The most significant threat to the northern Mexican gartersnake is the presence of harmful nonnative species because nonnative prey directly upon gartersnakes and compete with them for prey (USFWS 2014d). Declines in gartersnake prey base (native amphibians and fish populations) from disease and nonnative predators and parasites have led to subsequent declines in the distribution and density of gartersnake populations. Finally, the destruction and modification of northern Mexican gartersnake habitat continues to threaten the species (USFWS 2008c, 2014d). Habitat destruction and modification have resulted from dams, water diversions, groundwater pumping, woodcutting, recreation, mining, contaminants, urban and agricultural development, road construction, improper livestock grazing, wildfires, and undocumented immigration. The above-listed threats have resulted in the fragmentation of northern Mexican gartersnake populations and associated genetic impacts. Low birth rates relative to other gartersnakes may have negative implications for the species' ability to rebound in isolated populations.

Gila Chub

Status – The Gila chub was listed as endangered with critical habitat on November 2, 2005 (USFWS 2005). In October 2015, a draft recovery plan for the species was released (USFWS 2015b). A recovery plan for this species was drafted in October 20015 (USFWS 2015b).

Distribution – Overall, the populations of Gila chub rangewide (Arizona and New Mexico) currently appear to be stable. Six populations of Gila chub are present in two Ecosystem Management Areas on the Coronado National Forest: Bear Creek, Romero Creek, and Sabino Creek (Santa Catalina Ecosystem Management Area) and O'Donnell Creek, Post Canyon, and Turkey Creek (Huachuca Ecosystem Management Area). Within the Huachuca Ecosystem Management Area, all are part of one population estimated at fewer than 500 adults (USFWS 2015b). In 2005 all Gila chub populations on the Forest were considered unstable and threatened (i.e., the species is rare, has limited distribution, predatory or competitive nonnatives are present, or the habitat is modified or threatened in these three streams) (USFWS 2005). During 2005, Gila chub were repatriated in Sabino Creek and introduced to Romero and Bear Creeks. The Forest assisted with introductions, on private property, in the Canelo Hills. During 2008, Emergency flood repairs to Sabino Canyon resulted in short-term effects to habitat, but appear to have resulted in additional stability for habitats over the long term. Aquatic surveys conducted in 2014 by the University of Arizona and Arizona Game and Fish Department confirmed the stability of the Gila chub population in Sabino Creek, as well as the absence of nonnative species (USDA FS 2015).

Habitat – Gila chub commonly inhabit pools in smaller streams, springs, and cienegas, and can survive in small artificial impoundments (Miller 1946, Rinne 1975, Weedman et al. 1996, Minckley and March 2009). Gila chub are highly secretive, preferring quiet, deeper waters, especially pools, or remaining near cover including terrestrial vegetation, boulders, and fallen logs (Rinne and Minckley 1991, Carman 2006, Minckley and March 2009). Undercut banks created by overhanging terrestrial

vegetation with dense roots growing into pool edges provide ideal cover (Nelson 1993). Native fish found in Gila chub habitat include Sonora sucker (*Catostomus insignis*), longfin dace (*Agosia chrysogaster*), and speckled dace (*Rhinichthys osculus*) (USDA FS 2011).

Designated Critical Habitat Within the Coronado National Forest –Approximately 8.7 stream miles of critical habitat were designated on the Coronado. On the Coronado National Forest and adjacent Bureau of Land Management and private lands, three streams reaches are designated:

- **Sabino Canyon:** 6.9 miles of creek extending from the southern boundary of the Coronado National Forest upstream to its confluence with the West Fork of Sabino Canyon.
- **O'Donnell Canyon:** 6.2 miles of creek extending from its confluence with Turkey Creek upstream to the confluences of Western, Middle, and Pauline Canyons. Land ownership includes private, the BLM, and the Coronado National Forest.
- **Turkey Creek:** 3.9 miles of creek extending from its confluence with O'Donnell Canyon upstream to where Turkey Creek crosses Arizona Highway 83. Land ownership includes private lands and the Coronado National Forest.

Risk Factors – Decline of Gila chub is primarily due to habitat loss from various land use practices and predation and competition from nonnative fish species, and the highly fragmented and disconnected nature of the remaining Gila chub populations increases their vulnerability to these threats (USFWS 2005a). Land uses that have caused past habitat loss and continue to threaten Gila chub habitat are hydrologic modification of rivers, springs, and cienegas for human uses (groundwater pumping, dewatering, diversion of water channels, impoundments, and flow regulation); poorly managed livestock grazing; logging and fuelwood cutting; road construction and use; recreation; mining; and urban and agricultural development (USFWS 2005a). All of these activities have promoted erosion and arroyo formation and the introduction of predaceous and competing nonnative fish species (Miller 1961, Minckley 1985), and at least one, or some combination, of these activities is occurring in all of the remaining populations. Wildfires and wildfire suppression activities also pose a threat to the remaining populations by causing water quality changes that can kill fish (Rinne 2004, USFWS 2005a, Rhodes 2007) negatively altering food base for fishes (Earl and Blinn 2003), and resulting in stream and riparian vegetation alteration that negatively affects fish habitat (USFWS 2005a).

Perhaps the most serious threat to Gila chub is predation by, and competition with, nonnative organisms, including numerous nonnative fish species, bullfrogs (*Lithobates catesbeiana*), and virile crayfish (*Orconectes virilis*). Dudley and Matter (2000) correlated green sunfish presence with Gila chub decline, documented green sunfish predation on Gila chub, and found that even small green sunfish readily consume young-of-year Gila chub. Unmack et al. (2003) similarly found that green sunfish presence was correlated with the absence of young-of-year Gila chub in Silver Creek, Arizona. Nonnative fish parasites, such as Asian tapeworm (*Bothriocephalus acheilognathi*), also may be a threat to Gila chub (USFWS 2005a).

Several climate-related trends have been detected since the 1970s in the southwestern U.S. including increases in surface temperatures, rainfall intensity, drought, heat waves, extreme high temperatures, and average low temperatures (Lenart 2007).

Yaqui Chub

Status – The Yaqui chub was listed as endangered with critical habitat in August 1984 (USFWS 1984); however, no critical habitat was designated on the Coronado National Forest. A Rio Yaqui Fishes Recovery Plan, which included the Yaqui chub, was completed in March 1995 (USFWS 1995).

Distribution – The historic range of Yaqui chub includes the western Rio Yaqui basin, which drains western Sonora and portions of eastern Chihuahua in Mexico and the San Bernardino Valley in southeastern Arizona, U.S. (Minckley 1980, Minckley and Brown 1994).

Historical distribution of Yaqui chub included West Turkey Creek in the Chiricahua Mountains and Sulphur Springs Valley, which drains into West Turkey Creek; both are in the Coronado National Forest. Reintroductions into West Turkey Creek have taken place in recent years; however, the habitat on the Coronado is ephemeral, and no fish have been found in follow-up monitoring.

The Coronado National Forest completed three surveys in 2007, and six surveys in 2008, both on and off the Coronado. Private land below the Coronado has an extant population. However, no Yaqui chub have been found in West Turkey Creek on the Coronado since 2003. The probable reason for the loss of this population is most likely drought (USDA FS 2008). Pool habitats within the Coronado National Forest have likely diminished in quantity and quality due to drought and sediment flows following wildfires.

In 2009, three sites on West Turkey Creek within the Coronado National Forest boundary were surveyed, but no fish were found due to low water levels. Habitats on the Coronado are ephemeral, but healthy populations persist in private ponds and in perennial stream reaches at El Coronado Ranch downstream of the Forest Service monitoring sites. Riparian areas are largely ungrazed and in good condition (USDA FS 2010).

There are no known populations of Yaqui chub within the Coronado National Forest boundaries. However, the species does persist in private ponds and perennial reaches of West Turkey Creek on the El Coronado Ranch (USDA FS 2004), which borders the west boundary of the Chiricahua Mountains unit of the Douglas Ranger District. The ponds on the El Coronado Ranch are in the Upper Turkey Creek watershed.

Habitat – Adult Yaqui chub live in deep freshwater pools in creeks, scoured areas of cienegas, and other stream associated quiet waters. They seek cover in daylight, especially under undercut banks and in areas of accumulated debris often associated with higher aquatic plants (Lee et al. 1980).

Risk Factors – Temperature is a key factor defining the gradients of performance and the absolute bounds of life for most aquatic organisms. It also affects rates of growth and timing of key life history events or transitions (Rieman and Isaak 2010). Increased temperature may also lead to an increase in water temperature, which would allow other warmwater fishes (native and nonnative) to expand their range into the limited habitat occupied by Yaqui chub. Threats also include habitat destruction and modification and interactions with introduced fish species (USDA FS 2015).

Yaqui Catfish

Status – The Yaqui catfish was listed as threatened with critical habitat in August 1984 (USFWS 1984); however, no critical habitat was designated on the Coronado National Forest. A Rio Yaqui Fishes Recovery Plan, which included the Yaqui catfish, was completed in March 1995 (USFWS 1995).

Distribution – There are no known populations of Yaqui catfish on the Coronado; however, the species was released in ponds on the El Coronado Ranch in 1997 (USFWS 2010c), which borders the west boundary of the Chiricahua Mountains unit of the Chiricahua Ecosystem Management Area. The ponds on the El Coronado Ranch are in the West Turkey Creek watershed. The species also occurs on the San Bernardino National Wildlife Refuge located approximately 13 miles southwest of the Peloncillo Mountains unit of the Chiricahua Ecosystem Management Area (B. Radke, personal communication, September 26, 2016) in the Upper San Bernardino Valley watershed.

Habitat – This species inhabits moderate to large streams in areas of medium to slow current over sand/rock bottom at elevations ranging between 4,000 to 5,000 feet (1,219 to 1,425 meters) (USFWS 2010c).

Risk Factors – Since the 19th century, habitat of the Yaqui catfish has been steadily destroyed by stream bank erosion, construction of water impoundments that dewatered downstream habitat, excessive groundwater pumping, hybridization with channel catfish, and introduction of nonindigenous fish (USFWS 1984). The effects of climate change (decreased precipitation and water resources and increased evapotranspiration) are also a threat to this species.

Gila Topminnow

Status – The Gila topminnow was listed as endangered in 1967 without critical habitat (USFWS 1967); however, no critical habitat was designated on the Coronado National Forest. A recovery plan for Gila topminnow was prepared in 1982 (USFWS 1984a) and revised in 1998 (Weedman 1998); no recovery units or management areas were developed within this recovery plan.

Distribution – Historically, Gila topminnow were documented throughout Redrock Canyon since 1978 (USFWS 2008). The status of the Redrock Canyon Gila topminnow population has declined recently, and the species has not been documented since 2005. Although range and riparian conditions have largely improved, the area has been in drought since 1995, and the resulting reductions in habitat as stream channels have dried and perennial habitat has been reduced in extent, along with increases in nonnative species, primarily mosquitofish, have apparently extirpated the Gila topminnow from the drainage.

This species is currently known to occur in four drainages, in two ecosystem management areas on the Coronado. In 2015, in cooperation with the Arizona Game and Fish Department, Gila topminnow were reintroduced into Sabino Canyon in the Santa Catalina Ecosystem Management Area. In addition, they have been documented in O'Donnell, Redrock, and Parker Canyons in the Huachuca Ecosystem Management Area. In the fall of 2015, a new occurrence of Gila topminnow was discovered in lower Parker Canyon, roughly four miles below Parker Canyon Lake. Genetic analysis is being conducted on individuals recovered from the site to determine the source population.

The reestablishment history of Gila topminnow illustrates that even sites that were thought to be secure may fail for various reasons. Gila topminnow on Federal lands is widely dispersed and in some cases vulnerable to events beyond the respective land management agencies' control. Such actions would include invasions or unauthorized introductions of nonnative fishes and stochastic events such as floods.

Habitat – The Gila topminnow is an inhabitant of vegetated springs, brooks, and margins and backwaters of larger bodies of water. It prefers shallow, warm, fairly quiet waters but also can be found in moderate currents and depths up to 1 meter, in permanent and intermittent streams, and marshes. Its preferred habitat has dense mats of algae and debris (usually along stream margins or below riffles) and sandy substrate sometimes covered with mud and debris (NatureServe 2012).

Risk Factors – Threats include habitat loss and predation by introduced mosquitofish. Habitat destruction and introduction of nonnative species are the primary reasons for reductions in Gila topminnow populations. Current land use practices such as improper livestock grazing, mining, timber harvesting, road maintenance, and recreation pose major threats to habitat as well as existing and future populations. Additionally, population growth and development continue to affect potential recovery of the species through increased groundwater pumping and diversions to supply the growing populations, stream and river channelization, and increased water pollution (Weedman 1997).

Sonora Chub

Status – The Sonora chub was listed as threatened with critical habitat in April 1986 (USFWS 1986c.). A recovery plan was completed in 1992 (USFWS 1992).

Distribution – The Sonora chub (*Gila ditaenia*) is endemic to streams of the Rio del la Concepcion drainage of Sonora, Mexico, and Arizona. In May 2006, U.S. Fish and Wildlife Service staff confirmed the continued presence of Sonora chub in the headwaters of the Río Cocóspera at Rancho el Aribabi in Sonora, but the current status in Mexico is unknown. All waters occupied by Sonora Chub in the U.S. are in the Coronado National Forest and about one-half of the drainage is in Pajarita Wilderness and Goodding Research Natural Area (USFWS 2005). The Coronado National Forest contains 6 miles of habitat occupied by Sonora chub. Various agency staff (Forest Service, U.S. Fish and Wildlife Service, and other entities) have reliably detected Sonora chub, though the upstream limits of the species' occurrence in California Gulch appear to be variable based on the presence of nonnative fish—largemouth bass (*Micropterus salmoides*) in particular (USFWS 2010e).

Habitat – Habitat characteristics important to Sonora chub include clean permanent water with pools and intermediate riffle areas and/or intermittent pools maintained by bedrock or by subsurface flow in areas shaded by canyon walls (USFWS 2005). In Sycamore Creek, Sonora chub are found in the largest, deepest, most permanent pools (Carpenter 1982). Analysis of habitat use by Sonora chub showed this species preferring deep pools and some amount of floating cover (USFWS 1992).

It should be noted also that there is a safety concern associated with surveying for this species. The canyons where it occurs (Sycamore and California Gulch/Warsaw Canyon) are known routes for drug traffickers and undeclared aliens; therefore, border security issues make it difficult to monitor Sonora Chub populations. As a result, population surveys are only conducted in a major pool in the upper end of the canyon. These drainages are negatively impacted by the presence of nonnatives, including green sunfish and bullfrogs, although Sonora chub persists in good numbers in Sycamore Canyon, despite the presence of a large population of bullfrogs. Surveys conducted in 2005, 2006, and 2009 indicate that there was no known net loss of populations detected during the reporting period, nor a reduction of pool or spring habitat (USDA FS 2008, 2010).

Designated Critical Habitat Within the Coronado National Forest – Critical habitat includes Sycamore Creek, extending downstream from and including Yank Spring, to the International border (USFWS 1986c). The lower 1.2 miles of Penasco Creek and the lower 0.25 mile of an unnamed stream entering Sycamore Creek from the west, about 1.5 miles downstream from Yank Spring, were also designated. In addition, critical habitat includes a 25-foot-wide riparian area along each side of Sycamore and Penasco Creeks. Known primary constituent elements include pools of clean, permanent water with intermediate riffle areas or intermittent pools held by bedrock or maintained by subsurface flow where pools are often shaded by canyon walls. On the Coronado, approximately 6.5 miles of critical habitat are designated, including the following areas:

1. Sycamore Creek and a riparian zone 25-feet wide along each side of the creek from Yank's Spring downstream approximately 5 stream miles to the international border with Mexico;
2. Yank's Spring;
3. Penasco Creek, including a riparian zone 25-feet wide along each side of the creek from the confluence with Sycamore Creek; and
4. An unnamed tributary to Sycamore Creek, from its confluence with Sycamore Creek.

Risk Factors – The limited distribution of Sonora chub in the U.S. places inordinate importance on the quality of habitat in Sycamore Creek (USFWS 1992) and California Gulch. The Sycamore drainage has been highly modified by human activities, including grazing, mining, recreation, and the introduction of exotic taxa. It regularly sustains large floods and severe droughts. A series of

environmental perturbations made worse by degraded watershed conditions could cumulatively result in extirpation of the species from the U.S.

Sycamore Creek is at the edge of the range of the species, is isolated from other populations of Sonora chub, and has marginal habitat (Hendrickson and Juarez-Romero 1990). Channel degradation, siltation, and water pollution caused primarily by livestock grazing, roads, and mining have probably affected the habitat of Sonora chub. Cattle regularly gain access to Sycamore Canyon through an unmaintained section of fence along the international border (USFWS 1999) and degrade the riparian vegetation in the lower 4.0 kilometers (2.5 miles) of the stream (Carpenter 1982). In 1981, exploration for uranium occurred along an approximate 12-kilometer stretch of the upper eastern slopes of the Sycamore drainage. According to the 1992 recovery plan for the Sonora chub, uranium was found and claims are being maintained; however, no active mining was planned at that time.

Native fishes appear adept at maintaining populations during severe conditions so long as their habitats are unaltered (Minckley and Meffe 1987). Thus, a single catastrophic event, such as severe flood, fire, or drought, is unlikely to eliminate Sonora chub from the U.S.

Predation by nonnative vertebrates is also a threat to populations of Sonora chub. Green sunfish (*Lepomis cyanellus*) is a known predator on native fishes in Arizona (Minkley 1973) and has been found in Sycamore Creek below the entrance of Penasco Canyon (Brooks 1982).

Intensified future droughts are anticipated in the American Southwest (Seager et al. 2007) with predictions that the region "…will dry in the 21st century and that the transition to a more arid climate should already be underway." Weiss and Overpeck (2005) state that multiyear or decade-scale changes in precipitation will be difficult to forecast and will affect how ecosystems and watersheds function. These changes will be hard to predict and are likely to occur nonlinearly. Therefore, while it appears reasonable to assume that the species may be affected by climate change, there is a lack of certainty as to how climate change specifically will affect Sonora chub beyond loss, reduction, and degradation of habitat. There are no expectations of measurable changes in climate within the temporal bounds of this action.

Desert Pupfish

Status – The desert pupfish was listed as endangered with critical habitat in April 1986 (USFWS 1986a.); however, no critical habitat was designated on the Coronado National Forest. A recovery plan was prepared in 1993 (USFWS 1993); no recovery units or management areas were developed within this recovery plan.

Distribution – Desert pupfish were once widely distributed in desert springs, marshes, backwaters, and tributaries through much of the lower Colorado and Gila Rivers, from southern Arizona to southeastern California and northern Sonora, Mexico. At present, it is restricted to three natural populations in California and irrigation drains around the Salton Sea, one natural population in Arizona, and in five restricted locations in Mexico. There are 16 transplanted populations in the wild and all in Arizona (USDA FS 2011). The one natural population in Arizona occurs in Quitobaquito Spring and pond in Pima County and reintroductions have been made in Pima, Pinal, Maricopa, Graham, Cochise, La Paz, and Yavapai Counties, Arizona (USFWS 2010).

Numerous captive and wild, reestablished populations currently exist. These populations have been established on private, municipal, county, state, and Federal lands, including the Aravaipa Creek watershed, Mud Springs on the Tonto National Forest, and on the Muleshoe Cooperative Management Area. In 2013, the Bureau of Land Management reintroduced desert pupfish into the Las Cienegas National Conservation Area in three locations (USFS 2016). Plans are also in progress to reestablish desert pupfish in the San Pedro Riparian National Conservation Area. Additional captive sites persist in southern Arizona, with a number of refuge ponds having recently been created under a Safe Harbor Agreement including a site on the Audubon Society Appleton-Whittell Research Ranch near the Sierra

Vista Ranger District. The species currently does not occur within the Coronado National Forest; however, additional efforts to establish populations may take place in the future and, as such, they are included in this analysis.

Habitat – Desert pupfish are found in shallow water of desert springs, small streams, and marshes below 1,515 meters (5,000 feet) elevation. The species tolerates high salinities and high water temperatures (USFWS 2010a).

Risk Factors –Since the 19th century, habitat of the desert pupfish complex has been steadily destroyed by stream bank erosion, construction of water impoundments that dewatered downstream habitat, excessive groundwater pumping, application of pesticides to nearby agricultural areas, and introduction of nonindigenous fish species (USFWS 1986a.). Nonnative bullfrogs may also prove problematic in the management of desert pupfish as they are opportunistic omnivores with a diet that includes fish (Clarkson and deVos Jr. 1986; Cohen and Howard 1958). The effects of climate change (decreased precipitation and water resources and increased evapotranspiration) are also a threat to this species.

Gila Trout

Status – The Gila trout was listed as threatened without critical habitat in July 2006 (USFWS 2006c). A recovery plan was prepared in 1993 (USFWS 1993c) and was revised in 2003 (USFWS 2003). The recovery team has operated under the standard that new populations be stocked a minimum of three times and that reproduction be confirmed in the stream prior to the population being considered viable and established.

Distribution –Gila trout occupy about 6.5 miles of their historical range in Arizona. Currently there are 17 populations of Gila trout in the wild: 4 relict populations that are secure and 13 established replicates. All wild Gila trout populations are currently located on National Forest System lands, with 14 populations on Gila National Forest, 1 on the Apache-Sitgreaves National Forests (Raspberry Creek), 1 on the Coronado National Forest (Frye Creek), and Grapevine Creek on the Prescott National Forest (USDA FS 2011).

Ash, Frye, Deadman, and Marijilda creeks are now considered within the historical range of Gila trout. Gila trout have been introduced into both Frye and Ash creeks: Frye Creek in the Pinaleño Mountains was stocked in October 2009 and again in February 2011, and 5 trout were introduced into Ash Creek in November 2011 (USDA FS 2015). The Fry Creek population is doing well, reproducing with two age classes present. The Coronado also continued planning efforts for establishment of Gila trout populations in additional streams in the Pinaleño Mountains.

Habitat – Gila trout are found in small, high mountain streams at an elevation of approximately 1,524 to 3,048 meters (5,000 to 10,000 feet). They feed on insects and occasionally small fish (USFWS 2006b).

Risk Factors – Current limiting factors for Gila trout recovery include impacts of wildfire; continued impacts from predation, competition, and hybridization with nonnative trout; limited range of the species; and other habitat impacts.

Authorized livestock use has decreased on the Coronado National Forest. The Coronado has restrictions on grazing in the vicinity of the current Apache trout populations in the Pinaleño Mountains. Those streams have been proposed to become Gila trout streams sometime in the future. Other potential Gila trout recovery streams, now occupied by Apache trout, may have some risk from road systems. However, roads are limited on Mount Graham in the Pinaleño Mountains where these streams are located. New forestwide standards and guidelines under the Motorized Transportation System Program prohibits motor vehicle use (cross-country travel) off the designated system of roads, trails, and areas except as identified on motor vehicle use maps.

Apache Trout

Status – The Apache trout was listed as threatened without critical habitat in July 1975 (USFWS 1975). A recovery plan was prepared in 1983 (USFWS 1983) and revised in August 2009 (USFWS 2009); no recovery units or management areas were developed within this recovery plan.

Distribution – Historical distribution of Apache trout is unclear. Once Apache trout were recognized as a species separate from Gila trout, their original distribution was described as the upper Salt River drainage and headwaters of Little Colorado River in Arizona above 5,900 feet in elevation (USDA FS 2011).

On the north side of the Pinaleño Mountains, four creeks (Ash, Frye, Deadman, and Marijilda) have at some point contained hybridized populations of Apache trout (USDA FS 2015). All the hybridized Apache trout have been chemically removed from Ash Creek. In 2004, post-fire flooding from the Nuttall Fire eliminated all of the hybridized Apache trout from Frye Creek, and most of the hybridized fish from Marijilda and Deadman creeks. The trout in these creeks, along with Grant Creek and Big Creek (a tributary of Grant Creek) on the south side, were evaluated for genetic purity in 1998 (Grant and Big creeks were retested in 2013). Only the population in Grant and Big Creeks were found to be genetically pure, so the effects analysis that follows is directed only toward the population in these two creeks. Grant and Big Creeks drain into the Willcox Playa, which is a closed basin. The hybridized Apache trout remaining in Marijilda and Deadman creeks do not qualify for recovery actions. Recent direction from the U.S. Fish and Wildlife Service indicates that actions involving these hybrids do not require Section 7 consultation and, as such, effects to fish in these drainages will not be discussed further.

Habitat – Occurs in small, cold, high-gradient streams above 1,524 meters (5,000 feet) elevation. These streams have substrates consisting of boulders, rocks, and gravel, with some sand or silt, and flow through mixed-conifer forests and mountain meadows (USFWS 2008a).

Risk Factors – Authorized livestock use has decreased on the Coronado National Forest, and the Coronado has restrictions on grazing in the vicinity of the current Apache trout populations in the Pinaleño Mountains. Current limiting factors for Apache trout recovery include impacts of wildfire; continued impacts from predation, competition, and hybridization with non-native trout; limited range of the species; and other habitat impacts.

Spikedace

Status – The spikedace was listed as endangered with critical habitat in February 2012 (USFWS 2012b); however, no critical habitat was designated on the Coronado National Forest. A recovery plan was prepared in 1991 (USFWS 1991); no recovery units or management areas were developed within this recovery plan.

Distribution – In Arizona, populations are found in Aravaipa Creek, and are believed to be present in the Verde River, and Eagle Creek within Graham, Pinal, Greenlee, and Yavapai counties (USFWS 2012d). Undiscovered populations may exist in unsampled Gila basin streams. In addition, populations were translocated in Hot Springs and Redfield Canyons (Cochise and Graham Counties), and in Fossil Creek (Gila County) in 2007; Bonita Creek (Graham County), and the San Francisco River (Catron County) in 2008. Insufficient time has elapsed to determine whether these restoration projects will be successful. Spikedace does not occur within the Coronado's boundaries.

Habitat – This species is found in moderate to large perennial streams, under 6,000 feet in elevation, where it inhabits moderate- to fast-velocity waters over gravel and rubble substrates (USFWS 2012d). Specific habitat consists of shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand and gravel bars, and eddies at downstream riffle edges. Recurrent flooding helps the spikedace maintain its competitive edge over invading exotic species.

Risk Factors – Spikedace are estimated to be extirpated from approximately 90 percent of their historical range (USDA FS 2015). Prolonged drought, anticipated effects of climate change, and the increasing abundance and expanding range of competitive and predatory nonnative fishes have increased the threat of extinction for the species.

Loach Minnow

Status – The loach minnow was listed as threatened in October 1986 (USFWS 1986b) then uplisted to endangered with critical habitat in February 2012 (USFWS 2012b); however, no critical habitat was designated on the Coronado National Forest. A recovery plan was prepared in 1991 (USFWS 1991); no recovery units or management areas were developed within this recovery plan.

Distribution – This species was once common throughout much of the Gila River system including portions of the Gila, Blue, Tularosa, White, Verde, Salt, San Pedro, and San Francisco rivers in Arizona and New Mexico, as well as some of their tributaries (USFWS 2012c). In Arizona, the species is limited to reaches in the mainstem White River and East Fork of the White River (Navajo County), North Fork East Fork Black River and Boneyard Creek (Apache County), Aravaipa Creek, Deer Creek, and Turkey Creek (Graham and Pinal counties), San Francisco and Blue Rivers, and Eagle, Campbell Blue, and Little Blue Creeks (Greenlee County). Loach minnow does not occur within the Coronado boundaries (USDA FS 2015).

Habitat – The loach minnow is a bottom dweller of small to large perennial creeks and rivers, typically in shallow turbulent riffles with cobble substrate, swift currents, and filamentous algae at elevations below 8,000 feet (2,438 meters) (USFWS 2012c). Recurrent flooding is instrumental in maintenance of quality habitat.

Risk Factors – Loach minnow and its designated critical may be affected by damming, channel alteration, riparian zone modification and destruction, channel down-cutting, groundwater pumping, watershed conditions, stormwater runoff, introduction and spread of competitive and/or predatory non-native fish species, livestock grazing, timber harvest, wildfire, recreational activities, and other habitat alterations (USDA FS 2015, USFWS 2012c).

Roundtail Chub

Status – The roundtail chub was proposed to be listed as threatened in October 2015 (USFWS 2015d).

Distribution – The species was historically considered common in deep pools and eddies of large streams throughout its range in the upper and lower Colorado River basins in Wyoming, Utah, Colorado, New Mexico, and Arizona (USDA FS 2015). Today the roundtail chub occupies 18 to 32 percent of its historical range in the lower Colorado River basin and is limited to Arizona's Little Colorado, Bill Williams, Salt, and Verde River drainages and Eagle and Aravaipa Creeks, and New Mexico's upper Gila River. Roundtail chub does not occur within the Coronado.

Habitat – The roundtail chub occurs in cool to warm water over a wide range of elevations in rivers and streams throughout the Colorado River basin, often occupying open areas of the deepest pools and eddies of mid-sized to larger streams at elevations between 4,300 and 6,500 feet (USFWS 2010b, 2015d). This species is often associated with areas of cover in the form of boulders, overhanging cliffs, undercut banks, or vegetation.

Risk Factors – Roundtail chub populations have declined due to a combination of habitat loss and degradation related to dams, diversions, groundwater pumping, mining, development, recreation, improper livestock grazing, and competition and predation from nonnative fishes (USFWS 2010b). Global climate change is anticipated to worsen the effects of these threats.

Pima Pineapple Cactus

Status – The Pima pineapple cactus was listed as endangered without critical habitat in September 1993 (USFWS 1993a).

Distribution – Pima pineapple cactus occurs in Santa Cruz and Pima Counties, Arizona, and northern Sonora, Mexico. The range is from Tucson, Arizona, southward to northern Sonora, Mexico, and includes the Altar and Avra Valleys, Santa Cruz River Basin, and lower foothills of adjacent mountain ranges. The range extends about 45 miles east to west and 50 miles north to south (USFWS 1993a). Pima pineapple cactus occurs on the Coronado National Forest, Nogales, and Sierra Vista Ranger Districts. These populations are somewhat disjunct from the main distribution to the north. They represent only a minor part of the species' distribution and abundance, but are significant for their safety from potential development.

Habitat – Pima pineapple cacti grow in alluvial basins and hillsides of desert grasslands and desertscrub. The plant occurs most commonly in open areas on flat ridgetops or areas with less than 10 to 15 percent slope (USFWS 1993a). Pima pineapple cacti are also found in the transition zone between the desert grasslands and desertscrub. Vegetation within this transition zone is dominated by mid-sized mesquite trees, half shrubs, and patches of native grass and scattered succulent (USFWS 2004). Soils range from shallow to deep, and silty to rocky.

Risk Factors – There is ample habitat for survival of this cactus, but its key habitat in the vicinity of Tucson is privately owned and is prime real estate subject to commercial and residential development. The trend for this cactus is downward primarily due to this irreversible habitat loss (USFWS 1993a). Some areas within the species' range have been developed for farm production. The Avra and Altar Valleys and Santa Cruz River Basin are currently under cultivation, but were probably historical habitat for this species (USFWS 1993a).

Practices used to modify desert communities to increase grass production for livestock have affected this plant more than any direct livestock impacts. Improper livestock grazing during the mid-to-late 1800s and continuing livestock grazing practices may have significantly altered the ecosystem. Effects of improper livestock grazing include: erosion, changes in hydrology and microclimate, invasion of weedy exotic plant species, shifts in density, relative abundance, and vigor of native species (USFWS 2012).

Mechanical vegetation manipulation such as imprinting, chaining, and ripping directly damage or destroy plants, as well as reduce the shrub component of the plant community. The seeding of nonnative grasses, predominately Lehman's lovegrass (*Eragrostis lehmanniana*), usually follows mechanical manipulation. Up to 75 percent of Pima pineapple cactus habitat has been significantly altered by the introduction of this grass that outcompetes native grasses and has created monotypic stands over large areas of mid-elevation southern Arizona. This grass creates abundant fine fuels that burn very hot and carry fire rapidly through an area. Most native grasses and shrubs are not adapted to such fires and are eliminated from the community while Lehmann's lovegrass prospers under such conditions. Cacti, including Pima pineapple cactus, do not tolerate hot fires and are damaged or killed. Under these altered community conditions, the elimination of grazing may do more damage than its presence. Although trampled plants have been seen in grazed areas, grazing removes much of the grass that is competing for space, water, and nutrients, and removes the standing dead grass, thus reducing the fire hazard (USFWS 2012).

Off-road vehicle use can cause problems for Pima pineapple cactus (USFWS 2012). The cacti are small and can be covered by grass, making them difficult to see. Cacti on the Sierra Vista Ranger District occur in relatively flat areas that are very popular for off-road vehicle use. This activity is not authorized by the Forest Service, but the area was not adequately signed for non-entry. The Coronado National Forest increased patrols during weekends and holidays to more effectively manage this activity in occupied habitat.

No research has been initiated related to the specific effects of climate change on this species; however, there are no expectations of measurable changes in climate within the temporal bounds of the proposed action.

Huachuca Water Umbel

Status – The Huachuca water umbel was listed as endangered in January 1997 (USFWS 1997) and critical habitat was designated in July 1999 (USFWS 1999a). A draft recovery plan was prepared in March 2016 (USFWS 2016b); no recovery units or management areas were developed within this recovery plan.

Distribution – Naturally known locations of the Huachuca water umbel have increased to 30 in the United States and 21 in Sonora, Mexico, within the Santa Cruz, San Pedro, Rio Yaqui, Rio Sonora, and Rio Concepcion watersheds (USFWS 2014c). The Huachuca water umbel occurs on Federal, State, and county administered lands and on privately owned lands, and the majority of the known locations occur along the San Pedro River, in the Huachuca Mountains, and along Cienega Creek. In addition, this species has been introduced into new areas, and existing populations have been augmented in several locations throughout southeastern Arizona.

The Sierra Vista Ranger District manages six Huachuca water umbel sites in the Huachuca Mountains. These are the Scotia, Bear, Sunnyside, and Sycamore Canyon sites, as well as Sycamore Spring and Mud Spring. Scotia Canyon has one of the largest populations with plants occupying most of the suitable habitat along the 4,800 feet perennial reach of the stream. These four sites are at the highest known elevations for Huachuca water umbel. They are in the upper parts of the watershed and relatively secure from water withdrawals or water diversions. The sites are grazed, but the monitoring that occurs every two years in Scotia, Sunnyside, and Bear Canyons shows no adverse effects to Huachuca water umbel.

Significant flows in Scotia Canyon from the 2013 monsoon season scoured the canyon and because of this, larger patches were not as prevalent in the lower canyon portion as in previous years of survey; the flood also removed competing vegetation (USFWS 2014c). Significant flows from the 2013 monsoon season also scoured Sunnyside Canyon, and although larger patches were found, the overall extent in this canyon is believed to have contracted from previous years. At the confluence of Lone Mountain Canyon and Bear Canyon, a cattle exclosure has been erected around multiple small patches for protection. In 2014, during a field visit it was observed that plants existed both inside and outside of the exclosure. The species has been regularly observed in visits at Sycamore Spring, and although intensive grazing has occurred in the past, population numbers and distribution have increased in recent years at this site. In 2014, a survey of Mud Spring revealed many patches occurring both inside and outside of an erect bullfrog exclosure that also excludes cattle. Patches outside the exclosure occurred in two separate spring runs, one of which was heavily impacted by domestic livestock trampling and javelin wallows.

Habitat – The Huachuca water umbel grows in cienegas (marshy wetlands) and along streams and rivers (USFWS 1997). It can grow in saturated soils or as an emergent in water depths up to about 10 inches. The surrounding nonwetland vegetation can be desertscrub, grassland, oak woodland, or conifer forest at elevations of 2,000 to 7,100 feet (AGFD 1997). High quality Huachuca water umbel sites have stable perennial streamflow and herbaceous vegetation that stabilizes the banks and channel. Where these conditions are found, Huachuca water umbel often occurs as a common member of the aquatic community and is distributed uniformly along perennial stream segments. Huachuca water umbel seems to benefit from an intermediate level of flooding frequency that reduces competition with larger aquatic plants like cattails, sedges, and bulrushes. Conversely, floods that are too frequent or intense can destroy populations (Johnson et al. 1992).

Designated Critical Habitat within the Coronado National Forest – Seven critical habitat units have been designated for Huachuca water umbel in Cochise and Santa Cruz Counties. These are part of Sonoita Creek in T. 20 S., R. 16 E., sections 33 and 34 (unit 1); part of the Santa Cruz River and a tributary in T. 24 S., R. 17 E., sections 11, 13, and 14 (unit 2); in the Huachuca Mountains part of Scotia Canyon in T. 23 S., R. 19 E., sections 3, 9, 10, 16, and 21 (unit 3), part of Sunnyside Canyon in T. 23 S., R. 19 E., Sec. 10 (unit 4), part of Garden Canyon on the Fort Huachuca Military Reservation (unit 5), and part of Bear Canyon and tributaries in T. 23 S., R. 19 E., sections 25 and 36, T. 23 S., R. 20 E, sections 30 and 31, and T. 24 S., R. 19 E., Sec. 1 (unit 6); and the San Pedro River from T. 19 S., R. 21 E. to T. 23 S., R. 22 E. (unit 7) (USFWS 1999a). The Scotia, Sunnyside, and Bear Canyon units (3, 4, and 6) are on the Coronado National Forest and total approximately 8.3 stream miles. The critical habitat units include the stream courses and adjacent areas out to the beginning of upland vegetation.

Risk Factors – Water withdrawals, diversions, stream channelization, and levies in southern Arizona and Sonora have reduced the habitat available for Huachuca water umbel. Several historical locations no longer provide any suitable habitat because perennial streamflows have ceased due to lowered water tables. Continued human population growth in southern Arizona is expected to put greater pressure on water resources. Off-highway vehicle use is also noted as a threat to this species and populations in Bear Canyon have been impacted by off-highway vehicle use.

Widespread watershed degradation occurred in southern Arizona in the late 1800s due to uncontrolled livestock grazing, mining, hay harvesting, timber harvesting, and other practices such as fire suppression. This led to widespread erosion and channel entrenchment that has contributed to long-term or permanent degradation and loss of cienega and riparian habitats throughout southern Arizona and northern Mexico.

Poor livestock management can destabilize stream channels and disturb cienega soils creating conditions unfavorable to Huachuca water umbel, which requires stable stream channels and cienegas. Such management can also change riparian structure and diversity causing a decline in watershed conditions. However, livestock grazing that is well managed can be compatible with Huachuca water umbel. Cattle generally do not eat the plants because the leaves are too close to the ground, but they can trample plants. Huachuca water umbel is capable of rapidly expanding from rhizomes and can recover quickly from light trampling. Light trampling may also keep other plant density low, thus providing favorable Huachuca water umbel microsites (USFWS 1997).

No research has been initiated related to the specific effects of climate change on this species; however, there are no expectations of measurable changes in climate within the temporal bounds of the proposed action.

Canelo Hills Ladies' Tresses

Status – The Canelo Hills ladies' tresses was listed as endangered in January 1997 (USFWS 1997) without critical habitat.

Distribution – The Canelo Hills ladies' tresses grows in cienegas, in southern Arizona, and northern Sonora, Mexico. Cienegas are mid-elevation wetland communities often surrounded by relatively arid environments. They are usually associated with perennial springs and stream headwaters, have permanently or seasonally saturated highly organic soils, and are extremely rare wetland habitats (USDA FS 2011).

The Canelo Hills ladies' tresses is known from five cienega sites at about 5,000 feet elevation in the San Pedro River watershed in Santa Cruz and Cochise Counties, southern Arizona. The total amount of occupied habitat is less than 200 acres. Four of the sites are on private land (two of the four sites are owned by The Nature Conservancy) less than 23 miles north of the U.S.-Mexico border; one site is on the Sierra Vista Ranger District of the Coronado National Forest, near private land (USDA FS 2011).

It is difficult to estimate population size and stability for this orchid because nonflowering plants are hard to find in the dense herbaceous vegetation and because uncounted dormant plants cause the total population to be underestimated. The Nature Conservancy has monitored the plants at its Canelo Hills reserve since 1979, and has made yearly population counts since 1993. There is no clear population trend because the number of plants varies greatly from year to year. It was as high as 521 in 1995 and as low as 19 in 1997. In 1995, 107 plants bloomed, but only one plant bloomed in 1997. An informal survey of the Sheehy Springs site in 1999 counted 731 blooming plants; based on the survey, this may be the largest Canelo Hills ladies' tresses population. The site on the Coronado had four flowering plants when it was discovered in 1996 (USDA FS 2011). In a subsequent site visit in 1997 following heavy grazing in the area, all streamside vegetation had been removed including that supporting the plants previously found (USDA FS 2015).

Habitat – This species is found in finely grained, highly organic, saturated soils of cienegas. Plants occur intermixed with tall grasses and sedges at an elevation of approximately 1,524 meters (5,000 feet) (USFWS 2001b).

Risk Factors – The primary threat to Canelo Hills ladies' tresses is further loss of its limited habitat. Other threats include groundwater overdrafts, surface water diversions, impoundments, channelization, improper livestock grazing, agriculture, mining, road building, nonnative species introductions, urbanization, woodcutting, and recreation as factors that contribute to riparian and cienega habitat loss and degradation in southern Arizona (USDA FS 2011). There is anecdotal evidence that Canelo Hills ladies' tresses requires disturbances such as grazing or fire (AGFD 2000). Even if not required, these activities may benefit the orchid by reducing competing vegetation. The listing document (USFWS 1997) notes that there is disagreement among scientists on the effect of fire on the species and that determining the role of fire will be essential in properly managing the species.

Regionally Sensitive and Other Forest Planning Species – Affected Environment

The regional forester's sensitive species program is the Forest Service's dedicated initiative to conserve and recover plant and animal species according to Forest Service policy found in Forest Service Manual 2670. The Coronado National Forest improves habitat and restores ecosystems for sensitive species through vegetation treatments and management practices. Sensitive species are those plant and animal species identified by the regional forester for which population viability is a concern, as evidenced by the following:

- significant current or predicted downward trends in population numbers or density
- significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution

"Other forest planning species" are not listed as threatened, endangered, or sensitive but still have species-specific threats to their population viability that are not addressed by the coarse-filter analysis.

The habitat extent estimates reported in table 73 and table 74 are based upon the extent of potential natural vegetation types, or biophysical habitat elements that meet the life history requirements of the species limited by the ecosystem management areas (EMAs) where the species is known to occur. These acres may overestimate habitat extent for some species that use microsites that are too small to map accurately or that move on the landscape over time within the associated habitat element. See table 72 for definitions of codes used in the tables.

Table 73. Fine-filtered regionally sensitive species and occupied habitat on the Coronado National Forest[1]

Common Name	Scientific Name	Habitat Extent (acres) on the Coronado NF	Habitat Associations	Associated EMAs
[Desert] bighorn sheep	*Ovis canadensis [mexicana]*	133,623	RIA, ROC: DES, GRA	GAL, CAT
Mexican long-tongued bat	*Choeronycteris mexicana*	717,476	RIA, TER, CAV: ENC, PIO	PEL, CHI, DRA, TUM, RIT, HUA, WHE, CAT
[Pale] Townsend's big-eared bat	*Plecotus townsendii [pallescens]*	1,762,934	TER, CAV: DES, GRA, CHA, ENC, PIO, PON, WMC, DMC	ALL
American peregrine falcon	*Falco peregrinus anatum*	1,762,934	ROC: DES, GRA,CHA,ENC, PIO, PON, WMC, DMC	ALL
Northern goshawk	*Accipiter gentilis*	998,344	TER: ENC, PIO, PON, WMC, DMC	ALL
Arizona treefrog (Huachuca/Canelo DPS)	*Hyla wrightorum*	131,983	RIA, ROC: ENC, PIO	HUA
Lowland leopard frog	*Lithobates yavapaiensis*	277,432	RIA, AQU: DES, GRA	TUM, GAL, STE, CAT
Giant spotted whiptail	*Aspidoscelis burti stictogramma*	1,076,398	RIA, TER: DES, GRA, ENC	PEL, TUM, RIT, HUA, PIN, WIN, GAL, STE, CAT
Mexican stoneroller	*Campostoma ornatum*	197,664	AQU: GRA, ENC, PIO	CHI
Sonora sucker	*Catostomus insignis*	265,223	AQU: GRA, ENC	TUM, RIT
Longfin dace	*Agosia chrysogaster*	1,062,375	AQU: DES, GRA, CHA, ENC	CHI, TUM, RIT, HUA, CAT
Huachuca giant-skipper	*Agathymus evansi*	140,517	TER: ENC, PIO	HUA
Arizona Cymbiodytan water scavenger beetle	*Cymbiodyta arizonica*	unknown	RIA, SPG, AQU: - unknown	CHI
Stephan's riffle beetle	*Heterelmis stephani*	64,860	SPG, AQU: ENC	RIT
Huachuca springsnail	*Pyrgulopsis thompsoni*	209,501	SPG, AQU: GRA, ENC, PIO	HUA
Pinaleño mountain snail	*Oreohelix grahamensis*	47,959	ROC, TER: PON, WMC, DMC	PIN
Wet canyon talus snail	*Sonorella macrophallus*	70,136	RIA, ROC, TER: PIO, PON, WMC, DMC	PIN
Parish's abutilon	*Abutilon parishii*	317,156	RIA, ROC: DES, GRA	TUM, RIT, CAT

Common Name	Scientific Name	Habitat Extent (acres) on the Coronado NF	Habitat Associations	Associated EMAs
Santa Rita yellowshow	*Amoreuxia gonzalezii*	43,233	ROC, TER: GRA	RIT
Copper Mine milk-vetch	*Astragalus cobrensis* var. *maguirei*	247,231	RIA: ENC, PIO	PEL,CHI
Huachuca milk-vetch	*Astragalus hypoxylus*	137,883	TER: ENC	HUA
Ayenia	*Ayenia truncata (=A. glabra)*	62,290	TER: DES, GRA	RIT
Elusive browallia	*Browallia eludens*	140,853	RIA, TER: ENC, PIO	HUA
Chihuahuan sedge	*Carex chihuahuensis*	183,767	RIA, AQU: PIO, PON, WMC, MOM	CHI, RIT, HUA, PIN, CAT
Cochise sedge	*Carex ultra*	632,617	RIA, SPG: ENC, PIO	PEL, CHI, DRA, TUM, RIT, HUA, GAL
Soft Mexican-orange	*Choisya dumosa var. mollis*	64,705	TER: ENC, PIO	TUM
Recurved corycactus	*Coryphantha recurvata*	155,101	TER: GRA, CHA, ENC	TUM
Smooth baby-bonnets	*Coursetia glabella*	338,181	TER: ENC PIO	CHI, HUA
Arid throne fleabane	*Erigeron arisolius*	762,408	TER: GRA, ENC	CHI, DRA, TUM, RIT, HUA, WIN
Chiricahua gentian	*Gentianella wislizeni*	22,452	TER: PON, WMC, MOM	CHI
Coleman's coralroot	*Hexalectris colemanii*	111,619	RIA: GRA, ENC	RIT
Purple-spike coralroot	*Hexalectris warnockii*	338,181	TER: ENC, PIO	CHI, HUA
Chiricahua mudwort	*Limosella pubiflora*	237,996	SPG, AQU: ENC, PIO, PON, WMC	PEL, CHI
Beardless chinch weed	*Pectis imberbis*	340,544	TER: GRA, ENC, disturbed	RIT, HUA
Broad-leaf ground-cherry	*Physalis latiphysa*	36,649	TER: DES, GRA	PIN
Hinkley's Jacob's-ladder	*Polemonium pauciflorum hinckleyi*	36,649	RIA, ROC: PON, WMC, DMC, SPR	CHI
White-flowered cinquefoil	*Potentilla albiflora*	50,975	TER: PON, WMC, SPR, MOM	PIN
Huachuca cinquefoil	*Potentilla rhyolitica* var. *rhyolitica*	6,571	ROC: WMC	RIT, HUA
Whisk fern	*Psilotum nudum*	48,266	RIA, TER: DES	TUM
Porsild's starwort	*Stellaria porsildii*	20,162	TER: WMC, MOM	CHI
Aravaipa woodfern	*Thelypteris puberula* var. *sonorensis*	115,840	RIA, SPG, ROC: DES, GRA	CAT

1. Codes for status, habitat associations, and associated ecosystem management area can be found in table 72.

Table 74. Fine-filtered other forest planning species for the Coronado National Forest[1]

Common Name	Scientific Name	Habitat Extent (acres) on the Coronado NF	Habitat Associations	Associated EMAs
Arizona cave amphipod	*Stygobromus arizonensis*	374,699	AQU, CAV: ENC	CHI, RIT, HUA
Barfoot (“Bearfoot”) woodlandsnail	*Ashmunella esuritor*	30,716	ROC, TER: PIO, PON	CHI
Chiricahua woodlandsnail	*Ashmunella proxima*	276,659	RIA, ROC: GRA, CHA, ENC, PIO, PON, WMC, DMC	CHI
Pungent talussnail	*Sonorella odorata*	4,292	ROC, TER: PIO, PON, WMC, DMC	CAT
Heart vertigo snail	*Vertigo hinkleyi*	140,517	TER: ENC, PIO, PON	HUA
No common name	*Mannia californica*	201,419	RIA, ROC: ENC, PIO	TUM, CAT
No common name	*Plagiochasma wrightii*	235,551	RIA, ROC: ENC	CHI, TUM
Pringle’s fleabane	*Erigeron pringlei*	18,115	RIA, ROC: WMC, DMC	RIT, PIN
Arizona eryngo	*Eryngium sparganophyllum*	212,221	RIA: ENC, PIO, PON	RIT, CAT
Bigelow’s thoroughwort	*Eupatorium bigelovii*	15,244	RIA, ROC: WMC, DMC	PIN
Santa Catalina burstwort	*Hermannia pauciflora*	56,408	ROC, TER: DES	CAT
Southwest monkeyflower	*Mimulus dentilobus*	11,619	RIA, SPG: GRA, ENC	RIT
Leafy Jacob’s-ladder	*Polemonium foliosissimum* var. *flavum*	47,959	TER: PON, DMC	PIN
Cochise woodsia	*Woodsia cochisensis*	782,139	SPG, ROC: GRA, ENC, PIO	CHI, DRA, TUM, RIT, HUA

1. Codes for status, habitat associations, and associated ecosystem management area can be found in table 72.

Species Diversity and Viability – Environmental Consequences

Coarse-Filter/Fine-Filter Approach to Analysis

The coarse-filter review in the species viability analysis determines whether desired conditions and objectives proposed in the alternatives would sustain the viability of forest planning species. Occasionally, plan components including standards, guidelines, or both that address specific threats to habitat elements are included in the coarse-filter review.

Direction offered by the no-action alternative is not conducive to a coarse-filter assessment, because the 1986 plan does not establish specific desired conditions or objectives. However, the 1986 plan establish hundreds of mitigation recommendation that may be comparable to “groups” specified in the

components of the action alternatives. For example, a guideline/standard listed by the no-action alternatives is "Revegetate wildfire areas with wildlife forage, cover, and riparian species. Native species should be used when available." This is comparable to a mitigation that might be listed for the ALL and TER group of the action alternatives. Refer to the chapter 3 heading "Vegetation Communities" for more detail describing how direction in the no-action alternative would guide habitat management toward achieving resilient, self-sustaining ecosystems.

Although plan components are not coded in the alternative descriptions, desired conditions and objectives are referred to as "DC" and "VO" in this environmental impact statement. Codes listed in table 72 are typically intuitive, based on acronyms or abbreviations of terms used in the forest plan. For a given species, DC refers to the desired conditions of the habitat elements that the species occupies. Similarly, VO (vegetation objectives) refers to the objectives for management (acres treated over a specific timeframe) of the vegetation habitat element in which the species occurs. In most cases, species occupy more than one habitat element, so most DC and VO codes refer to several.

Plan components contribute to conservation of a species by their influence on sustaining vegetation habitat, restoration, or both and reducing potential threats (uncharacteristic wildfire, insect outbreaks) and depleted or degraded surface water resources. All desired condition statements relate to environmental goals to which the Forest Service aspires in order to achieve resiliency in self-sustaining ecosystems. While plan components in the revised forest plan may guide the movement of habitat attributes toward desired conditions, most desired conditions are not likely to be fully achieved within the life of this plan. Thus, emphasis was placed on objectives in the coarse-filter review, because they are indicators of progress toward desired habitat conditions.

Plan components were further categorized into groups if in combination, they apply to several species. For example, guidelines for biophysical (BIP) features related to management of talus (i.e., rock debris) were included in the group "ROC." ROC group components meet viability requirements for nearly all talus snails and several other rock-dwelling species. Other groups were considered coarse-filter components because they addressed forestwide threats or commonly used mitigations across several habitat elements. Following is an overview of coarse-filter plan component groups.

- ALL: These are actions (objectives) and mitigations (standards and guidelines) that apply to many and varied species; they are generally good management for a variety of rare plants and animals. An example is RAM-G-2, which applies to range management: "Burned areas should be given sufficient deferment from grazing, especially during the growing season, to ensure plant recovery and vigor."
- TER: These plan components benefit all terrestrial species. An example of a component in the TER group is VME-G-1: "Fuel reduction and habitat restoration projects should leave clusters of live trees and shrubs to benefit species that require these structures for breeding, feeding, shelter, and other habitat needs." A guideline such as this can benefit hundreds of species—the vast majority of species in VME, which is the identifier for "Vegetation: Madrean encinal woodland."
- AQU: These plan components benefit aquatic species in lotic (flowing) and lentic waters, seeps, and springs, constructed and natural waters, and wet meadows. An example is NWS-G-3: "Fuel buildup should be reduced around natural water sources to protect them from uncharacteristic fire effects."
- ROC: These plan components benefit rock-dwelling species (talus, cliff, outcrops). An example is BIP-G-2: "Management activities should be designed to avoid or minimize the alteration of naturally occurring rocky outcroppings or cliff faces.)
- RIA: These plan components benefit riparian species; this is often related to aquatic features. An example is RAM-G-5: "Within riparian areas, structures used to manage livestock should be located and used in a way that does not conflict with riparian functions and processes."
- CAVE: These plan components benefit cave-dwelling species, particularly bats.

For fine-filter species, plan components beyond desired conditions and objectives are needed to meet population viability requirements. These may include species-specific measures, such as with recovery plans and conservation agreements, ARP-G-1. In virtually all cases, coarse-filter components (DC, VO, and groups) provide positive management strategies, but are not specific enough to ensure that the population viability requirements of certain species are met.

The no-action alternative is not considered in coarse-filter assessments, because there are no specific desired conditions or objectives. However, this is not to imply that there are no coarse-filter counterparts in the no-action alternative. Indeed, there are hundreds of mitigations that could be considered as counterparts to action alternative groups. For example, a guideline/standard (not differentiated) is: "Revegetate wildfire areas with wildlife forage, cover, and riparian species. Native species should be used when available." This is comparable to a mitigation that would be part of the ALL and TER group of the action alternatives. The "Vegetation Communities" section describes in more detail how the elements of the no-action alternative would move these habitats toward or away from the desired conditions for resilient, self-sustaining ecosystems.

Habitat Elements by Alternative (Coarse Filter Analysis)

Terrestrial vegetation communities on the Coronado comprise deserts, grasslands, interior chaparral, Madrean encinal woodland, Madrean pine-oak woodland, ponderosa pine-evergreen shrub, mixed-conifer (wet and dry) forest, spruce-fir forest, montane meadows, aquatic habitat, wetlands, and riparian areas.

Desert

Two significant threats to desert communities (Sonoran and Chihuahuan desertscrub) are invasion by nonnative grasses—particularly buffelgrass—and wildfire. The threats are interrelated because fire risk goes up with increased presence of nonnative grasses. Buffelgrass is currently established in the Sonoran Desert portion of the desert communities' habitat element. Plan objective (VDC-O-1) calls for the suppression of buffelgrass invasion within the Sonoran Desert over the life of the plan. This would meet viability requirements of at least eight species associated with deserts, especially in the Santa Catalina Ecosystem Management Area, where buffelgrass poses a serious threat to wilderness character in the Pusch Ridge Wilderness.

In terms of addressing the threat of buffelgrass, there are only slight differences between alternatives. Because buffelgrass is a threat in only the Santa Catalina ecosystem management area, which is geographically separate from other desert habitat on the Coronado, the action alternatives sufficiently address threats to desert communities as a habitat element and provide for species viability. Alternative 1 proposes more wilderness in the desert community than the others, which, because of restrictions on motorized and mechanized uses in wilderness, would likely decrease the introduction of buffelgrass on vehicles. On the other hand, these same restrictions may hinder the progress of buffelgrass treatment if access by vehicle is not available in some areas.

Alternative 2 would designate a Motorized Recreation Land Use Zone in desert communities in the Santa Catalina Ecosystem Management Area, which could compound with the effects of buffelgrass by causing more ground disturbance, noise, and increasing the risk of human-caused fire ignition. Because of this, alternative 2 does not protect this habitat element as well as the other alternatives.

Overall, however, management direction in each action alternative and the no-action alternative and their respective objectives for treating invasive species would move desert communities toward reference conditions over the life of the plan. Consequently, plan components under all alternatives would provide for the viability of coarse-filter species.

Grasslands

Grasslands (semidesert grasslands, plains grassland, and oak savannah) are primarily threatened by invasion of nonnative species (Lehmann lovegrass) and even native shrubs, as well as overgrazing. In most circumstances, Lehmann lovegrass cannot be eradicated and is now part of a new grassland community. Because many native plant and animal species have adapted to the nonnative grasslands, containing and preventing further expansion of the Lehman's lovegrass community is the key to providing for species viability for those dependent on the native grassland's composition and structure. Because of this, there are no objectives to control Lehmann lovegrass but the proposed action no longer encourages activities that cause it to spread, which are part of the no-action alternative. Overgrazing's effect on desert communities is mitigated by range management components in all alternatives and setting limits on stocking rates, duration, and intensity appropriately in annual operating instructions based on project-level National Environmental Policy Act analysis. That leaves invasion by native shrubs and trees as the primary threat to many species of grassland obligates (including the highest variety of overwintering sparrows in the U.S.).

The objective (VGC-O-1) for this habitat element is to treat at least 72,500 acres of grasslands by various methods. Grasslands cover the largest proportion of the Coronado National Forest (over 25 percent of the land base). Based on likely projected treatments, all 12 of the ecosystem management areas will have shrub reduction treatments ranging from 1,000 acres (2 of the smaller ecosystem management areas) to 20,000 acres (Tumacacori Ecosystem Management Area). The level and diversity of treatments to address habitat threats in this habitat element across the Coronado provides for the viability of species whose threats are tied to changes in the structure and composition of these sites from shrub encroachment. Grasslands are usually the most conducive vegetation community treated by planned and unplanned ignitions (high potential for resiliency, frequent restoration projects).

No action and the proposed action would provide similarly for grassland communities habitat threats and species viability for associated species. Even though the no-action alternative does not have as holistic an approach to management, it does not provide a serious impediment to managing using a more updated methodology. From a species management perspective, the proposed action is more beneficial to wildlife over no action due to the need to actively manage grasslands to prevent shrub encroachment, especially in the forest planning species-rich Tumacacori Potential Wilderness Area. However, the addition of some recommended wilderness areas (especially the Dragoon, Bunk Robinson, Whitmire, and Mount Fagan) would benefit grassland species over the proposed action as is.

In alternative 2, motorized recreation would impact grassland communities more than any other habitat element. Approximately 21,459 acres of grasslands are present in the Motorized Recreation Land Use Zone specified by alternative 2. This is an increase of approximately 18,942 acres over the acreage of grasslands in the Motorized Recreation Land Use Zone specified by the proposed action and alternative 1. Under alternative 2, there is an increased potential for new construction of off-highway vehicle trails and other facilities in support of motorized recreation, which could result in a net loss of the grassland communities on the Coronado and increased disturbance to associated wildlife. These impacts would not result in a loss of species viability.

Overall, however, management direction in each action alternative and the no-action alternative and their respective objectives for treating invasive species would move grassland communities toward reference conditions over the life of the plan. Consequently, plan components under all alternatives would provide for the viability of coarse-filter species.

Interior Chaparral

Interior chaparral has very few closely associated species. Because it frequently burns at relatively high intensity, plants and animals that have evolved in chaparral are resilient to effects of fire and are

primarily types of species that have a greater ability to survive in multiple habitat elements. The no-action alternative provides direction to reduce shrubs and increase livestock forage in this vegetation community, which is improper management given its historic range of variation. In the proposed action, desired conditions direct the Forest Service to retain this habitat element as a native ecosystem but not where it is encroaching on adjacent grasslands. However, any differences between alternatives for coarse-filter species in this habitat element would be inconsequential because none depends on it exclusively.

Overall, however, management direction in each action alternative and the no-action alternative and their respective objectives for treatment of interior chaparral habitat would move the community toward reference conditions over the life of the plan. Consequently, plan components under all alternatives would provide for the viability of coarse-filter species.

Madrean Encinal and Madrean Pine-Oak Woodlands

Madrean encinal and Madrean pine-oak woodlands are often adjacent or intermixed with one another and have similar threats. The primary threat is uncharacteristic fire behavior due to overstocking and high fuel loads, brought about by historic overgrazing followed by decades of fire suppression. Both habitat elements are rich with forest planning species, but the pine-oak woodlands decidedly more so, partly because of its occurrence in riparian situations at moderate elevations. Although Madrean pine-oak woodlands are a relatively small part of the land base of the Coronado National Forest, this is a Mexican habitat element originating in the Sierra Madre Occidental, so the Coronado manages most of the habitat in the U.S.

Given the situation, one would think that pine-oak woodlands would be high priority to receive forest restoration treatment, but the objective (VMP-O-1) only targets 25,000 acres, and those acres would likely only occur in about one-half of the ecosystem management areas, given projects currently planned. However, the situation is different after the 2011 fires in the Chiricahua and Huachuca Ecosystem Management Areas where much of this habitat occurs, because thousands of acres were already “treated” by wildfire, but it is too soon to assess conditions. Although much Madrean encinal woodland also burned, much of it was likely low-severity burns that helped maintain the ecosystem.

The objective for Madrean encinal woodland is 367,000 acres (VME-O-1). This high number reflects that this is a major habitat element of the Coronado National Forest, and also Mexican in origin. It is also an ecosystem that can be readily maintained by natural processes. Treatments are relatively inexpensive and projects are often selected in oak woodlands to meet restoration targets. It is difficult to compare the proposed action with alternative 1 because Chiricahua Addition West and Mount Wrightson would need mechanized treatment, which would increase their risk of uncharacteristic fire under wilderness management. There are some recommended wildernesses in alternative 1 that would contribute to Madrean biotic refugia without a predicted increase in uncharacteristic fire behavior, including Bunk Robinson, Whitmire Canyon, Dragoon, Chiricahua Addition North, and Ku Chish. Therefore, alternative 1 would do the most to provide for species viability in these habitat elements because it would provide more natural and intact ecosystems.

Overall, however, management direction in each action alternative and the no-action alternative and their respective objectives for treatment would move Madrean encinal and pine-oak communities toward reference conditions over the life of the plan. Consequently, plan components under all alternatives would provide for the viability of coarse-filter species.

Montane Forest

Montane forest includes ponderosa pine/evergreen oak, dry mixed-conifer, wet mixed-conifer, and spruce/fir vegetation communities. They represent the cline of dry to wet forests along an elevational gradient. Ponderosa pine is not common in pure stands on the Coronado National Forest, as it is elsewhere in the region. The mixed-conifer types are rarely differentiated in the literature with regards

to their typical plant and animal inhabitants, so they were analyzed together in the population viability assessment. They have a natural, but infrequent fire-return regime (less frequent on the wet end). Spruce-fir is not fire adapted per se, except as having a stand-replacement event with very infrequent fires (following high fuel buildup followed by drought and late spring ignition). As with the woodland types, all of the montane forest habitat elements are suffering from the same forest health issues. These forests have also experienced recent large-scale wildfires, but active management with mechanized equipment is needed for all high elevation forests. The spruce/fir community is somewhat different because it has mostly been replaced following the Nuttall Complex fires. The pine and mixed-conifer fires have burned with a mosaic of intensities, so treatments are still necessary.

There are relatively few forest planning species overall for montane conifer forests, but because the land base is small, they are biologically important, and have the highest number of endemics among forest planning species. The objective for ponderosa pine (VPP-O-1) is to treat 12,500 acres, but no treatments are recommended for the Huachuca or Santa Rita Ecosystem Management Areas (R. Lefevre, pers. comm.) because stands are so small they cannot be mapped. The objectives for dry mixed-conifer (VDM-O-1) recommends treating 13,800 acres and 2,400 acres in wet mixed-conifer (VWM-O-1) among the several ecosystem management areas having significant amounts of mixed-conifer. For alternatives in montane forest types, there are no differences, because most of the area has burned or is already scheduled for treatment.

The Mount Graham Wilderness Study Area, which is also a recommended wilderness area common to all alternatives, includes approximately 98 percent (28,426 acres) of montane forest on the Coronado. Because of the presence of structures and recreation facilities at these high elevations, it is unlikely these ecosystems will ever become self-sustaining through natural processes. Restrictions that may ultimately result from recommending this area as wilderness would likely limit the ability to treat and manage these forest communities for desired conditions.

However, overall management direction in the each action alternative and the no-action alternative and their respective objectives for treatments would move montane forest communities toward reference conditions over the life of the plan. Consequently, plan components under all alternatives would provide for the viability of coarse-filter species.

Aquatic, Wetland, and Riparian Areas

Species relying upon aquatic, wetland, and riparian habitat elements are categorically the most at-risk species, so in many cases, the fine-filter was needed to meet viability requirements. Aquatic habitats are threatened by a host of problems, including water diversion, invasive plants, invasive predators, conversion to stock-watering structures, and climate change (frequent drought has been a premier problem). Three objectives do address Coronado National Forest management: NWS-O-1 is for applying for instream flow water rights within 10 years. NWS-O-2 is for completing reconstruction of at least three developed springs, and NWS-O-3 is for restoration projects, development projects, or both to benefit aquatic habitats for “species of conservation concern” (likely the most at-risk species we can manage for). There are unknowns here, however, because there are no indications as to which sites or species will ultimately be selected. Most of the instream water rights that will be applied for have one or more of these species present. Of the 30 potential streams in this environmental impact statement to be applied for, the Coronado National Forest has an objective for 10. Since the applications target streams occupied by high-risk species, several are filtered out by these objectives. In many cases, there are few reasonable management options for providing adequate water quantity for aquatic species, especially dealing with climate change and within the context of water rights. There are also numerous aquatic species that required fine-filter components, because aquatic species tend to be rare, occur in disjunct populations, and have multiple threats.

Overall, however, management direction in each action alternative and the no-action alternative and their respective objectives for treatments would move aquatic, wetland, and riparian communities

toward reference conditions over the life of the plan. Consequently, plan components under all alternatives would provide for the viability of coarse-filter species.

Biophysical Features Group

Forest plan components for biophysical features (BIP group) are generally coarse-filter components, but include standards and guidelines. Those components that address rocks, cliffs, and talus include BIP- G-1, BIP-G-2, and MIN-G-1. The components essentially make rock features off limits for construction (locatable mineral exploration and extraction notwithstanding, which is outside the scope of forest planning). Essentially all of the rock dwellers are addressed by the coarse filter.

Other features in the biophysical features group are caves and karst (natural attributes) and mines, adits, and shafts; unnatural features. These are addressed in BIP-G-3, BIP-G-4, and BIP-S-1. These are coarse-filter components for species that use large subterranean features, especially, but not limited to, bats. Other species of animals use these features, and would benefit from these plan components. There are a few invertebrates and bats with limited ranges endemic to certain areas for which habitat protections alone are not sufficient that were carried forward to the fine-filter analysis. For bats in the fine-filter analysis, the limiting factor in their distribution and abundance are mines and adits appropriate for breeding.

Management direction in each action alternative and the no-action alternative would move biophysical features toward reference conditions over the life of the plan. Consequently, plan components under all alternatives would provide for the viability of coarse-filter species.

Habitat Elements by Alternative (Fine Filter Analysis)

Species for which addressing habitat threats alone was insufficient to provide for their viability are discussed in the following sections Even though some of their threats were addressed by components reviewed in the coarse-filter evaluation, vulnerabilities to these species remain and require additional plan components and/or mitigation in order to meet species viability requirements.

Federally Listed Species – Environmental Consequences

Most of the threatened, endangered, and candidate species (table 71) were not covered only by coarse-filter plan components (usually desired condition statements and objectives), because the species typically had inherent fine-filter threats that required species-specific plan components. For example, many of the species listed by the Endangered Species Act have recovery plans or conservation agreements, and are managed by any number of species-specific conservation measures in those documents. In this environmental impact statement, the plan component identifier (table 148 in appendix F) directing the Coronado National Forest to follow guidance of these documents is ARP-G-1. Also, Mexican spotted owl and Mount Graham red squirrel were addressed extensively in standards and guidelines in the no-action alternative, and many of these components were carried forward into the action alternatives.

Environmental consequences are discussed for threatened, endangered, and candidate species, which required fine-filter plan components (table 75) in the population viability assessment. More details on potential effects of implementing the preferred alternative, as well as effects determinations, will be addressed in the biological evaluation and biological assessment.

Under all alternatives, relevant laws, policies, and manual direction such as Forest Service Manual 2600 that regulate the management of federally listed and regionally sensitive species would remain in place, and these species would continue to be addressed in project-level analyses.

Status codes in table 71 are as follows:

- E = endangered

- Ep = nonessential, experimental population
- T = threatened
- P = proposed for listing

Plan component codes in the table are defined in table 72.

Table 75. Federally listed species threats and plan components to address threats

Common Name	Scientific Name	Status	Threats	Plan Components to Address Threat Providing for Viability
Mammals				
Jaguar	*Panthera onca*	E	Shooting, habitat conversion, roads, fragmentation, and loss, reduction in understory vegetation density in riparian areas.	ARP-G-1; DC; VO; ALL; TER
Ocelot	*Leopardus pardalis*	E	Habitat conversion, roads, fragmentation, and loss.	ARP-G-1; DC; VO; ALL; TER
Mexican gray wolf	*Canis lupus baileyi*	E, Ep	Human-caused mortalities	ARP-G-1; DC; VO; ALL; TER
Mount Graham red squirrel	*Tamiasciurus hudsonicus grahamensis*	E	Stand-replacing crown fires, insect outbreaks, high avian predation, and climate change.	DC; VO; ALL; TER; ARP-G-1; EMA-PIN-G-3A, 3B, 3C; EMA-PIN-S-2; VDM-G-1, 3, and 5; VSF-G-1, VSF-G-3, VSF-G-4 (1), (2), (3); VWM-G-1, 3, 4, 5, and 6; see text for discussion of Pinaleño Ecosystem Restoration Project
Lesser long-nosed bat	*Leptonycteris yerbabuenae*	E	Loss of habitat, loss of saguaros and agaves as food resources, grazing, fire, and loss of cave/adit roosting sites.	DC; VO; ALL; TER; CAV; ARP-G-5; BIP-G-3 and 4; BIP-S-1; RAM-G-1, 6, and 7; VDC-G-3 and 2; VIC-G-1; VMP-G-1 several special areas (see sensitive species section)
Mexican long-nosed bat	*Leptonycteris nivalis*	E	Same as above. However, this species is very peripheral to Coronado National Forest (only a few foraging records on Peloncillo Ecosystem Management Area).	DC; VO; ALL; TER; CAVE; ARP-G-1; BIP-G-3 and 4; BIP-S-1; EMA-PEL-S-1; RAM-G-1, 6, and 7; VDC-G-3; VIC-G-1; VMP-G-1

Common Name	Scientific Name	Status	Threats	Plan Components to Address Threat Providing for Viability
Birds				
Mexican spotted owl	*Strix occidentalis lucida*	T	Stand-replacing crown fires, drought, insect disease, fire suppression, and other forest health issues.	DC; VO; TER; ARP-G-1; RAM-G-1 and 4; VAC-G-1 to 6; VMP-3, 9, 10, 12, and 13; VDM-G-1, 3, and 5; VWM-G-1, 4, 5, and 6; several special areas (see sensitive species section)
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	T	The loss, degradation, and fragmentation of riparian habitat.	DC; VO; ALL; TER; RIA
Northern Aplomado falcon	*Falco femoralis septentrionalis*	Ep	Habitat degradation due to brush encroachment fostered by overgrazing and fire suppression; overcollecting; and reproductive failure caused by organochlorine pesticide use, namely DDT.	ARP-G-1; DC; VO; ALL; TER;
Amphibians				
Sonora tiger salamander	*Ambystoma mavortium stebbinsi*	E	Predation by nonnative species; diseases, catastrophic floods and drought, illegal collecting, and stochastic extirpations or extinction characteristic of small populations.	DC; VO; ALL; TER; RIA; ARP-G-1; ISM-G-1; RAM-S-2; NWS-G-1,2, 3; VGC-1 and 2
Chiricahua leopard frog	*Lithobates chiricahuensis*	T	Water diversion, pumping, or increased evapotranspiration; overgrazing; wildfires; chytridiomycosis; and climate change.	DC; VO; ALL; TER; RIA ARP-G-1; COW-G-2; ISM-G-1; NWS-G-1 to 5; RAM-S-2 and 3; RIA-G-2, 3, and 4; VGC-1 and 2; several special areas (see sensitive species section)
Reptiles				
New Mexico ridge-nosed rattlesnake	*Crotalus willardi obscurus*	T	Loss of habitat, prescribed fire, wildfire, illegal collection, cattle grazing, commercial beargrass harvesting, excessive erosion and sedimentation into talus slides, some recreational activities, and pesticides.	DC; VO; ALL; TER; ARP-G-1

Common Name	Scientific Name	Status	Threats	Plan Components to Address Threat Providing for Viability
Northern Mexican gartersnake	*Thamnophis eques megalops*	T	Water diversion, pumping, or increased evapotranspiration; overgrazing; loss of specialized prey species (e.g., native fishes and leopard frogs); invasive species; wildfire, woodcutting, recreation, mining, contaminants, urban and agricultural development, road construction, and disease.	DC; VO; ALL; TER; RIA; ISM-G-1, NWS-G-1, 2, and 3
Fish				
Gila chub	*Gila intermedia*	E	Predation by and competition with nonnative organisms (American bullfrogs (*L. catesbeiana*), and crayfish (*Orconectes virilis*)); and habitat alteration, destruction, and fragmentation resulting from water diversions of rivers, springs, and cienegas for human uses (groundwater pumping, dewatering, diversion of water channels, impoundments, and flow regulation), poorly managed livestock grazing, logging and fuelwood cutting, road construction and use, recreation, mining, and urban and agricultural development.	DC; VO; ALL; TER; RIA; AQU; ARP-G-1 (draft recovery plan)
Yaqui chub	*Gila purpurea*	E	Invasion and predation of native and nonnative species.	DC; VO; ALL; TER; RIA; AQU; ARP-G-1
Yaqui catfish	*Ictalurus pricei*	E	Habitat destruction (e.g., stream bank erosion, construction of water impoundments, excessive groundwater pumping) and introduction of nonindigenous fish.	DC; VO; ALL; TER; RIA; AQU; ARP-G-1
Gila topminnow	*Poeciliopsis occidentalis*	E	Habitat destruction (e.g., from groundwater pumping and water diversion); invasive species, especially Mosquitofish (*Gambusia affinis*); overgrazing, mining, timber harvesting, road maintenance, and recreation.	DC; VO; ALL; TER; RIA; AQU; ARP-G-1

Common Name	Scientific Name	Status	Threats	Plan Components to Address Threat Providing for Viability
Sonora chub	*Gila ditaenia*	T	Predation by nonnative vertebrates, drought, climate change, channel degradation, siltation, and water pollution caused primarily by livestock grazing, roads, and mining.	DC; VO; ALL; TER; RIA; AQU; ARP-G-1
Desert pupfish	*Cyprinodon macularius*	E	Introduction and spread of predatory and competitive fishes, water impoundment and diversion, water pollution, stream channelization, and habitat modification.	DC; VO; ALL; TER; RIA; AQU; ARP-G-1
Gila trout	*Oncorhynchus gilae*	T	Wildfire; predation, competition and hybridization with nonnative trout; limited range.	DC; VO; ALL; TER; RIA; AQU; ARP-G-1
Apache trout	*Oncorhynchus gilae apachae*	T	Grazing	DC; VO; ALL; TER; RIA; AQU; ARP-G-1
Spikedace	*Meda fulgida*	E	Drought, climate change, competitive and predatory nonnative fishes	DC; VO; ALL; TER; RIA; AQU; ARP-G-1
Loach minnow	*Tiaroga cobitis*	E	Habitat modification, introduction and spread of competitive and/or predatory non-native fish species, livestock grazing, timber harvest, wildfire, and recreational activities	DC; VO; ALL; TER; RIA; AQU; ARP-G-1
Roundtail chub	*Gila robusta*	P	Habitat loss and degradation related to dams, diversions, groundwater pumping, mining, development, recreation, improper livestock grazing, and competition and predation from non-native fishes, and climate change	DC; VO; ALL; TER; RIA; AQU; ARP-G-1
Plants				
Pima pineapple cactus	*Coryphantha scheeri* var. *robustispina*	E	Loss of desert and grassland habitat; grazing, wildfire; invasive grasses; and illegal collection.	DC; VO; ALL; TER; VDC-G-1 and 3; EMA-RIT-G-2; EMA-HUA-G-2; RAM-G-1 and 4
Huachuca water umbel	*Lilaeopsis schaffneriana* var. *recurva*	E	Water withdrawals, diversions, stream channelization, levies, overgrazing, and trampling.	DC; VO; ALL; RIA; EMA-HUA-G-2; NWS-1, 2, 3, and 5; RAM-G-1 to 5; WET-G-1; WET-S-1; ARP-G-1 (draft recovery plan)

Common Name	Scientific Name	Status	Threats	Plan Components to Address Threat Providing for Viability
Canelo Hills ladies' tresses	*Spiranthes delitescens*	E	Further loss of limited habitat, groundwater overdrafts, surface water diversions, impoundments, channelization, improper livestock grazing, agriculture, mining, road building, nonnative species introductions, urbanization, wood cutting, and recreation.	DC; VO; ALL; RIA; NWS-O-2;NWS-O-3; RIA-G-2; WET-O-1; WET-O-2; WET-S-1; WET-G-1; MTS-G-2; MTS-G-3; NWS-G-2; NWS-G-3; NWS-G-4

Jaguar and Critical Habitat, Ocelot and Mexican Gray Wolf

Summary of Determinations:

- The implementation of any alternative may render a "may affect, likely to adversely affect" determination for jaguar, jaguar designated critical habitat, and ocelot.
- The implementation of any alternative may render a "not likely to jeopardize in proposed 10(j) area" determination for Mexican gray wolf.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management, or land acquisition in any of the alternatives may have short-term effects on terrestrial habitat or species populations, but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

No Action – Jaguar, ocelot and Mexican gray wolf presence on the Coronado National Forest is extremely rare, however adverse effects from management actions are possible. Overall, the 1986 forest plan and its implementing standards and guidelines are positive for the long-term conservation and recovery of these species. The Coronado has low total miles and a low road density standard and there is no cross-country travel allowed on the national forest, which is positive for large carnivores as roads and cross-country travel result in habitat fragmentation. In addition, the Coronado National Forest is a long-standing member of the Jaguar Conservation Team, and the Forest Service participates in the remote camera census program for jaguar detection along the international border with Mexico. Effects to jaguar, ocelot, and Mexican gray wolf habitat from fire and fuels management, including prescribed fire, may result in reducing cover in some areas, but it is anticipated these effects would be insignificant because treatments would be limited in size and vegetation would respond quickly after treatment, eventually providing additional cover. Fire and fuels management may also have indirect benefits to jaguar, ocelot, and Mexican gray wolf by improving prey base habitat productivity through increased plant vigor. The Coronado has the third highest recreation use in the Southwestern Region, and effects to these large carnivores resulting from recreation activities may include avoidance, habituation, displacement, habitat modification or loss, and a potential for illegal shooting.

Proposed Action – The proposed action defines desired conditions based on the current science for grasslands, Interior chaparral, Madrean pine-oak, Madrean encinal, riparian vegetation, mixed conifer forest and ponderosa pine communities and provides management objectives and guidelines as a framework for implementing site-specific projects to achieve desired conditions. Forestwide plan objectives state that a minimum of 500,700 acres in these habitat types be treated through planned and unplanned ignitions and mechanical treatments every 10 years to maintain species diversity and an appropriate diversity of open conditions and structural classes. Fire management, including prescribed fire, can have indirect effects by improving prey base habitat productivity through increased plant

vigor however, in some cases valuable cover may be altered or lost. From 2003 to 2012, the Coronado has had a moderate to large prescribed fire program burning about 128,624 acres, which is one of the highest totals in the region over that time period.

Rangewide, impacts of roads on large carnivores include direct mortality from vehicle collisions, avenues for illegal shooting, direct habitat loss, and harassment. Areas where jaguars and ocelots have occurred on the Coronado, however, have low road densities and include portions of areas currently being considered for wilderness status. Further, currently the Coronado has 0.99 mile per square mile of National Forest System roads; this low road density standard is well within densities generally recommended for carnivore conservation (USDA FS 2011).Through land or facility development or activities, minerals projects have the potential to impact jaguar, ocelot and Mexican gray wolf, and their prey, often via disturbance and loss/fragmentation of habitat. Effects to these carnivores from the activities of this program are similar to the effects of roads. In addition, surface occupancy causes direct habitat loss and the addition of human occupation increases the chances for harassment and lethal encounters. Mineral extraction operations may occur during the planning period, which may adversely impact the jaguar and its habitat.

Alternative 1 – In addition to incorporating the proposed action, alternative 1 proposes that 14 additional land parcels (in addition to Mount Graham, Ku Chish, Whetstone, and Chiricahua North Recommended Wilderness Areas) be recommended for wilderness designation. Recommending these wilderness areas would result in identical effects when compared to the proposed action. Acres (beyond the proposed action) of Madrean pine-oak, Madrean encinal, riparian vegetation and mixed conifer forest and ponderosa pine communities that may be included under alternative 1 total 144,707 acres within the additional 14 areas proposed. Table 76 shows the number of acres of jaguar critical habitat in the recommended wilderness areas.

Wilderness areas do not have roads, thus wilderness areas would protect large carnivores from impacts such as direct mortality from vehicle collisions, avenues for illegal shooting, direct habitat loss, and harassment. Areas where large carnivores occur on the Coronado have low road densities and include portions of areas currently being considered for wilderness status. Currently, the Coronado has 0.99 mile per square mile of NFS roads. This low road density standard is well within densities generally recommended for carnivore conservation (USDA FS 2011).

Table 75 lists the major threats (fourth column) followed by the guidelines and standards that address threats to jaguar, ocelot and Mexican gray wolf (fifth column). ARP-G-1 defers mitigations to recovery plans for threatened and endangered species. The ocelot and Mexican gray wolf have final recovery plans and the jaguar has a draft recovery plan and designated critical habitat. The recovery outline was used to develop a full jaguar recovery plan (USFWS 2016c) which is incorporated to the plan by reference per ARP-G-1.

Table 76. Acres of jaguar critical habitat within recommended wilderness areas under alternative 1

Potential Wilderness Area	Acres of Jaguar Critical Habitat
Bunk Robinson Wilderness Study Area	15,740
Mt. Fagan	5,366
Mt. Wrightson	13,791
Whetstone	16,218
Whitmire Canyon Wilderness Study Area	12,153

Alternative 2 – This alternative proposes the expansion of the Motorized Recreation Land Use Zone in comparison to the proposed action and alternative 1. Alternative 2 recommends only the Mount Graham Wilderness Study Area for designation; however, management of this and other existing

wilderness study areas for wilderness characteristics would continue to restrict the use of mechanized and motorized equipment and vehicles.

Under alternative 2, approximately 61,283 acres within the expanded Motorized Recreation Land Use Zone are in Madrean pine-oak, Madrean encinal, riparian vegetation, mixed conifer forest and ponderosa pine communities, which are suitable habitat for jaguar, ocelot, and Mexican gray wolf. These areas would be avoided by these large carnivores due to the high level of disturbance by noise and human interaction. There is a potential for off-highway vehicle trails and other facilities to be built in riparian areas in support of motorized recreation, which would result in a net loss of these communities on the Coronado. On the other hand, an officially designated land use zone for motorized recreation could direct off-road activities to the land use zone and away from other riparian areas that are currently being used.

Designated Critical Habitat – Jaguars require connectivity to Mexico, availability of native prey species and water sources, dense canopy cover, rugged terrain, and minimal to no human development. Activities that may adversely modify critical habitat are any that destroy or substantially reduce the habitat requirements listed above. They can include rangeland management, recreational development, fires, and mining activity that proceed without adequate consideration of the welfare of the jaguar.

Livestock grazing can modify native prey species' habitat by altering vegetation composition and structure directly by trampling, clipping, or browsing. These changes could alter prey species distribution and/or density by removing herbaceous vegetation that provides food and hiding cover. Livestock management on the Coronado National Forest adjusts livestock forage utilization based on site-specific resource conditions and management objectives, but in general, utilization is managed at a level corresponding to light to moderate intensity (15 to 45 percent of current year's growth). This level of utilization provides adequate food and cover for jaguar prey species (USFS 2013). Further, livestock fences on the Coronado are constructed to minimize wildlife impacts.

Closely spaced water sources are important for jaguar survival. Most water sources are water troughs and ponds that contain water during all or most of the year and these water sources do not exclude use by jaguar or prey species.

Mining activity, including road use both during the day and at night could cause displacement around the area for the duration of mining activities. Rugged terrain such as canyons, ridges, and rocky hills is an important component in jaguar habitat and mining activities could alter the topography within the project area, which would cause temporary displacement around the area of activities. Mineral extraction operations may occur during the planning period, which may adversely impact critical habitat of the jaguar.

Fires can alter prey species' habitat and well as resting and denning habitat. If fires occur in an area when jaguars are moving through, they would likely vacate the area temporarily due to the presence of fire itself, a temporary lack of prey species in the area, and increased human activity (USFS 2013). Wildfire and prescribed fires can also change canopy cover; however, fires are primarily managed to result in low- to moderate-intensity fire, with limited areas of high-intensity fire.

Jaguars require minimal human interaction. Recreational activities such as hiking, hunting, and off-highway vehicle driving are expected to continue on the Coronado National Forest over the life of the project; however, these activities are regulated and there will be no urban development or additional summer homes as a result of this plan within jaguar critical habitat on Coronado National Forest lands. Therefore, we do not anticipate and increase in human-jaguar interactions.

Table 77, table 78, and table 79 outline the trends and determinations by alternative for jaguar, ocelot, and Mexican gray wolf.

Table 77. Jaguar trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Negative	Negative	Negative	Negative
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

ESA = Endangered Species Act; NA = not applicable

Table 78. Ocelot trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Negative	Negative	Negative	Negative
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

Table 79. Mexican gray wolf trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Negative	Negative	Negative	Negative
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	Not likely to jeopardize in proposed 10(j) area	Not likely to jeopardize in proposed 10(j) area	Not likely to jeopardize in proposed 10(j) area	Not likely to jeopardize in proposed 10(j) area
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

Mount Graham Red Squirrel and Critical Habitat

Summary of Determinations:

The implementation of any alternative would result in a “may affect, likely to adversely affect” determination for Mount Graham red squirrel and Mount Graham red squirrel critical habitat.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management, or land acquisition in any of the alternatives may have short-term effects on habitat or species populations but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest. Under all alternatives, the Pinaleño Ecosystem Restoration Project will be implemented. The project focuses on restoring resiliency to Mount Graham red squirrel habitat but has short-term negative effects from vegetation management activities. Under all alternatives, management considerations for Mount Graham red squirrel

supersede those for all other species per forest plan direction and the Mount Graham red squirrel recovery plan.

Current resource programs have different effects on the Mount Graham red squirrel. Rangeland management and associated livestock grazing have incidental effects on the Mount Graham red squirrel since no grazing occurs within the core range of the species. Two programs—fire management and watershed management—perform activities that are evaluated on a site-specific basis for impacts to the red squirrel, but would generally result in long-term benefits for the squirrel. Removal of forest products associated with fire has the potential to impact foraging, nesting and midden habitat by reducing available resources.

The engineering program performs direct activities (road maintenance, road closures) which could result in habitat fragmentation or direct mortality; however, no new roads are projected to be constructed. Road activity that is limited to simple maintenance has a negligible effect. Furthermore, there is a beneficial effect on the red squirrel if roads are closed.

Recreational use occurs in the range of the red squirrel but is regulated. It is not known if recreational use in the range of the red squirrel exceeds capacity at certain times, but with the restrictions in place, effects are likely to be minimal when coupled with other guidelines for protection of wildlife, fish, rare plants, and watershed resources. Although facility development, under special use permit, and mineral exploitation are restricted to some extent under all alternatives, new facilities and mineral extraction are not prohibited in the range of the Mount Graham red squirrel. Although site-specific management plans would be developed for any new facilities, there could be further loss and degradation of habitat. Mineral extraction has the potential to impact foraging habitat and reduce available resources. The data on mineral exploitation indicate these impacts may be negligible because the average site is less than 2 acres.

Under current conditions, about 90 percent of the Mount Graham Recommended Wilderness Area is highly departed from reference conditions and under extreme risk of uncharacteristic fire. There is an elevated need to treat this area due to its importance as Mexican spotted owl and Mount Graham red squirrel habitat. The decrease in the ability to mechanically treat, use planned ignitions, or both in this area prior to reintroduction of natural ignitions could result in uncharacteristic fire behavior if a wildfire were to occur, as was the case for the Clark Peak and Nuttall Complex Fires. However, the impacts of recommending the Mount Graham Recommended Wilderness Area would be negligible as it is already managed as wilderness due to its status as wilderness study area.

No Action – Under this alternative, Mount Graham red squirrel habitat (wet mixed-conifer and spruce/fir forest) is specifically addressed under Management Areas 2 and 2a, and there are numerous standards and guidelines addressing management in these areas to mitigate potential effects to Mount Graham red squirrel. This alternative does not discuss the differences between wet and dry mixed-conifer forest and does not define desired future conditions for resilient stands or provide guidance on how to achieve these desired conditions. However, this would not prevent ecological restoration of these vegetation communities since the Pinaleño Ecosystem Restoration Project was developed under the no-action alternative.

Vegetation treatments would continue under the 1986 forest plan; however, departure from reference condition vegetation, fuels, and disturbance regimes after the first 10 years would likely remain high over the majority of this vegetation community.

In the 1986 forest plan, there are many amendments, standards, and guidelines for Mount Graham red squirrel, including special use management numbers 5 and 9 (Mount Graham International Observatory and electronic sites), which address habitat loss; transportation system number 5, reducing traffic in Mount Graham red squirrel habitat, to alleviate disturbance, possibly causing behavioral and fecundity alteration; and insects and disease number 1, which limits insect control

activities within Mount Graham red squirrel habitat. For Management Areas 2 and 2A (forest plan change notice 2 in June 1996 and amendment number 4 in 1998), there are dozens of standards and guidelines that specifically address threats to, and habitat needs of, Mount Graham red squirrel, Mexican spotted owl, and northern goshawk and set limits on activities in Mount Graham red squirrel habitat (Management Areas 2 and 2A). These measures do not overly limit restoration activities in Mount Graham red squirrel habitat to increase the risk of uncharacteristic fire or impede habitat improvement necessary to sustain the Mount Graham red squirrel population. In this regard, the no-action alternative is much more responsive to the needs of Mount Graham red squirrel than any of the other alternatives but may become out of date with the recovery plan if it is revised and so is not as flexible as the proposed action.

Proposed Action – The proposed action defines desired conditions based on the current science for wet mixed-conifer and spruce/fir communities and provides management objectives and guidelines as a framework for implementing site-specific projects to achieve the desired conditions. Forestwide plan components would guide treatment in the mixed-conifer forest through planned and unplanned ignitions and mechanical treatments on 16,200 acres to maintain species diversity and an appropriate diversity of open conditions and structural classes. There are no plan objectives to restore habitat quality in the spruce/fir forest in the proposed action or any of the alternatives, which would have a minimal effect since most of this vegetation community has burned in the last decade and is now in an early seral condition within the historic range of variation for the potential natural vegetation type.

Table 71 lists the major threats (fourth column) followed by the guidelines and standards that address threats to Mount Graham red squirrel (fifth column). ARP-G-1 defers mitigations to recovery plans for threatened and endangered species. The Mount Graham red squirrel has a final recovery plan (USFWS 1993d) and a revised recovery plan has been drafted (USFWS 2011), which is incorporated into the plan by reference per ARP-G-1.

EMA-PIN-G-3A, B, and C refer specifically to Mount Graham red squirrel. The first establishes a hierarchy, recognizing needs of Mount Graham red squirrel conservation and management as superseding all other species (including Mexican spotted owl and northern goshawk). The second relates to potential effects of recreation, and the third ensures protection of the middens (caching and den sites), as was done in the design of the Pinaleño Ecosystem Restoration Project. EMA-PIN-S-2 prohibits the establishment of new recreational structures. The VDM, VWM, and VSF guidelines (see table 72 for guideline codes) are for conducting vegetation management in montane conifer forests, especially to retain important structural features, re-create old-growth life form to squirrel habitat, and guidance for crews doing vegetation management. As a set, these plan components address the threats to species viability for Mount Graham red squirrel, such that there is a low risk of the species becoming extinct due to Forest Service management of its habitat.

Alternative 1 – Alternative 1 proposes that 16 land parcels be recommended for wilderness designation forestwide, including the Mount Graham Recommended Wilderness Area. There are no additional proposed wilderness areas within Mount Graham red squirrel habitat, so alternative 1 and the proposed action are identical with regards to this species.

Alternative 2 – This alternative proposes expansion of the Motorized Recreation Land Use Zone in comparison to the proposed action and alternative 1. Alternative 2 includes Stockton Pass Road to the south of Mount Graham as an area managed for scenic values and motorized use, but the area is far enough away that it would not directly impact Mount Graham red squirrel habitat. Indirectly, increased motorized recreational use in Stockton Pass could result in an accidental fire, which could ultimately burn intensely on the south-facing slope into Mount Graham red squirrel habitat. However, because the amount of motorized use of Stockton Pass is not anticipated to increase, this is not expected to be a serious threat related to this particular alternative.

Designated Critical Habitat – Activities that may adversely modify critical habitat are any that destroy or substantially reduce forest density in the vicinity of occupied habitat (e.g., middens). This can include timber harvest and recreational development that proceed without adequate consideration of the welfare of the squirrel (USFWS 1990). Timber production is no longer practiced in the Pinaleño Ecosystem Management Area, but the Pinaleño Ecosystem Restoration Project targets forest restoration objectives to decrease the threat of uncharacteristic wildfire. Designated critical habitat acres would remain the same across all alternatives.

Rangeland management has no effect on Mount Graham red squirrel critical habitat since no grazing occurs in the designated critical habitat. The engineering program performs direct activities (road maintenance, road closures) which have a negligible or beneficial effect on critical habitat, but performs interrelated activities depending on other resource needs. It is not known if recreational use in critical habitat exceeds capacity at certain times, but there are restrictions in place, so effects are likely to be minimal when coupled with other guidelines for protection of wildlife, fish, and rare plants and watershed resources. Although facility development, under special use permit, and mineral exploitation are restricted to some extent under all alternatives, new facilities and mineral extraction are not prohibited in critical habitat of the Mount Graham red squirrel. Although site-specific management plans would be developed for any new facilities or minerals projects, there could be further reduction of resources and loss and degradation of habitat. The data on mineral exploitation indicates that these impacts may be negligible because the average site is less than 2 acres.

The potential effects of climate change to the Mount Graham red squirrel could include long-term drought and hotter average temperatures, which could result in a higher risk of stand-replacing fires, heat and water stress on conifer trees, and increase in exotic pest episodes, all of which would be major threats to Mount Graham red squirrel habitat. However, there are no expectations of measurable changes in climate within the temporal bounds of the proposed action (USFWS 2012).

Table 80 outlines the trends and determinations by alternative for Mount Graham red squirrel.

Table 80. Mount Graham red squirrel trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trends[1]	Positive	Positive	Positive	Positive
Habitat trends[1]	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

1. Population and habitat trends for Mount Graham red squirrel needs an explanation. There was a huge population decline in the last 2 decades, so the population is already very low and holding capacity is low. There were catastrophic insect outbreaks followed by catastrophic fires. While it is hoped the Coronado National Forest will recover, especially under the Pinaleño Ecosystem Restoration Project, it is possible that because of human causes and climate change, the ecosystem and squirrel may not recover.

Lesser Long-nosed Bat

Summary of Determinations:

The implementation of any alternative would result in a “may affect, likely to adversely affect” determination for lesser long-nosed bat.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management,

or land acquisition in any of the alternatives may have short-term effects on habitat or species populations but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

No Action – The 1986 forest plan does not define desired future conditions or objectives for treating desert communities and desert grasslands, Madrean encinal woodland, or interior chaparral, but there are many standards and guidelines for habitat management, especially for range management in Management Area 4, which contains mitigations for habitat protection. The no-action alternative recognizes the need to restore ecological processes in fire-dependent ecosystems, but it does not provide desired conditions that support this species' foraging habitat and does not include strategic objectives for accomplishing these goals. There are standards and guidelines to protect caves and roosts.

Under the no-action alternative, desert and grassland communities would continue to be departed from desired conditions. According to the 2009 ecological sustainability report, 52 percent of Coronado National Forest grasslands are in a shrub-invaded state (USDA FS 2009b). Vegetation treatments would likely continue in accordance with the limited direction in the 1986 forest plan, which emphasizes treatment for sustained livestock forage, as well as control of shrub invasion.

Under the no-action alternative, the overall structure of chaparral and Madrean encinal woodland would remain similar to the current condition, although changes at the species composition and structural stage may result from more frequent fire.

The no-action alternative has standards and guidelines to protect caves and roosts and to protect all agaves and saguaros, which are food for the bat. It also contains restrictions on livestock use in Management Area 4, which prevent livestock from competing with bats for critical food sources. The no-action alternative is more specific than strategic in design, so there are many more fine-filter type components in the no-action alternative that mitigate direct impacts to or avoid bat roosting habitat, but the lack of objectives for treating the overall habitat for the bat is problematic for ensuring restoration goals that protect food sources and other habitat needs.

Proposed Action – The proposed action would result in plant composition trending toward desired conditions, as would plant density, individual plant basal area, and root density in the surface soil horizon. The proposed action defines desired conditions based on the current science for desert communities and desert grasslands, and provides management objectives and guidelines that would provide a framework for implementing site-specific projects to achieve desired conditions. These plan components would result in planned and unplanned ignitions and mechanical treatments on at least 72,000 acres to maintain open, native grasslands with appropriate shrub and overstory cover. Every year herbicides and manual methods would be used to suppress or eradicate buffelgrass on 1,000 to 1,500 acres of Sonoran Desert. Desired conditions and objectives would improve habitat quality and threats to the bat associated with loss of habitat conditions, while guidelines protect food resources (primarily paniculate agaves). The proposed action would maintain grasslands in a more open state that would restore fire to its characteristic role in these communities. The reduction of shrub encroachment and the promotion of continuous fuels would increase fire spread and improve nutrient cycling, thus improving the health and vigor of individual plants that support bats and provide food sources. Encouraging characteristic disturbance in the grasslands also promotes a functioning system and further maintains the open, native states described by the desired conditions. Management activities initiated under this alternative would essentially be the same as was done under the no-action alternative, so the effects determinations would be the same. However, the proposed action is more comprehensive in addressing bat habitat besides roosting areas and would, therefore, better provide for species viability.

Management of landscape-scale wildland fire has the potential to result in short term impacts to lesser long-nosed bat. The primary threats to the lesser long-nosed bat are loss of or disturbance at roost sites

and impacts to forage sources (USFWS 2016e). All activities at or near known roost sites will be designed to avoid impacts, including the possibility of smoke in roosting sites. Another potential impact from wildland fire may include changes to foraging habitat through loss of agaves. The objectives of these treatments could impact the foraging habitat of lesser long-nosed bat by burning agaves outright or by affecting agave phenology for the short term (the current growing season); however, only a small portion of available habitat would likely be affected at any one time. Fine-filter plan components are listed in table 71. There are plan components that address retention of agaves, the primary food of lesser long-nosed bats, and adits and caves which lesser long-nosed bats use during the summer months (post-maternal roosts). Standards and guidelines would guide management to retain and enhance habitat for paniculate agaves to benefit this species. Plan components also incorporate mitigations from the recovery plan. Livestock grazing is listed as a threat because cattle may forage upon bolting agave stalks. Plan components guide range use by limiting livestock grazing to levels that allow the persistence of native vegetation communities, which would encourage preservation and recruitment of paniculate agave.

The use of herbicide and pesticides can have adverse effects on aquatic and upland species and are expected to continue under this plan as they have under the previous forest plan. Any potential projects implemented would be assessed on a case-by-case basis to determine potential effects on individual species and to mitigate them. Minerals management could also impact lesser long-nosed bat by disturbing roosting bats and causing localized losses of agaves due to surface disturbance.

Alternative 1 – For all resources, plan components for alternative 1 are the same as for the proposed action. This alternative proposes that 16 areas be managed as recommended wilderness. The grassland communities, which are the most threatened habitats for lesser long-nosed bats, are present in each of the recommended wilderness areas. Approximately 30,694 acres, or 7 percent, of the grassland communities would be recommended for wilderness designation under alternative 1. As discussed earlier, some recommended wilderness areas would make good candidates as biological refugia, because the ecosystem and fire regimes are functioning and do not pose an increased risk of uncharacteristic fire. For grasslands and chaparral, the Tumacacori and Santa Teresa Recommended Wilderness Areas would require active management to create better habitat conditions for this species. The environmental consequences of this alternative would be similar to those of the proposed action, although most of the other recommended wilderness within lesser long-nosed bat habitat would benefit from management as wilderness.

Alternative 2 – Forest plan components for alternative 2 are the same as for the proposed action. This alternative proposes expansion of the Motorized Recreation Land Use Zone in comparison to the proposed action and alternative 1. Alternative 2 recommends only the Mount Graham Wilderness Study area (61,315 acres) for wilderness; however, the environmental consequences of this alternative would be similar to those of the proposed action, although the motorized recreation areas would increase slightly in part of the grassland habitat for lesser long-nosed bat. This species is a nocturnal forager so the motorized recreation areas in its habitat would not cause too much disturbance, because most motorized recreation occurs during the day.

Lesser long-nosed bat populations seem to be fairly stable, although it is difficult to assess, partly because habitat management in Mexico is poorly known (these are migratory species that spend summers on the Coronado National Forest). Endangered Species Act determinations are the same for all alternatives because management and components are fairly consistent across the board for lesser long-nosed bat habitat. The action alternatives are similar to the no-action alternative, which has already gone through section 7 consultation with the U.S. Fish and Wildlife Service.

Table 81 outlines the trends and determinations by alternative for lesser long-nosed bat.

Table 81. Lesser long-nosed bat trends by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

Mexican Long-nosed Bat

Summary of Determinations:

The implementation of any alternative would result in a "may affect, not likely to adversely affect" determination for Mexican long-nosed bat.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management, or land acquisition in any of the alternatives may have short-term effects on habitat or species populations, but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

No Action – The 1986 forest plan does not define desired future conditions or objectives for treating desert grasslands, interior chaparral, Madrean encinal, Madrean pine-oak, and Ponderosa pine, but there are many standards and guidelines for habitat management, especially for range management in Management Area 4, which contains mitigations for habitat protection. The no-action alternative recognizes the need to restore ecological processes in fire-dependent ecosystems, but it does not provide desired conditions that support this species foraging habitat and does not include strategic objectives for accomplishing these goals. There are standards and guidelines to protect caves and roosts.

Under the no-action alternative, the grassland communities would continue to be departed from desired conditions. According to the 2009 ecological sustainability report, 52 percent of Coronado National Forest grasslands are in a shrub-invaded state (USDA FS 2009b). Vegetation treatments would likely continue in accordance with the limited direction in the 1986 forest plan, which emphasizes treatment for sustained livestock forage, as well as control of shrub invasion.

Under the no-action alternative, the overall structure of chaparral and Madrean encinal woodland would remain similar to the current condition, although changes at the species composition and structural stage may result from more frequent fire.

The no-action alternative has standards and guidelines to protect caves and roosts and to protect all agaves, which are food for the bat. It also contains restrictions on livestock use in Management Area 4, which prevent livestock from competing with bats for critical food sources. The no-action alternative is more specific than strategic in design, so there are many more fine-filter type components in the no-action alternative that mitigate direct impacts to or avoid bat roosting habitat, but the lack of objectives for treating the overall habitat for the bat is problematic for ensuring restoration goals that protect food sources and other habitat needs.

Proposed Action – The proposed action would result in plant composition trending toward desired conditions, as would plant density, individual plant basal area, and root density in the surface soil

horizon. The proposed action defines desired conditions based on the current science for grassland communities and provides management objectives and guidelines that would provide a framework for implementing site-specific projects to achieve desired conditions. These plan components would result in planned and unplanned ignitions and mechanical treatments on at least 72,000 acres to maintain open, native grasslands with appropriate shrub and overstory cover. Desired conditions and objective would improve habitat quality and threats to the bat associated with loss of habitat conditions, while guidelines protect food resources (primarily paniculate agaves). The proposed action would maintain grasslands in a more open state that would restore fire to its characteristic role in these communities. The reduction of shrub encroachment and the promotion of continuous fuels would increase fire spread and improve nutrient cycling, thus improving the health and vigor of individual plants that support bats and provide food sources. Encouraging characteristic disturbance in the grasslands also promotes a functioning system and further maintains the open, native states described by the desired conditions. Management activities initiated under this alternative would essentially be the same as was done under the no-action alternative, so the effects determinations would be the same. However, the proposed action is more comprehensive in addressing bat habitat, including roosting areas and would, therefore, better provide for species viability. The primary threats to the Mexican long-nosed bat are loss of, or disturbance at, roost sites and impacts to forage sources.

Fine-filter plan components are listed in table 71. Standards and guidelines would guide management to retain and enhance habitat for paniculate agaves to benefit this species. Mexican long-nosed bats roost in adits and caves during the summer months (post-maternal roosts). Livestock grazing is listed as a threat because cattle may forage on bolting agave stalks. Plan components guide range use by limiting livestock grazing to levels that allow the persistence of native vegetation communities, which would encourage preservation and recruitment of paniculate agave.

Alternative 1 – For all resources, plan components for alternative 1 are the same as for the proposed action. This alternative proposes that 16 areas be managed as recommended wilderness. The grassland communities, which are the most threatened habitats for Mexican long-nosed bats, are present in each of the recommended wilderness areas. Approximately 30,694 acres, or 7 percent, of the grassland communities would be recommended for wilderness designation under alternative 1. As discussed earlier, some recommended wilderness areas would make good candidates as biological refugia, because the ecosystem and fire regimes are functioning and do not pose an increased risk of uncharacteristic fire. The environmental consequences of this alternative would be similar to those of the proposed action, because the two recommended wilderness areas under this alternative that are within Mexican long-nosed bat habitat are recommended as wilderness study areas under the proposed action.

Alternative 2 – Forest plan components for alternative 2 are the same as for the proposed action. This alternative proposes expansion of the Motorized Recreation Land Use Zone in comparison to the proposed action and alternative 1. Alternative 2 recommends only the Mount Graham Wilderness Study area (61,315 acres) for wilderness; thus, the environmental consequences of this alternative would be discountable because there are no known roosts in the area, and it was not known to be utilized by the bat historically.

Table 82 outlines the trends and determinations by alternative for Mexican long-nosed bat.

Table 82. Mexican long-nosed bat trends by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

Mexican Spotted Owl and Critical Habitat

Summary of Determinations:

The implementation of any alternative would result in a "may affect, likely to adversely affect" determination for Mexican spotted owl and Mexican spotted owl critical habitat.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management, or land acquisition in any of the alternatives may have short-term effects on habitat or species populations but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

No Action – The 1986 forest plan addresses mixed-conifer ecosystems in the context of habitat for Mexican spotted owl and northern goshawk. However, it does not discuss the differences between wet and dry mixed-conifer forest, though both are occupied by this species. The no-action alternative does not define desired future conditions for resilient stands or provide guidance on how to achieve these desired conditions. Components in the 1986 forest plan that address Mexican spotted owl were mostly taken directly out of the current recovery plan. These components are problematic because they were designed for environmental conditions in areas that have very divergent topography and forest form and structure. In addition, the standards and guidelines are extremely restrictive (e.g., 9-inch diameter cap), and may not allow restoration of late-successional forests. The Pinaleño Ecosystem Restoration Project was able to be approved and implemented to effectively manage to restore conifer forests only because management for the Mexican spotted owl and northern goshawk was trumped by plan direction to manage habitat for Mount Graham red squirrel. In Mexican spotted owl habitat elsewhere on the Coronado, this would not be possible without a plan amendment.

Vegetation treatments would continue under the 1986 forest plan; however, departure from reference condition for vegetation, fuels, and disturbance regimes after the first 10 years would likely remain high over the majority of this vegetation community, except in areas within the Pinaleño Ecosystem Restoration Project and those burned in the numerous recent fires, especially in the Chiricahua and Huachuca Mountains.

The Mount Graham Wilderness Study Area was designated in 1984, so it is integrated into the no-action alternative. Under current conditions, the majority (about 90 percent) of this area is highly departed from reference conditions and under extreme risk of uncharacteristic fire. There is an elevated need to treat this area due to its importance as Mexican spotted owl and Mount Graham red squirrel habitat. The inability to mechanically treat, use planned ignitions, or both in this area prior to reintroduction of natural ignitions could result in uncharacteristic fire behavior if a wildfire were to occur.

Under the no-action alternative, there are several special areas and research natural areas. These are discussed in detail elsewhere. Several of these have spotted owl habitat (i.e., protected activity centers and critical habitat).

Proposed Action – The proposed action defines desired conditions based on the current science for mixed-conifer communities and provides management objectives and guidelines as a framework for implementing site-specific projects to achieve desired conditions. Forest plan components would guide management to treat mixed-conifer forest through planned and unplanned ignitions and mechanical treatments on 16,200 acres to maintain species diversity and an appropriate diversity of open conditions and structural classes. The standards and guidelines from the no-action alternative would be incorporated into the proposed action by ARP-G-1, which tiers to current recovery plan conservation measures. Therefore, there would be no difference in effects to Mexican spotted owl between the no action and proposed action alternatives. Unlike the no-action alternative, the proposed action would not need to be amended in order to remain current when the recovery plan for Mexican spotted owl is revised. It is anticipated that this revision would allow for greater flexibility in treating in and around Mexican spotted owl habitat to reduce the threat of uncharacteristic fire.

The Mount Graham Recommended Wilderness Area, research natural areas, and other special areas were carried forward from the 1986 forest plan into the proposed action, so these do not differ from the no-action alternative. The proposed action also recommends 3 other wilderness areas and 2 wilderness study areas: the Whetstone Recommended Wilderness, the Ku Chish Recommended Wilderness, the Chiricahua-North Addition Recommended Wilderness, Whitmire, and Bunk Robinson are recommended as wilderness study areas. Protected activity centers exist in all three of the newly recommended wilderness areas, as well as the Mount Graham Recommended Wilderness Area, but not in either of the recommended Wilderness Study Areas. Some of the recommended wilderness areas would provide excellent refugia for Mexican spotted owl, especially Ku Chish and Chiricahua Addition North. These areas would need little to no mechanized treatment to reach desired conditions and resiliency to natural phenomena. Mount Graham and Whetstone Recommended Wilderness Areas would be poor refugia. These areas would result in a moderate to high viability risk for the Mexican spotted owl based on the limited ability of the Forest Service to make progress toward the ponderosa pine and mixed-conifer habitat desired conditions and the increased risk of losing these habitat elements to wildfires by having unnaturally high fuel loads in these stands.

Alternative 1 – In addition to incorporating the proposed action, alternative 1 also proposes that 14 additional land parcels (in addition to Mount Graham, Ku Chish, Whetstone, and Chiricahua North Recommended Wilderness Areas) be recommended for wilderness designation. The additional acres (beyond the proposed action) of mixed-conifer forest that may be included under alternative 1 total 1,275 acres within the additional 14 areas proposed. Table 83 lists the acres of recommended wilderness areas within Mexican spotted owl critical habitat.

Some of the additional recommended wilderness areas in alternative 1 would provide excellent refugia for Mexican spotted owl, especially Dragoon. Jhus Canyon would need little to no mechanized treatment to reach desired conditions and resiliency to natural phenomena. Chiricahua Addition West, Tumacacori, and Galiuro Recommended Wilderness Areas would be poor candidates. These areas would result in a moderate to high viability risk for the Mexican spotted owl based on the limited ability of the Forest Service to make progress toward the ponderosa pine and mixed-conifer habitat desired conditions and the increased risk of losing these habitat elements to wildfires by having unnaturally high fuel loads in these stands.

Table 83. Acres of Mexican spotted owl critical habitat within recommended wilderness areas

Potential Wilderness Area	Acres Within Mexican Spotted Owl Critical Habitat
Tumacacori	12,372
Mount Wrightson Addition	10,332
Whetstone	14,250
Ku Chish	24,785
Chiricahua addition-North	6,229
Chiricahua addition-West	1,955
Jhus Canyon	10,078
Winchester	6,982
Galiuro Addition	1,820
Mount Graham Recommended Wilderness Area	50,896
Santa Teresa Addition-North	1,963
Santa Teresa Addition-South	1,368
Total acres	**143,030**

Alternative 2 – This alternative proposes the expansion of the Motorized Recreation Land Use Zone in comparison to the proposed action and alternative 1. Alternative 2 recommends only the Mount Graham Wilderness Study Area for designation; however, management of this and other existing wilderness study areas for wilderness characteristics would continue to restrict the use of mechanized and motorized equipment and vehicles. Effects from this alternative are discussed under designated critical habitat.

Designated Critical Habitat – Designated critical habitat acres would remain the same across all alternatives. Under all alternatives, the Mount Graham Recommended Wilderness Area would burn uncharacteristically severe due to the current stand densities. Alternative 1 would restrict access and vegetation management in recommended wilderness areas causing an increase in stand density, canopy closure, and basal area. This buildup would cause some stands to burn uncharacteristically severe, while some would be maintained through a natural fire regime. Table 84 outlines the trends and determinations by alternative for Mexican spotted owl.

Table 84. Mexican spotted owl population and critical habitat trends, and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive[1]	Negative	Negative
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

ESA = Endangered Species Act

1. This is positive relative to the other alternatives. Alternative 1 is negative because several poor selections of recommended wilderness areas (see text) trump the general benefits of wilderness areas that do not need active management.

Under alternative 2, approximately 20,228 acres of proposed Motorized Recreation Land Use Zone overlap Mexican spotted owl critical habitat. Of this total, only 631 acres are within a vegetation community (Madrean pine-oak) that could have primary constituent elements that would make them suitable Mexican spotted owl habitat. This area could degrade over time and negatively affect primary constituent elements needed for critical habitat. However, most Mexican spotted owl habitat is in small discontinuous areas of less than 30 acres, which lacks protected activity centers and large areas of primary constituent elements. The closest protected activity center is 1 mile away from the Motorized Recreation Land Use Zone in the Santa Rita Ecosystem Management Area and may result in noise disturbance in the protected activity center. As a result, there may be only minor differences between the proposed action and alternative 2 in terms of effects to Mexican spotted owl critical habitat.

Wildland fire is one of the most utilized methods of ecosystem restoration on the Coronado National Forest. The goal of this program is to enhance resiliency of all vegetation communities. Long term, this program will reduce the risk of uncharacteristic fire impacts and improve prey habitat by producing more opens stands with various structural stages. However, in the short term, implementation could result in impacts to foraging habitat through temporary alteration of forest structure and reduced quality of prey habitat. Other potential impacts to Mexican spotted owl critical habitat could result from road construction and maintenance of the Coronado's motorized transportation system, as well as from construction or maintenance of recreation facilities.

The Mexican spotted owl population does not have statistically valid population trend information for the Coronado National Forest and is, therefore, difficult to assess. Endangered Species Act determinations are the same for all alternatives, because standards and guidelines that reduce the effects of vegetation treatments area carried forward, either directly or incorporated by referencing the recovery plan. Under all action alternatives, there are objectives to treat vegetation in Mexican spotted owl habitat.

Western Yellow-billed Cuckoo and Proposed Critical Habitat and Northern Aplomado Falcon (nonessential, experimental population)

Summary of Determinations:

- The implementation of any alternative may render a "may affect, likely to adversely affect" determination for western yellow-billed cuckoo and "not likely to result in destruction or adverse modification" to western yellow-billed cuckoo proposed critical habitat.
- The implementation of any alternative may render a "not likely to jeopardize" determination for northern Aplomado falcon.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management, or land acquisition in any of the alternatives may have short-term effects on aquatic and riparian habitat or species populations, but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

No Action – Under the 1986 forest plan, riparian habitat would move at a slower pace toward desired conditions than the proposed action and the plan does not define desired future conditions or objectives for treating desert communities, or desert grasslands, but there are many standards and guidelines for habitat management, especially for range management in Management Area 4, which contains mitigations for habitat protection. The no-action alternative recognizes the need to restore ecological processes in fire-dependent ecosystems, but it does not provide desired conditions that support these species' foraging habitat and does not include strategic objectives for accomplishing these goals.

Under the no-action alternative, the grassland communities would continue to be departed from desired conditions. According to the 2009 ecological sustainability report, 52 percent of Coronado National Forest grasslands are in a shrub-invaded state (USDA FS 2009b). Vegetation treatments would likely continue in accordance with the limited direction in the 1986 forest plan, which emphasizes treatment for sustained livestock forage, as well as control of shrub invasion.

Proposed Action – The proposed action defines desired conditions based on the current science for riparian and desert communities and provides management objectives and guidelines that would provide a framework for implementing site-specific projects to achieve desired conditions. For western yellow-billed cuckoo, these objectives and guidelines are mostly found in the sections on natural waters and riparian management. For northern Aplomado falcon, the section on range management provides standards and guidelines. For natural waters, guidelines protect surface water quality and quantity, as well as the surrounding vegetation, which provides foraging habitat for adults. Guidelines also provide for the retention of large trees and snags along a riparian corridor; these benefit both riparian species by providing perches and nesting sites. The standards and guidelines under range management provide specifically to alleviate grazing pressure and to provide cover for native species, which also provides for prey species.

Alternative 1 – In addition to incorporating the proposed action, this alternative proposes that 16 land parcels be recommended for wilderness designation. Approximately 20,576 acres, or 12 percent, of the desert communities would be allocated within these proposed wilderness areas, and approximately 932 acres of riparian communities would be designated.

Alternative 2 – Under this alternative, there are additional effects on approximately 31 acres of riparian area included in the proposed Motorized Recreation Land Use Zone. The western yellow-billed cuckoo is a riparian species that can be found across all ecosystem management areas, so there is a potential it could inhabit the area within the 31 acres. The northern Aplomado falcon does not occur in the Motorized Recreation Land Use Zone areas specified by alternative 2; therefore, the effects of alternative 2 on these two species would be the same as those of the proposed action.

Proposed Critical Habitat – Of the 245,000 acres of western yellow-billed cuckoo proposed critical habitat in Arizona, approximately 125 acres occur on the Coronado National Forest in the Santa Rita Ecosystem Management Area within Florida Wash. The Standards and Guidelines in the Coronado land and resource management plan seek to mitigate or prevent impacts on wildlife and plant diversity.

There is plan direction for avoiding riparian effects from roads. Roads can result in removal of riparian vegetation and degradation of watershed function and integrity. Wildland fire has the potential to impact western yellow-billed cuckoo, primarily through changes to habitat from structural changes or loss of nesting structure. The objective of this program area is to restore uplands which would benefit riparian resources in the long-term but could result in effects to riparian habitat through short-term watershed affects such as sedimentation. In general, guidance should assist in minimizing or, under certain circumstances, avoiding adverse effects to proposed western yellow-billed cuckoo critical habitat from prescribed fire management activities. The Coronado provides sustainable livestock grazing. Direct and indirect effects may take place as the result of the implementation of Standards and guidelines pertinent to rangeland management, but overgrazing is not likely to result since grazing only occurs on 18 of the 125 acres of proposed critical habitat on the Coronado National Forest, thus the effects would be insignificant and discountable.

Table 85 and table 86 outline the trends and determinations by alternative for western yellow-billed cuckoo and northern Aplomado falcon.

Table 85. Western yellow-billed cuckoo trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Proposed Critical habitat determination	Not likely to result in destruction or adverse modification	Not likely to result in destruction or adverse modification	Not likely to result in destruction or adverse modification	Not likely to result in destruction or adverse modification

ESA = Endangered Species Act

Table 86. Northern Aplomado falcon (nonessential, experimental population) trends by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	Not likely to jeopardize	Not likely to jeopardize	Not likely to jeopardize	Not likely to jeopardize
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

Sonora Tiger Salamander, Chiricahua Leopard Frog and Critical Habitat, New Mexico Ridged-nosed Rattlesnake, and Northern Mexican Gartersnake and Proposed Critical Habitat

Summary of Determinations:

- The implementation of any alternative would result in a "may affect, likely to adversely affect" determination for Sonora tiger salamander.
- The implementation of any alternative would result in a "may affect, likely to adversely affect" determination for Chiricahua leopard frog and for Chiricahua leopard frog critical habitat.
- The implementation of any alternative would result in a "may affect, likely to adversely affect" determination for New Mexico ridged-nosed rattlesnake.
- The implementation of any alternative would result in a "may affect, likely to adversely affect" determination for northern Mexican gartersnake and a "not likely to result in destruction or adverse modification" for northern Mexican gartersnake proposed critical habitat.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments; recreation management; watershed management; wildlife, fish, or rare plants management; or land acquisition in any of the alternatives may have short-term effects on habitat or species populations but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

The habitat trend varies across all alternatives for the Sonora tiger salamander, Chiricahua leopard frog, and northern Mexican gartersnake, even though there are objectives, standards, and guidelines targeting these aquatic-associated species. This is because the habitat needs for the species is more

complex than simply the vegetation community or presence of water; it also includes water quantity and quality, hydrology, species that co-occur, climate, geomorphic features, diseases present, and many other factors ("habitat" is all of the environmental parameters the species needs to persist). The outlook from climate change and water needs by society suggests surface water will always be a rare and threatened resource for these species.

No Action – Under this alternative, riparian habitat would move at a slower pace toward desired conditions than the proposed action. With such small quantities of riparian habitat across the Coronado National Forest, there is a guideline in the no-action alternative for establishing one stock tank per mile. This density of livestock waters can be detrimental to native aquatic species because it allows for potential spread of nonnative species (especially American bullfrog, warmwater fishes, and northern crayfish). Leopard frogs and tiger salamanders have been able to occupy and breed in stock tanks, but often populations cannot persist as well as they do in high quality natural situations. Northern Mexican gartersnakes are typically present in more natural situations or stock waters that have certain "natural" characteristics and lack invasive predators. Runoff, sedimentation, and loss of riparian vegetation from recreation use are problems that are not adequately addressed under current management direction. These factors degrade the quality of the existing and potential aquatic and riparian habitat for threatened and endangered species.

The Sonora tiger salamander ("Huachuca tiger salamander") is a management indicator species under the 1986 forest plan, and is referenced in the plan, but there is little direction on managing for this species. This species was to have "appropriate habitat components" measured in the monitoring plan. This was done through annual surveys by Arizona Game and Fish Department.

Under the no-action alternative, upland watershed projects would continue under the direction of the 1986 forest plan. Riparian-specific projects would be conducted as opportunities are presented, and best management practices as described in Forest Service Handbook 2509.22 would be implemented to minimize alteration of riparian areas. This would result in continued movement of riparian area conditions toward desired conditions across the Coronado, with isolated areas of static or downward trends where opportunities to make changes are not available.

Proposed Action – The proposed action recommends four wilderness areas and two wilderness study areas. These are the Whetstone, Mount Graham, Ku Chish and the Chiricahua North Addition Recommended Wilderness, and the Whitmire and Bunk Robinson Wilderness Study Areas. The Sonora tiger salamander and northern Mexican gartersnake probably do not occur in any of the recommended wilderness areas and so effects to them are discountable.

The Peloncillo Mountains, in which two wilderness study areas are recommended (Whitmire and Bunk Robinson Wilderness Study Areas), is the only mountain range in the Coronado National Forest in which the New Mexico ridge-nosed rattlesnake occurs. Chiricahua leopard frogs are also likely present in the Bunk Whitmire Wilderness Study Area, as there are recent records from the vicinity. These areas have both burned in the recent past and thus are good candidates to be managed through natural processes. Designating these areas as wilderness study areas will also help protect habitat for these species.

The proposed action provides guidelines and standards for aquatic species including the Chiricahua leopard frog, Sonora tiger salamander, and northern Mexican gartersnake in the sections on natural waters, riparian management, and range management. These guidelines protect surface water quality and quantity, as well as the surrounding vegetation and bank vegetation, which provides foraging, shade and hibernacula habitat. Range management standards provide stock pond guidance for Chiricahua leopard frogs and other species, because most leopard frog and Sonora tiger salamander localities are now in stock ponds, rather than natural waters. Wildland fire may result in short-term impacts to these species and their habitat; however, the objective of the program is to restore uplands,

which would benefit aquatic resources. Overall, these plan components address the threats related to availability of high-quality water and loss of habitat quality that could further imperil aquatic species.

Some additional guidelines address the threat of invasive species or site-specific management in areas where these species are known to occur. Chiricahua leopard frogs are found in several areas that have inherent protections by their designation—such as the Goodding Research Natural Area, a natural water system that harbors the heart of the Sycamore Canyon metapopulation. Sonora tiger salamanders are found in the Huachuca Ecosystem Management Area, so the site-specific guidelines for this area also protect habitat for this species. These plan components support the recovery of the species associated with these sites.

The threat of chytridiomycosis and maintaining water quantity in the face of climate change are outside the Forest Service's management capability, so no components directly address these threats in a species-specific way. There is a potential population of Sonora tiger salamander in Scotia Canyon that may have genetic issues because of hybridization or they may be nonnative to the site. There are no plan components for genetic problems.

The proposed action defines desired conditions based on the current science for desert communities and provides management objectives and guidelines that would provide a framework for implementing site-specific projects to achieve desired conditions for species such as New Mexico ridge-nosed rattlesnake.

Alternative 1 – Alternative 1 incorporates all the components of the proposed action with the addition of 12 additional recommended wilderness areas. The Sonora tiger salamander and northern Mexican gartersnake probably do not occur in any of the recommended wilderness areas and so effects to them from alternative 1 would be the same as the proposed action. The New Mexico ridge-nosed rattlesnake may occur in the Whitmire and Bunk Robinson Wilderness Study Areas.

The consequences of implementing alternative 1 would include those listed for the proposed action along with an additional 346 acres of habitat for Chiricahua leopard frogs associated within 9 of the recommended wilderness areas. Chiricahua leopard frogs were extirpated from the entire Chiricahua Ecosystem Management Area (the type locality for the species), but have been reintroduced on the east side of the range. Future reintroductions of the west side of the range would be impacted by the recommended wilderness in the Chiricahua Ecosystem Management Area. The Tumacacori Recommended Wilderness, where Chiricahua leopard frogs may occur because of its proximity to the Coronado National Forest's largest metapopulation, is not in a condition that would allow it to sustain natural processes, particularly fire, and so its recommendation may pose a threat to Chiricahua leopard frogs if they are present. They are also likely present in or near the Galiuro Addition Recommended Wilderness, which has the same issue. It is possible they currently occupy other recommended wilderness areas in the elevational and distributional range, but there is not enough information to determine potential effects to these populations. All of the recommended wilderness areas are currently grazed and would continue to be grazed under alternative 1. The need for watershed or riparian improvement or restoration projects—whether for management of grazing, fuels, recreation, or other purposes—would be evaluated on a site-specific basis and, if possible, would be accomplished within the constraints that apply to wilderness areas, such as no mechanized or motorized equipment.

Approximately 20,576 acres, or 12 percent, of the desert communities would be allocated in these proposed wilderness areas, although it is unknown how many acres of suitable habitat exist for New Mexico ridge-nosed rattlesnake. The Whitmire and Bunk Robinson Wilderness Study Areas may benefit the rattlesnake by reducing risk of direct mortality from motorists.

Alternative 2 – Under this alternative, there are additional effects on approximately 31 acres of riparian area included in the proposed Motorized Recreation Land Use Zone. There is a potential for

off-highway vehicle trails and other facilities to be built in riparian areas in support of motorized recreation, which would result in a net loss of this community on the Coronado. Chiricahua leopard frogs occur in the vicinity of the Motorized Recreation Land Use Zones of the northern Santa Rita Mountains. On the other hand, an officially designated land use zone for motorized recreation could direct off-road activities to the land use zone and away from other riparian areas that are currently being used, in some cases with significant effects on riparian vegetation, animals, soils, and channel morphology.

There are no proposed Motorized Recreation Land Use Zones in the Peloncillo Mountains, thus New Mexico ridge-nosed rattlesnake will experience the same effects from alternative 2 as from the proposed action.

The determination for the no-action alternative for Sonora tiger salamander is “may affect, likely to adversely affect” because there are virtually no forest plan components in the 1986 forest plan addressing this species or its habitat and threats. In the no-action alternative, stock tank management is limited to use by cattle for drinking, rather than persistence of native aquatic fauna and structure that supports wildlife use. However, in the action alternatives, there are numerous objectives for restoration of upland habitats (primarily grassland) and conservation of Sonora tiger salamander through guidelines, including a recovery plan. There are also mitigations to protect populations from the largest threat, invasive species. In alternative 2 there is no guidance for climate change, and the Motorized Recreation Land Use Zone has the potential to adversely affect 65 acres. Table 87 outlines the trends and determinations by alternative for Sonora tiger salamander.

Table 87. Sonora tiger salamander trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive	Positive	Negative
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

* The no-action alternative is “likely to adversely affect” because there are no components in the 1986 forest plan addressing this species or its habitat and threats.

Chiricahua leopard frog populations have been extremely dynamic. There was a huge decline from historic records, but in recent years, most remaining populations have been relatively stable, expanding and collapsing in response to environmental factors (rain, disease). Chiricahua leopard frogs occur across a broad range of habitats and are widely distributed across the Coronado National Forest. Thus, even though there are mitigations (guidelines and standards) in place to offset effects of the activities, the effects associated with them are less predictable and more likely to affect populations. Activities that have occurred under the no-action alternative are likely to be very similar to those under the action alternatives. Under the 1986 forest plan, leopard frog populations have declined precipitously since historic conditions. Some of the reasons for declines were due to factors beyond control of the Forest Service (chytridiomycosis and drought), whereas some activities are due to Forest Service management strategies, such as wildfire use and livestock grazing. As a result, there is no difference between alternatives in how they might contribute toward listing for the species (table 88).

Designated Critical Habitat – Designated critical habitat acres for the Chiricahua leopard frog would remain the same across all alternatives. The Standards and Guidelines in the proposed action of the Coronado land and resource management plan seek to mitigate or prevent impacts on wildlife and plant diversity. Some plan direction seeks to avoid riparian effects from roads. In general, guidance should assist in minimizing or, under certain circumstances, avoiding adverse effects to Chiricahua leopard frog critical habitat from management activities. The Coronado seeks to provide sustainable livestock grazing and maintain or improve riparian and watershed conditions. Direct and indirect effects, may take place as the result of the implementation of standards and guidelines pertinent to rangeland management, but overgrazing is not likely to result. Potential negative effects exist from wildland fire, grazing, herbicide use for invasive species management, sale of forest products, minerals management, roads, and recreational users. Effects from these programs include degradation of water quality from sedimentation, trampling of riparian and streambank vegetation, presence of herbicide in aquatic systems and dewatering of the aquifer. Table 88 outlines the trends and determinations by alternative for Chiricahua leopard frog.

Table 88. Chiricahua leopard frog and critical habitat trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive	Negative	Negative
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

ESA = Endangered Species Act

The New Mexico ridged-nosed rattlesnake population status is unknown at this time. The Peloncillo population of New Mexico ridged-nosed rattlesnake is one of three known populations; the privately owned Animas Mountains, New Mexico and Sierra San Luis Mountains, Mexico contain the other two populations. Multiple lines of evidence suggest an exceptionally small population occurs in the Peloncillo Mountains, and the Peloncillo population tested positive for genetic bottlenecks in several statistical tests (USDA FS 2011).

New Mexico ridged-nosed rattlesnake habitat in the Peloncillo Mountains improved in 2008 when the Whitmire Fire burned through part of three polygons of core habitat. Preliminary analysis indicated that the fire effects were low, and the upper canopy in the core habitat polygons was not impacted. Fuel loading creates an altered fire regime, which leads to hot fires that destroy woodlands and are a serious threat to the New Mexico ridged-nosed rattlesnake and its habitat (USDA FS 2011). Conducting prescribed fires or managing natural fires under the action alternatives will reduce the threat of hot fires, which is reflected in table 89.

Because the Peloncillo Mountains are more accessible to the public than the Animas and Sierra San Luis Mountain ranges, illegal collection and other human activities are potentially more important threats than elsewhere in the range of the New Mexico ridged-nosed rattlesnake. The current Coronado forest plan standards and guidelines restrict the use of motorized vehicles to existing trails and roadways, and other roads are closed, adverse effects from poaching and direct killing by motor vehicles could occur (USDA FS 2011).

Grazing within the Peloncillo Mountains, and specifically in Management Area 4, where the New Mexico ridged-nosed rattlesnake is currently known to occur, is primarily managed at forage use levels and requires higher density water developments and interior fencing. Loss of groundcover may

cause snakes to move less during foraging or mating, as well as increasing their risk of predation (USDA FS 2011). Table 89 outlines the trends and determinations by alternative for New Mexico ridge-nosed rattlesnake.

Table 89. New Mexico ridged-nosed rattlesnake trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

The northern Mexican gartersnake was historically much more widespread that it currently is, having occurred in several of our ecosystem management areas where there was surface water and native frogs and fishes. However, as a result of surface water loss through diversion and pumping, loss in prey (especially leopard frogs and native fishes), and an increase in predators (particularly American bullfrog), populations have plummeted. The only recent (within the past 10 years) records on the Coronado National Forest are from Scotia Canyon (one individual seen in recent years), Redrock Canyon (one individual seen in recent years), Brown Canyon (one individual), and Canelo Hills (which still has a population). It is also possible that there are low-density populations in Parker Canyon (last record was from 1986) and Bear Canyon (last record was from 1987). All of these Coronado National Forest sites are in the Huachuca Ecosystem Management Area. This species is close to being extirpated from the Coronado and possibly throughout its entire U.S. range (status of populations in Mexico are poorly known). In order for the negative trend to be reversed, the significant threats must be mitigated: populations must be enhanced, native prey base must be restored (which are plagued by high morbidity invasive diseases), invasive species must be controlled, and surface water must be retained in natural water systems. Much of this is beyond National Forest System control and authority. The forest plan components help mitigate many of the land management threats, but these are not enough to address problems facing the populations themselves, prey base, and climate change.

In table 90, habitat trend is negative across all alternatives, even though there are objectives, standards, and guidelines targeting this and other aquatic-associated species. This is because the habitat needs for the species is more complex than simply the vegetation community or presence of water; it also includes water quantity and quality, hydrology, species that co-occur, climate, geomorphic features, diseases present, and many other factors (“habitat” is all of the environmental parameters the species needs to persist). This is an example where the species may not be able to maintain viable populations on the Coronado National Forest, but it still meets population viability requirements because the plan components are the actions the Forest Service has authority to manage for. Survival of the species (at least in the U.S.) will take a concerted effort by several agencies and nongovernment organizations addressing the various threats. This is mentioned in the “Management Approaches” sections of the revised forest plan.

Proposed Critical Habitat – Proposed critical habitat acres for the northern Mexican gartersnake would remain the same across all alternatives. The Standards and guidelines in the proposed action of the Coronado land and resource management plan seek to mitigate or prevent impacts on wildlife and plant diversity. Some plan direction seeks to avoid riparian effects from roads. In general, guidance should assist in minimizing or, under certain circumstances, avoiding adverse effects to proposed

northern Mexican gartersnake critical habitat from management activities. The Coronado seeks to provide sustainable livestock grazing and maintain or improve riparian and watershed conditions. Direct and indirect effects, may take place as the result of the implementation of standards and guidelines pertinent to rangeland management, but overgrazing is not likely to result. Potential negative effects exist from wildland fire, grazing, herbicide use for invasive species management, sale of forest products, minerals management, roads, and recreational users. Effects from these programs include degradation of water quality from sedimentation, trampling of riparian and streambank vegetation, presence of herbicide in aquatic systems and dewatering of the aquifer.

Table 90 outlines the trends and determinations by alternative for northern Mexican gartersnake.

Table 90. Northern Mexican gartersnake trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Negative	Negative	Negative	Negative
Habitat trend	Negative	Negative	Negative	Negative
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Proposed Critical habitat determination	Not likely to result in destruction or adverse modification	Not likely to result in destruction or adverse modification	Not likely to result in destruction or adverse modification	Not likely to result in destruction or adverse modification

ESA = Endangered Species Act

Gila Chub and Critical Habitat, Yaqui Chub, Yaqui Catfish, Gila Topminnow, Sonora Chub and Critical Habitat, Desert Pupfish, Gila Trout, Apache Trout, Spikedace and Critical Habitat, Loach Minnow and Critical Habitat, Roundtail Chub

Summary of Determinations:

- Implementation of any alternative would result in a “may affect, likely to adversely affect” determination for Gila chub, Yaqui catfish and Sonora chub, and for Gila chub and Sonora chub critical habitat.
- Implementation of any alternative would result in a “may affect, likely to adversely affect” determination for Yaqui chub, Gila topminnow, desert pupfish, Gila trout, spikedace, loach minnow, and roundtail chub.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management, or land acquisition in any of the alternatives may have short-term effects on aquatic and riparian habitat or species populations, but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

No Action – The no-action alternative does little to address native fish populations. The only plan content related to stream habitat conditions does not distinguish between native fish habitat and sport fish. It does have management for riparian resources that is adequate to support habitat for a diversity of species and which would not result in the loss of riparian habitat extent (see “Riparian Areas” section for more information). Under this alternative, most fish and frog populations have decreased dramatically, but there are a few streams where Gila chub and Sonora chub are doing well and have actually thrived the past several years. Based on the analysis of the effects on the aquatic habitat, it was determined that this alternative would maintain species viability on the Coronado National Forest, but would not increase trends in individual species populations.

For watersheds affected by historic mining, grazing, hydrologic modification (channelization), pesticide use, recreation, motor vehicle travel, and agriculture, actions to correct these situations would continue at the current rate under the no-action alternative, which may result in continued violations of water quality into the future (see "Water Resources" for more information). Management actions under this alternative would cause no change to habitat quantity or distribution, and habitat quality would continue to improve slowly. Thus, populations of Gila chub, Yaqui chub, Yaqui catfish, Gila topminnow, Sonora chub, desert pupfish, Gila trout, Apache trout, spikedace, loach minnow, and roundtail chub would be expected to be maintained at current levels.

Gila chub, Sonora chub, Gila topminnow, and spikedace are management indicator species under the 1986 forest plan, but there is little guidance on managing for these species or the waters they occur in. These species were to have "appropriate habitat components" measured in the monitoring plan. This was done via surveys by Arizona Game and Fish Department, which focused on population size and localities but also habitat condition.

To decrease risk to the Gila trout on Mount Graham in the Pinaleño Mountains from road sedimentation, a forestwide standard and guideline (2025) under the recreation program was put in place during 2010 that prohibits motor vehicle use (cross-country travel) off the designated system of roads, trails, and areas except as identified on motor vehicle use maps.

Proposed Action – The proposed action recommends the addition of 4 wilderness areas and 2 wilderness study areas. These are the Mount Graham, Ku Chish, Chiricahua North Addition and Whetstone Recommended Wilderness and the Whitmire and Bunk Robinson Wilderness Study Areas. As a recommended wilderness areas, these areas would provide another layer of protection; however, in the Mount Graham and Whetstone Recommended Wilderness Areas, the ponderosa pine and mixed-conifer habitat are highly departed from desired conditions and thus at increased risk of wildfires due to unnaturally high fuel loads. These effects include increased runoff of floodwaters, deposition of debris and sediment originating from the burned area.

Other potential effects from implementing the proposed action include adverse effects from use of herbicides and pesticides for treatment of invasive plants, mineral extraction, roads, recreation, and grazing activities. These effects include habitat loss and fragmentation, increased sedimentation, floodplain and streambank vegetation removal, reduction of cover and exposure of soil to erosion and dewatering of the aquifer.

However, under this alternative, fine-filter plan components (table 71) include recovery plans for Gila chub (draft recovery plan),Yaqui chub, Yaqui catfish, Gila topminnow, Sonora chub, desert pupfish, Gila trout, Apache trout, spikedace, loach minnow and roundtail chub. All species are addressed by components to control of invasive species that could decimate populations, which has happened in most of the historic drainages. There are also components that address retaining high water quality and protecting pools from the threat of intense wildfire. Sedimentation into streams is a huge potential threat that can extirpate entire drainages, as happened with Sabino Canyon following the fire. There are many plan components that deal with upland habitat management and reduce the risk of uncharacteristic fire (see "Vegetation Communities" for more information). Therefore, the proposed action alternative better addresses the threats to these species from management in the surrounding uplands.

The development of springs and implementation of stream restoration projects, to provide aquatic habitat and restore proper functioning condition, would result in improved habitat quantity and quality for plant and/or animal species associated with them. This is particularly important for protecting species from the impacts of climate change and from the effects of uncharacteristic fire in their watershed.

Alternative 1 – Alternative 1 incorporates all the components of the proposed action with the addition of 12 additional recommended wilderness areas (beyond the 4 recommended in the proposed action). Management of these lands would be dominated by natural processes and mechanized and motorized uses would occur on a limited basis for management purposes only and would not be permitted to permanently alter the landscape. Under this alternative, terrestrial habitats would benefit from the increase in unaltered landscapes except for where the area's management as a recommended wilderness would increase the risk of uncharacteristic fire. Areas already in a condition that would allow fire to play its natural role on the landscape would allow large tracts of land to become refugia for individual species survival.

The headwaters of Sycamore Creek lie within the boundaries of Tumacacori Recommended Wilderness Area. As a recommended wilderness area, this area would provide another layer of protection to the Sonora chub within Sycamore Canyon, but upland habitats are outside the range of historic variability and its recommendation could increase the risk of uncharacteristic fire. However, part of the Tumacacori Recommended Wilderness Area burned in 2011 and 2016 and ash was transported into Sycamore Canyon. The fish and frog populations seem to be doing well, and the fire "treated" some of the upland vegetation. So it is possible that the risk to these species is not as great as some others.

Alternative 2 – Under this alternative there are additional effects on approximately 31 acres of riparian area included in the proposed Motorized Recreation Land Use Zone. None of the Motorized Recreation Land Use Zones would affect any of these species, so the effects would be identical to the proposed action.

Designated Critical Habitat – Designated critical habitat acres would remain the same across all alternatives. Designated critical habitat exists on the Coronado for Gila chub and Sonora chub. Yaqui catfish, desert pupfish, spikedace and loach minnow all have designated critical habitat, but it does not occur on the Coronado. Implementation of any alternative would result in a "may affect, likely to adversely affect" determination for critical habitat for both the Gila chub and Sonora chub. The standards and guidelines in the Coronado land and resource management plan seek to mitigate or prevent impacts on wildlife and plant diversity. Some plan direction seeks to avoid riparian effects from roads. In general, guidance should assist in minimizing or, under certain circumstances, avoiding adverse effects to Gila chub and Sonora chub critical habitat from management activities. The Coronado seeks to provide sustainable livestock grazing and maintain or improve riparian and watershed conditions. Direct and indirect effects, may take place as the result of the implementation of standards and guidelines pertinent to rangeland management, but overgrazing is not likely to result. Potential negative effects exist from wildland fire, grazing, herbicide use for invasive species management, sale of forest products, minerals management, roads, and recreational users. Effects from these programs include degradation of water quality from sedimentation, trampling of riparian and streambank vegetation, presence of herbicide in aquatic systems and dewatering of the aquifer.

The Gila chub population trend is reflected in pre- and post-Aspen Fire Sabino Creek conditions, where the species is currently doing well. Determinations are based on recent, past consultation, and the fact that Sabino Canyon receives much recreational use and maintenance. Plus, there should be no differences in alternatives related to Sabino Canyon and other locations. There is much human activity in Sabino Canyon and the potential for excessive sedimentation or scouring exists, partly based on management in upland habitats; hence, the "likely to adversely affect" determination (table 91). The reason the determinations are the same for all action alternatives is because there are no differences in management proposed for this area. In the case of the Coronado National Forest, the loss of any robust population would result in loss of population viability for this species, but the loss of a few individuals due to management actions would result in an adverse effect determination, but not the loss of population viability. Table 91 outlines the trends and determinations by alternative for Gila chub.

Table 91. Gila chub trends and critical habitat and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Stable	Stable	Stable	Stable
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

ESA = Endangered Species Act

The only Yaqui chub population on the Coronado National Forest does well in some years and poor in others. There is no guidance on managing for Yaqui chub in the no-action alternative, while there are several guidelines that address threats in the action alternatives, and the plan components are all the same. In addition, the action alternatives manage the overall riparian and aquatic habitat better than the no-action alternative. There are no differences in management of lands where the species occurs in the action alternatives. Table 92 outlines the trends and determinations by alternative for Yaqui chub.

Table 92. Yaqui chub trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Dynamic	Dynamic	Dynamic	Dynamic
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

The Yaqui catfish population trend is based on unknown plans to reestablish extirpated populations, which would occur in all alternatives. Recently, the Southwestern Region completed consultation on all of the forest plans in Arizona and New Mexico. Neither the Yaqui catfish nor its critical habitat occur on the Coronado; however, downstream effects from management activities are possible to the species. Table 93 outlines the trends and determinations by alternative for Yaqui catfish.

Table 93. Yaqui catfish trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

The Gila topminnow population trend is based on a recently reintroduced population in Sabino Canyon in the Santa Catalina Mountains and a recently discovered population in Parker Canyon in the Huachuca Mountains. In addition, they have been documented in O'Donnell, and Redrock Canyons in the Huachuca Ecosystem Management Area. Table 94 outlines the trends and determinations by alternative for Gila topminnow.

Table 94. Gila topminnow trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Positive	Positive	Positive	Positive
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

Sonora chub population trend is based on continued occupancy of pools in Sycamore Canyon. The no-action alternative does little to address Sonora chub. However, all of the action alternatives have plan components, which include three objectives to protect habitat for aquatic species, as well as several guidelines and standards not found in the no-action alternative. The Sonora chub population has always appeared to be stable, even when confronted with a large population of American bullfrogs, which are currently eradicated or managed to a very low number and after large-scale fires upstream in 2011 and 2016. Therefore, the action alternatives would better provide for the viability of the species on the Coronado National Forest. Table 95 outlines the trends and determinations by alternative for Sonora chub.

Table 95. Sonora chub trends and critical habitat and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Stable	Stable	Stable	Stable
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

ESA = Endangered Species Act

The desert pupfish population trend is based on unknown plans to reestablish extirpated populations, which would occur in all alternatives. Neither the desert pupfish nor its critical habitat occur on the Coronado. The nearest known occurrences of this species to the Coronado, downstream from the Santa Rita Ecosystem Management Area on the Las Cienegas National Conservation Area (USDA FS 2016). The only critical habitat for this species in Arizona occurs on the Organ Pipe Cactus National Monument. Table 96 outlines the trends and determinations by alternative for desert pupfish.

Table 96. Desert pupfish trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

ESA = Endangered Species Act; NA = not applicable

Currently, there is one population of Gila trout on the Coronado. Frye Creek, in the Pinaleño Mountains, was stocked in October 2009 with 500 Gila trout of the South Diamond lineage, and in February of 2011, a supplemental stocking of Gila trout was completed. Other Coronado National Forest potential recovery streams, now occupied by Apache trout, may have some risk from road systems. However, roads are limited on Mount Graham in the Pinaleño Mountains where these streams are located. Motor vehicle use (cross-country travel) is prohibited off the designated system of roads, trails, and areas except as identified on motor vehicle use maps. Authorized livestock use has decreased on the Coronado. The Coronado has restrictions in place on grazing in the vicinity of the current Apache trout populations in the Pinaleño Mountains. Those streams have been proposed to become Gila trout streams sometime in the future. The Coronado, in cooperation with the Arizona Game and Fish Department and U.S. Fish and Wildlife Service, has completed nonnative salmonid removal and established new Gila trout populations. There are standards and guidelines that support conservation and recovery of Gila trout. Table 97 outlines the trends and determinations by alternative for Gila trout.

Table 97. Gila trout trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Stable	Stable	Stable	Stable
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

The Apache trout is a nonnative species and was introduced as part of its recovery plan many years ago, but they hybridized with other nonnative trout (especially rainbow trout). On the north side of the Pinaleño Mountains, four creeks (Ash, Frye, Deadman, and Marijilda) have at some point contained hybridized populations of Apache trout (USDA FS 2015). All the hybridized Apache trout have been chemically removed from Ash Creek. In 2004, post-fire flooding from the Nuttall Fire eliminated all of the hybridized Apache trout from Frye Creek, and most of the hybridized fish from Marijilda and Deadman creeks. The trout in these creeks, along with Grant Creek and Big Creek (a tributary of Grant Creek) on the south side, were evaluated for genetic purity in 1998 (Grant and Big creeks were retested in 2013). Only the population in Grant and Big Creeks were found to be genetically pure, so the effects analysis that follows is directed only toward the population in these two creeks. Table 98 outlines the trends and determinations by alternative for Apache trout.

Table 98. Apache trout trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

The spikedace population trend is based on unknown plans to reestablish extirpated populations, which would occur in all alternatives. Neither the spikedace nor its critical habitat occur on the Coronado; however, downstream effects from management activities are possible. Table 99 outlines the trends and determinations by alternative for spikedace.

Table 99. Spikedace trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

ESA = Endangered Species Act

The loach minnow population trend is based on unknown plans to reestablish extirpated populations, which would occur in all alternatives. Neither the loach minnow nor its critical habitat occur on the Coronado; however, downstream effects from management activities are possible. Table 100 outlines the trends and determinations by alternative for loach minnow.

Table 100. Loach minnow trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

ESA = Endangered Species Act

The roundtail chub population trend is based on unknown plans to reestablish extirpated populations, which would occur in all alternatives. The roundtail does not occur on the Coronado; however, downstream effects to this species from management activities are possible. Table 101 outlines the trends and determinations by alternative for roundtail chub.

Table 101. Roundtail chub trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Positive	Positive	Positive	Positive
ESA determination	Not likely to jeopardize	Not likely to jeopardize	Not likely to jeopardize	Not likely to jeopardize

ESA = Endangered Species Act; NA = not applicable

Pima Pineapple Cactus

This species is typically found in the desert to grassland ecotone, but plan components only target "pure" habitat elements, making management species- and site-specific. The Pima pineapple cactus population trend is based on survey reports (table 102). Habitat trend of action alternatives is difficult to predict because there are no objectives targeting occupied area and, historically, the occupied area has not been treated because it is desert, it is occupied by this species, or both.

Summary of Determinations:

Implementation of any alternative may render a "may affect, likely to adversely affect" determination for Pima pineapple cactus.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management, or land acquisition in any of the alternatives may have short-term effects on habitat or species populations but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

No Action – There is no guidance in the 1986 forest plan on how to address the effects and threats of invasive species, including the unique problems associated with controlling the spread of invasive species such as Lehman's lovegrass and bufflegrass, which increase the likelihood of uncharacteristic fire. While invasive species treatments have occurred under the 1986 forest plan, direction is lacking, inhibiting the ability of the Coronado National Forest to move this community toward desired conditions. Additionally, the 1986 forest plan promotes the use of fire to improve grassland habitat for livestock but does not require mitigation for the Pima pineapple cactus. Management under the direction of the 1986 plan may change the composition of desert ecosystems sufficiently to result in reduced acreage on the Coronado.

Proposed Action – The proposed action defines desired conditions based on the current science for desert and grassland communities and provides management objectives and guidelines that would provide a framework for implementing site-specific projects to achieve desired conditions. Forest plan components would guide management to treat 1,000 to 1,500 acres of buffelgrass invasion annually using chemicals and hand pulling to decrease the spread of this invasive species. Every 10 years, the plan stipulates treating at least 72,500 acres of grasslands using wildland fire (planned and unplanned ignitions), thinning, and mastication.

This species is known to occur within the Santa Rita and Huachuca Ecosystem Management Areas. Additional plan components within the Santa Rita and Huachuca Ecosystem Management Areas

would guide management activities involving ground disturbance and/or vegetation management to incorporate site-specific design features to benefit habitat for, or mitigate impacts to, rare plant populations. None of the recommended wilderness in the proposed action overlaps with Pima pineapple cactus habitat.

Alternative 1 – In addition to incorporating the proposed action, this alternative proposes that 16 land parcels be recommended for wilderness designation. Approximately 20,576 acres, or 12 percent, of the desert communities would be allocated within these proposed wilderness areas, although it is unknown on how many acres Pima pineapple cactus occurs.

Alternative 2 – The Pima pineapple cactus does not occur in any area with additional Motorized Recreation Land Use Zone and so the effects of this alternative are the same as the proposed action. Table 102 outlines the trends and determinations by alternative for Pima pineapple cactus.

Table 102. Pima pineapple cactus trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Negative	Negative	Negative	Negative
Habitat trend	Negative	Unknown	Unknown	Unknown
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

Huachuca Water Umbel and Critical Habitat

Summary of Determinations:

The implementation of any alternative may render a “may affect, likely to adversely affect” determination for Huachuca water umbel and Huachuca water umbel critical habitat.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management, or land acquisition in any of the alternatives may have short-term effects on aquatic and riparian habitat or species populations, but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

No Action – The Huachuca water umbel is not specifically addressed in the 1986 forest plan, but riparian habitat is protected from activities in several plan components. There are also management areas that address the sensitivity of important riparian areas (including perennial streams, an aquatic feature). This plant is actually aquatic (growing in standing water) to riparian (adjacent to surface water), and aquatic habitats outside of the management areas are generally lacking. Also, surface water discussions mostly focus on stock tanks, which can divert water from natural watercourses. Generally, stock tanks do not provide habitat for Huachuca water umbel, whereas natural watercourses do.

Proposed Action – The proposed action offers the following plan components that could benefit this species:

- Apply for at least 10 instream flow water rights on streams for recreation and wildlife purposes, prioritizing locations necessary for sustaining native fish populations.
- Treat 2,500 to 10,000 acres of uplands with vegetation treatments or soil and watershed restoration treatments to maintain watershed stability and, thereby, the structure and function of streams, flood plains, and riparian vegetation.
- Restore native vegetation and natural water flow patterns on at least 10 wetland sites within 10 years of forest plan approval.

This species is known to occur within the Huachuca Ecosystem Management Area. An additional plan component within the Huachuca Ecosystem Management Area would guide management activities involving ground disturbance and/or vegetation management to incorporate site-specific design features to benefit habitat for, or mitigate impacts to, rare plant populations.

Effects that may result from implementing the proposed action include increased runoff of floodwaters, deposition of debris and sedimentation of water channels from wildland fire. Use of herbicides and pesticides to treat invasive species can have an adverse effect on aquatic species, including the Huachuca water umbel. Livestock grazing can result in trampling of plants and changing riparian and aquatic conditions; however, this species currently successfully coexists with grazing in Bear Canyon in the Huachuca Mountains.

Alternative 1 – None of the recommended wilderness areas occur in the range of the Huachuca water umbel, so effects of this alternative are comparable to the proposed action for this species.

Alternative 2 – The Huachuca water umbel is not affected by any of the Motorized Recreation Land Use Zones in this alternative, so effects of this alternative are comparable to the proposed action.

Designated Critical Habitat – Designated critical habitat acres would remain the same across all alternatives. The discussions in the previous section for effects to the species also apply to critical habitat. Primary constituent elements of critical habitat also include sufficient baseflow, healthy stream channels, and maintenance of riparian vegetation. All of the program areas mentioned above also similarly affect the primary constituent elements of the critical habitat units for the Coronado National Forest.

The status of Huachuca water umbel populations is not well documented, but the species is known to be surviving. New populations have recently been discovered, suggesting populations are somewhat stable. However, all aquatic species are threatened by drought and other factors. Table 103 outlines the trends and determinations by alternative for Huachuca water umbel.

Table 103. Huachuca water umbel trends and determinations, by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect
Critical habitat determination	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect	May affect, likely to adversely affect

ESA = Endangered Species Act

Canelo Hills Ladies' Tresses

Summary of Determinations:

Because there is only one location where this species occurs on the Coronado National Forest, and that area is protected by a fence and excluded from livestock grazing, the implementation of any alternative may render a "may affect, not likely to adversely affect" determination for Canelo Hills ladies' tresses.

Effects Common to All Alternatives – The implementation of plan components related to vegetation treatments, recreation management, watershed management, wildlife, fish, or rare plants management, or land acquisition in any of the alternatives may have short-term effects on aquatic and riparian habitat or species populations but would produce long-term benefits to the maintenance and improvement of habitats and species populations on the Coronado National Forest.

No Action – The Canelo Hills ladies' tresses is not specifically addressed in the 1986 forest plan, but riparian habitat is protected from activities in several plan components. There are also management areas that address the sensitivity of important riparian areas.

Proposed Action – Canelo Hills ladies' tresses occur in cienegas, none of which fall within recommended wilderness areas in the proposed action. These rare wetlands are protected by several plan components:

- MTS-G-3: New road construction in riparian areas should be avoided, except to cross, unless alternate routes are physically or financially infeasible or have greater overall resource impacts. If these activities are unavoidable, they should be designed and implemented to minimize effects to natural water flow and native vegetation communities.
- MTS-G-2: New road construction in meadows and wetlands should be avoided where physically or financially feasible. If these activities are unavoidable, they should be designed and implemented to minimize effects to water flow, wetland recharge, and ecosystem function.
- NWS-G-2: Water quality, quantity, and habitat features at natural springs and seeps should be protected or enhanced.
- NWS-G-3: Fuel buildup should be reduced around natural water sources to protect them from uncharacteristic fire effects.
- NWS-G-4: Management activities should not impair soil moisture recharge at outflows of natural water sources.
- NWS-O-2: Reconstruct at least 3 developed springs within 10 years to provide aquatic habitat for the recovery of plant and/or animal species.
- NWS-O-3: Complete 3 stream restoration and/or development projects to benefit aquatic species of conservation concern within 10 years.
- RIA-G-2: Livestock grazing in riparian areas should only be allowed when there are no significant deleterious effects to riparian area structure or function.
- WET-O-1: Restore native vegetation and natural water flow patterns on at least 10 wetland sites every 10 years.
- WET-S-1: The total acreage of existing wetlands will not be diminished due to management activities.
- WET-G-1: Management activities should only be allowed in wetlands if vegetative communities (except noxious and/or invasive plants), soil function and structure, and hydrologic function are kept the same or improved.

Alternative 1 – None of the recommended wilderness areas occur within the range of the Canelo Hills ladies' tresses, so the effects of this alternative are comparable to the proposed action for this species.

Alternative 2 – The Canelo Hills ladies' tresses is not affected by any of the Motorized Recreation Land Use Zones in this alternative, so the effects of this alternative are comparable to the proposed action.

Table 104 outlines the trends and determinations by alternative for Canelo Hills ladies' tresses.

Table 104. Canelo Hills ladies' tresses trends and determinations by alternative

Trends and Determinations	No Action	Proposed Action	Alternative 1	Alternative 2
Population trend	Unknown	Unknown	Unknown	Unknown
Habitat trend	Negative	Positive	Positive	Positive
ESA determination	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Critical habitat determination	NA	NA	NA	NA

ESA = Endangered Species Act; NA = not applicable

Regionally Sensitive Species and Other Forest Planning Species – Environmental Consequences

Species that were not federally listed as threatened or endangered are either Southwestern Region Forest Service sensitive species (table 105) or "other planning species" (table 106). Each of these lists has a somewhat different content. Sensitive species tend to be vertebrates and select plants, while "other planning species" tend to be invertebrates and other, apparently rare, plants. However, this category also has common game species or species of public interest. There tends to be a fair amount of literature on natural history of sensitive species, while many of the "other planning species" are poorly known (game and public interest species being the notable exception). Although the origin and content of the lists are different, a finite number of species tend to face the same threats, so they are mostly considered together here (except as noted) based on the common threats and population viability risks.

Many of the sensitive species were filtered out during the coarse-filter process if they are relatively widespread, highly mobile, and lacked specific natural history requirements. This included most birds, bats, and terrestrial mammals. These species benefit from habitat restoration (desired conditions and objectives) and are relatively widespread terrestrial "generalists." They, therefore, do not need additional fine-filter components to address their associated threats. Most of the "other" forest planning species were filtered out by the coarse filter for two main reasons:

1. There was insufficient information on the species to develop fine-filter components, so the assumption was made that coarse-filter components would suffice for species that evolved in the ecosystems being restored; or
2. They were associated primarily with terrestrial biophysical features, which have adequate plan components to protect them from threats.

The Coronado has many species that are closely associated with biophysical features (especially talus slopes), so a few forestwide plan components were sufficient to negate the need for species- or site-specific fine-filter components. As an example, there are 40 of 47 mollusks (appendix F) in the coarse-filter category that are associated with biophysical features and could be screened using the coarse filter components alone.

One of the main threats to rare and localized forest planning species is extirpation or extinction through stochastic (random, unpredictable) events. Rarity alone is not a criterion for requiring fine-

filter components, but where our management would contribute to the vulnerability of the species to extirpation or extinction, then the Forest Service would need additional plan components to meet its population viability requirements. The best example of fine-filter components addressing the possibility of extirpation by stochastic events is for plants whose known distribution is limited to one or two ecosystem management areas. If a population were to be extirpated from one of two known ecosystem management areas due to our management actions, then it would be extirpated from 50 percent of its range across the planning area (Coronado National Forest) and would not meet the criteria to "maintain viable populations (not species viability), well distributed across the planning area." As a result, many of the ecosystem management areas in the action alternatives have a species-specific guideline, a site-specific guideline, or both to address management in areas that could affect rare species population viability, such as this one from the Tumacacori Ecosystem Management Area (EMA-TUM-G-2):

> Management activities involving ground disturbance and/or vegetation management should incorporate site-specific design features to benefit habitat for, or mitigate impacts to, rare plant populations. For the Tumacacori Ecosystem Management Area, these species and associated management threats include, but are not limited to, the following: Cochise woolwort: grazing; recurved corycactus: illegal collection, grazing, road construction and maintenance; soft Mexican-orange: fire.

Another reason that numerous species were not screened by the coarse filter alone was threats to aquatic species. Aquatic species tend to be rare and localized distributions and have been steadily declining. As an example, the longfin dace is the most widely distributed fish on the Coronado National Forest, but occupied stream habitat is still rare, so it has numerous guidelines targeting mitigation in natural waters: NWS-G-1, NWS-G-3, and NWS-G-5. These components are in addition to two coarse-filter components (objectives): NWS-O-1 and NWS-O-3 that support maintaining water quantity needed for aquatic habitat.

Table 105. Sensitive species threats and plan components to address threats

Common Name	Scientific Name	Threats	Plan Components to Address Threat Providing for Viability
[Desert] Bighorn sheep	*Ovis canadensis mexicana*	Invasive species of buffelgrass; loss of aquatic habitats; off-road vehicle use; development; disease from domestic goats and sheep and energy resource development.	BIP-G-2; REC-G-6; RAM-G-3; RAM-S-1; VDC-G-1 and 2; WIL-PSR-G-1 and 2; EMA-CAT-S-2A
Mexican long-tongued bat	*Choeronycteris mexicana*	Grazing and fire suppression; loss of food supplies (nectar and pollen of agave and columnar cactus) due to development, ranching practices, harvesting, or any activities that disturbs agave and/or columnar cactus populations; and disturbance of roost sites.	ARP-G-5; BIP-G-3 and 4; BIP-S-1; RAM-G-4; VIC-G-1, VMP-G-1; several special areas (see text)
[Pale] Townsend's big-eared bat	*Plecotus townsendii [pallescens]*	Reduction of chaparral habitat, loss of habitat (e.g., reclamation of abandoned mines), vandalism, and disturbance of maternity roosts and hibernacula.	ARP-G-5; BIP-G-3 and 4; BIP-S-1; RAM-G-4; several special areas (see text)
American peregrine falcon	*Falco peregrinus anatum*	Environmental toxins, habitat loss, human disturbance, and illegal take.	ARP-G-3; BIP-G-2; REC-G-6; several special areas (see text)

Common Name	Scientific Name	Threats	Plan Components to Address Threat Providing for Viability
Northern goshawk	*Accipiter gentilis*	Stand-replacing crown fires, drought, insects, disease, and other forest health issues.	ARP-G-2A to D; EMA-CHI-S-2A and B; several special areas (see text)
Arizona treefrog (Huachuca/Canelo DPS)	*Hyla wrightorum*	Wildfire and subsequent erosion, sedimentation, and ash flow.	DC; VO; ALL; TER; RIA; ISM-G-1; COW-G-2; EMA-HUA-G-1, 2 and 4; NWS-G-1 to 5; RIA-G-2, 3, and 4; ARP-G-2 (draft conservation agreement)
Lowland leopard frog	*Lithobates yavapaiensis*	Habitat alteration and fragmentation and the introduction of nonnative predatory and competitive fishes, crayfishes, and frogs; drought; and disease.	COW-G-2; ISM-G-1; NWS-G-1 to 5; RAM G 2 and 3; RAM-S-2 and 3; several special areas (see text)
Giant spotted whiptail	*Aspidoscelis stictogramma*	Invasive species of buffelgrass; loss of aquatic habitats; off-road vehicle use; development; and energy resource development.	RIA-G-1 to 4; VDC-G-1 and 2; VGC-G-1 and 2; several special areas (see text)
Mexican stoneroller	*Campostoma ornatum*	Aquifer pumping, reduction in streamflows, water diversion, drought, and predation by nonnative green sunfish.	NWS-G-4
Sonora sucker	*Catostomus insignis*	Alteration of historic flow regimes and construction of reservoirs have diminished available habitat, and general watershed erosion causing excessive sand deposition in streams has eliminated much of the required pool habitat.	NWS-G-1; NWS-G-2
Desert sucker	*Catostomus clarkia*	Alteration of historic flow regimes and construction of reservoirs have diminished available habitat, and general watershed erosion causing excessive sand deposition in streams has eliminated much of the required pool habitat.	NWS-G-1; NWS-G-2
Longfin dace	*Agosia chrysogaster*	Habitat alterations and interactions with nonnative fish species. Large areas of habitat have been destroyed by dewatering, stream diversion, groundwater pumping, dam construction, channel and watershed erosion, and other factors.	NWS-G-1; NWS-G-2 NWS-G-5
Huachuca giant-skipper	*Agathymus evansi*	Grazing and fire suppression; and fire.	VIC-G-1, VIC-G-5; VMP-G-1; EMA-HUA-S2 A and B
Arizona Cymbiodytan water scavenger beetle	*Cymbiodyta arizonica*	Water use, grazing, logging habitat modification, erosion, sedimentation, and siltation.	NWS-G-1 and 2; EMA-CHI-S1A to D; EMA-CHI-S2A and B; RAM-G-5

Common Name	Scientific Name	Threats	Plan Components to Address Threat Providing for Viability
Stephan's riffle beetle	*Heterelmis stephani*	Spring habitats degraded and trampling of larvae.	DC; VO; AQU; NWS-G-1, 2, 3, and 5; WET-G-1; WET-S-1
Huachuca springsnail	*Pyrgulopsis thompsoni*	Habitat modification and loss through catastrophic wildfire and grazing.	DC; VO; RIA; ARP-G-1; NWS-G-1, 2, 3, and 5; RAM-G-1 to 5; WET-G-1; WET-S-1
Pinaleño mountain snail	*Oreohelix grahamensis*	Stand-replacing crown fires, drought, insects, disease, and other forest health issues.	BIP-G-1 and 2; MIN-G-1; EMA-PIN-MA; EMA-PIN-S-1A and B; ARP-G-2 (draft conservation agreement)
Wet canyon talussnail	*Sonorella macrophallus*	Stand-replacing crown fires, drought, insects, disease, and other forest health issues.	EMA-PIN-MA; MIN-G-1; ARP-G-2 (draft conservation agreement); Wet Canyon Talus snail Special Area
Parish's abutilon	*Abutilon parishii*	Competition with exotic plants such as buffelgrass and Thornberry; livestock habitat degradation, trampling, and grazing; mining, hiker trampling and trail maintenance.	BIP-G-2; MIN-G-2 VDC-G-1 and 2; RAM-G-1 and 2 and 4 to 7; RIA-G-2; WET-G-1; several special areas (see text)
Santa Rita yellowshow	*Amoreuxia gonzalezii*	Invasive species, invasion by native and nonnative shrubs, overgrazing, fire suppression, development, and mining.	EMA-RIT-G-2; RAM-G-1 and 2 and 4 to 7
Copper Mine milk-vetch	*Astragalus cobrensis var. maguirei*	Water diversion, pumping, or increased evapotranspiration, overgrazing, climate change, and concentrated recreation.	EMA-PEL-G-2; EMA-CHI-G-3; RAM-G-1 and 2 and 4 to 7; several special areas (see text)
Huachuca milk-vetch	*Astragalus hypoxylus*	Habitat degradation, trampling from recreation and grazing, and fire suppression.	EMA-HUA-G-2; EMA-HUA-S2 A and B; RAM-G-1 and 2 and 4 to 7; REC-G-2
Ayenia	*Ayenia truncata (= A. glabra)*	Invasive species, invasion by native and nonnative shrubs, overgrazing, fire suppression, and development.	EMA-RIT-G-2; RAM-G-1 and 2 and 4 to 7
Elusive browallia	*Browallia eludens*	Grazing, fire suppression, and diversion, pumping, or increased evapotranspiration, climate change, fuelwood cutting, and hiking.	EMA-HUA-G-2; RAM-G-1 and 2 and 4 to 7; EMA-HUA-S2 A and B; REC-G-2;
Chihuahuan sedge	*Carex chihuahuensis*	Water loss through diversion, pumping, or increased evapotranspiration; overgrazing; and climate change.	WET-S-1; WET-G-1; RIA-G-2; MTS-G-3; RAM-G-1 and 2 and 4 to 7; MOM-G-1, 2 and 4; several special areas (see text)

Common Name	Scientific Name	Threats	Plan Components to Address Threat Providing for Viability
Cochise sedge	*Carex ultra*	Water loss through diversion, pumping, or increased evapotranspiration; overgrazing; and climate change.	WET-S-1; WET-G-1; RIA-G-2; MTS-G-3; RAM-G-1 and 2 and 4 to 7; several special areas (see text)
Soft Mexican-orange	*Choisya dumosa var. mollis*	Grazing, fire suppression, and climate change.	EMA-TUM-G-3 and -4; EMA-TUM-s-2A and B; RAM G-1 and 6
Recurved corycactus	*Coryphantha recurvata*	Invasive species, invasion by native and nonnative shrubs, overgrazing, fire suppression, and development.	EMA-TUM-G-3; EMA-TUM-G-4; EMA-TUM-s-2A and B; RAM-G-1 and 2 and 4 to 7
Smooth baby-bonnets	*Coursetia glabella*	Grazing, fire suppression, and climate change.	EMA-HUA-G-2; EMA-CHI-G-2; EMA-CHI-G-3
Arid throne fleabane	*Erigeron arisolius*	Reduction of chaparral habitat, grazing, and fire suppression.	RAM-G-1 and 2 and 4 to 7; MOM-G-1, 2 and 4; several special areas (see text)
Chiricahua gentian	*Gentianella wislizeni*	Stand-replacing crown fires, drought, insects, disease, and other forest health issues; grazing; and recreation development.	EMA-CHI-G-3; EMA-CHI-S-1A to D; RAM-G-1 and 2 and 4 to 7; REC-G-2; MOM-G-1, 2 and 4.
Coleman's coralroot	*Hexalectris colemanii*	Invasive species, invasion by native and nonnative shrubs, overgrazing, fire suppression, development, and mining.	EMA-RIT-G-2; EMA-DRA-G-4; RAM-G-1 and 2 and 4 to 7
Purple-spike coralroot	*Hexalectris warnockii*	Grazing, fire suppression, climate change, collecting, fire, and facility maintenance.	EMA-CHI-G-3; EMA-HUA-G-2, EMA-DRA-G-4, EMA-RIT-G-2; RAM-G-1 and 2 and 4 to 7
Chiricahua mudwort	*Limosella pubiflora*	Climate change diversion, pumping, or increased evapotranspiration; overgrazing; and concentrated recreation.	EMA-PEL-G-2; EMA-PEL-S-1; RAM-G-1 and 2 and 4 to 7; REC-G-2; WET-G-1; WET-S-1;
Beardless chinch weed	*Pectis imberbis*	Invasive species, invasion by native and nonnative shrubs, overgrazing, fire suppression, development, and road maintenance.	EMA-RIT-G-2; EMA-HUA-G-2; RAM-G-1 and 2 and 4 to 7
Broad-leaf ground-cherry	*Physalis latiphysa*	Invasive species of buffelgrass, loss of aquatic habitats, off-road vehicle use, grazing, development, and energy resource development.	VDC-G-1 and 2; EMA-PIN-G-1; RAM-G-1 and 2 and 4 to 7; WET-G-1; WET-S-1;
Hinkley's Jacob's ladder	*Polemonium pauciflorum hinckleyi*	Water diversion, pumping, or increased evapotranspiration; overgrazing; climate change; hiking and fire.	EMA-CHI-G-3; RAM-G-1 and 2 and 4 to 7; WET-G-1; WET-S-1;
White-flowered cinquefoil	*Potentilla albiflora*	Stand-replacing crown fires, loss of natural fire regime; drought, insects, disease, and other forest health issues.	EMA-PIN-G-1; EMA-PIN-S-1A and B; MOM-G-1, 2 and 4.

Common Name	Scientific Name	Threats	Plan Components to Address Threat Providing for Viability
Huachuca cinquefoil	*Potentilla rhyolitica var. rhyolitica*	Grazing and recreation.	EMA-HUA-G-2; RAM-G-1 and 2 and 4 to 7; REC-G-2; EMA-HUA-S-2A and B
Whisk fern	*Psilotum nudum*	Invasive ssp. of Buffelgrass; loss of aquatic habitats; off-road vehicle use; development, and energy resource development; diversion, pumping, or increased evapotranspiration; overgrazing; and climate change.	RIA-G-1 and 2; EMA-TUM-G-3 and 4; EMA-TUM-S-1A and B; MTS-G-2 and 4
Porsild's starwort	*Stellaria porsildii*	Stand-replacing crown fires, drought, insects, disease, and other forest health issues; grazing; and recreation development.	EMA-CHI-G-3; REC-G-2; EMA-CHI-S-1A to D; EMA-CHI-S-2A and 2 B; MOM-G-1, 2 and 4.
Aravaipa woodfern	*Thelypteris puberula* var. *sonorensis*	Water diversion, pumping, or increased evapotranspiration; overgrazing; climate change; collecting; and spring development.	EMA-CAT-G-2; EMA-CAT-S-1A and B; RAM-G-1 and 2 and 4 to 7; WET-G-1; WET-S-1

Table 106. Other forest planning species threats and plan components to address threats

Common name	Scientific Name	Threats	Plan Components to Address Threat Providing for Viability
Arizona cave amphipod	*Stygobromus arizonensis*	Groundwater pollution and groundwater depletion.	Pending strategy for Bog Springs (possible Conservation Agreement) and/or more information on distribution,
Barfoot ("Bearfoot") woodlandsnail	*Ashmunella esuritor*	Desiccation, habitat/cover loss, fire.	RIA-G-3; RIA-G-4; BIP-G-1; EMA-CHI-S-1A to D; EMA-CHI-S-2A and 2B
Chiricahua woodlandsnail	*Ashmunella proxima*	Desiccation, habitat/cover loss, fire, limited distribution.	RIA-G-3; RIA-G-4; BIP-G-1; EMA-CHI-S-1A to D; EMA-CHI-S-2A and 2B
Pungent talussnail	*Sonorella odorata*	Desiccation, loss of habitat and cover, and high-intensity wildfire.	EMA-CAT-G-1; MIN-G-1
Heart vertigo snail	*Vertigo hinkleyi*	Desiccation, loss of habitat and cover, and high-intensity wildfire.	EMA-HUA-G-3
No common name	*Mannia californica*	Unknown, but could be threatened by stochastic events.	EMA-TUM-G-2; EMA-TUM-S-1A and B; EMA-TUM-S-2A and B
No common name	*Plagiochasma wrightii*	Unknown, but could be threatened by stochastic events.	EMA-TUM-G-2; EMA-TUM-S-1A and B; EMA-TUM-S-2A and B
Pringle's fleabane	*Erigeron pringlei*	Recreation, road construction, and collection by botanists.	EMA-RIT-G-2 EMA-PIN-S-1A and B; EMA-PIN-G-1, REC-G-2

Common name	Scientific Name	Threats	Plan Components to Address Threat Providing for Viability
Arizona eryngo	*Eryngium sparganophyllum*	Disturbed habitats; invasive weeds; grazing; urban and agricultural development.	EMA-RIT-G-2, EMA-CAT-G-2; EMA-CAT-S-1A and B
Bigelow's thoroughwort	*Eupatorium bigelovii*	Unknown, but could be threatened by stochastic events.	RIA-G-3; RIA-G-4; BIP-G-1
Santa Catalina burstwort	*Hermannia pauciflora*	Unknown, but could be threatened by stochastic events.	EMA-CAT-G-2; EMA-CAT-S-1A and B
Southwest monkeyflower	*Mimulus dentilobus*	Wetland habitats often used for household and livestock water.	EMA-RIT-G-2; COW-G-2; RIA –G-1 and 2, 4 and 6; WET-G-1; WET-S-1
Leafy Jacob's-ladder	*Polemonium foliosissimum var. flavum*	Unknown, but could be threatened by stochastic events.	EMA-PIN-G-1; EMA-PIN-S 1A and B
Cochise woodsia	*Woodsia cochisensis*	Unknown, but presumably loss of surface and groundwater.	NWS-G-2 to 5; WET-G-1; WET-S-1

Fine-filter Threats and Population Viability

In the regional sensitive species and other forest planning species categories, 69 species were found to have some risk (fine-filter species) to their population viability that needed further analysis. The species identified included: 6 mammals, 3 birds, 4 amphibians, 2 reptiles, 3 insects, 1 other invertebrate, 7 fish, 7 mollusks, 0 fungi-lichen, 2 mosses-liverworts, and 34 plants.

No Action

Invasive Species – Direction provided by the no-action alternative does not directly address the threat of invasive plant species to wildlife. It allows for seeding using nonnative species and for maintenance of desirable nonnatives for maintaining ecosystem diversity, each of which could adversely affect habitat for wildlife species. Even though this alternative does not directly address the threat of invasive plant species to wildlife habitat, it does not contain language that impedes the Forest Service's ability to contain and prevent introduction of invasive plants. Implementation under the no-action alternative has, therefore, been able to provide for the viability of species for which invasive species are a threat.

Stochastic Events – There is no mechanism in the no-action alternative for addressing the threat of stochastic events to populations of rare or endemic animals and plants. However, the requirement to manage for species viability has allowed the Forest Service and its partners to design project mitigations that prevent management activities from adversely contributing to this natural variability in habitat conditions. There is no language in the no-action alternative that has prevented addressing this threat where it has been possible to do so. Implementation under the no-action alternative has, therefore, not been able to provide for the viability of species for which stochastic events are a threat.

Vegetation Management – Treating vegetation outside its historic range of variation for ecosystem restoration goals (restoration of resiliency) is an important function of the Coronado National Forest's mission. Guidelines and standards to retain structural features and compositional integrity of forests and woodlands (and other habitat elements) are important mitigations to meet population viability objectives. In the no-action alternative, many of the guidelines and standards came from recovery plans or other similar documents. These documents have been incorporated into the plan in such a way

that when the source document or plan is updated, the no-action alternative no longer matches the newer content and must be amended.

Northern goshawk's major threats are forest health related. Guidelines for vegetative management in the 1986 forest plan include recommendations for managing northern goshawk habitat and its prey. These guidelines specify that the Forest Service manage for uneven-aged stand conditions, and retain live reserve trees, snags, downed logs, and woody debris levels throughout woodland, ponderosa pine, mixed-conifer, and spruce-fir forest cover types. The 1986 forest plan has guidelines with implied desired conditions for a specific size class distribution. The plan also describes opening size and reserve tree requirements (a specified number of trees retained according to opening size) by forest type. These guidelines were designed based on studies of goshawk conducted in northern Arizona on the Kaibab Plateau where the birds occupied vast, homogeneous stands of ponderosa pine. The conditions on the Coronado National Forest are very different as ponderosa pine only occurs as an ecotone between adjacent stand types. Also, the topography of the mountain ranges on the Coronado do not lend themselves to implementing design criteria as it was outlined for the larger more contiguous vegetation types typical of northern Arizona. As a result, implementation of these guidelines has hampered the ability to restore ecosystems to their historic range of variation and has had uncertain effects on providing for the viability of northern goshawk on the Coronado National Forest.

Management for forage improvement and control of undesirable natives under the no-action alternative has resulted in burning of desert communities and desert grasslands. Burning in these vegetation communities poses a risk to agaves that are not fire adapted but provide a food source for bats on the sensitive species list. Because of direction in the no-action alternative to retain agave and saguaros, site-specific avoidance to prevent burning areas where these agaves occur has been effective in mitigating these risks even though it is not a result of the direction in the no-action alternative. Implementation under the no-action alternative has, therefore, been able to provide for the viability of species for which loss of food supplies is a threat.

Threats to Aquatic, Riparian, Seep, and Wetland Habitats – The no-action alternative addresses the need to preserve cover for bank protection, shade, and sediment-water balance in fish-bearing streams. It also provides direction to improve riparian areas to satisfactory functioning conditions and to protect their productivity and diversity forestwide. Management Area 7 manages much of the riparian vegetation on the Coronado to provide for wildlife habitat and forage, and to exclude livestock grazing except when criteria are met that show the activity would not pose a threat to species viability. Wetlands are managed according to direction for riparian areas in the no-action alternative. The main issue with management of the no-action alternative is that not all riparian areas are included in Management Area 7, and so the direction that protects associated species from threats may not cover all locations where those threats exist. However, the most sensitive and important areas are included in Management Area 7 or identified as an issue in other parts of the plan. This is adequate to provide for the viability of aquatic and riparian dependent species, given current known threats but may not address emerging threats in the future if they occur outside Management Area 7.

There is also direction in the no-action alternative to maintain natural conditions around constructed waters that would provide wildlife and plant habitat. This direction addresses the same threats as the proposed action.

Mountain meadows have similar protections in the no-action alternative as in the proposed action and have similar effects to population viability.

Motorized Transportation System – The no-action alternative addresses avoiding road construction in wet meadows and on sensitive soils but not directly in wetlands or riparian areas. Many of the most important wetlands and riparian areas for species that have viability threats are within Management Area 7B, which also should be avoided for road and trail construction according to the no-action

alternative. Restricting construction of roads in areas sensitive to sedimentation and compaction effects would provide for viability of aquatic species for which increased turbidity and temperature would threaten the population. It would also provide for protection of rare plants that occur in these areas.

Biophysical Features – The no-action alternative provides some protection of biophysical features but is not as comprehensive as the proposed action. It has a guideline that states to "Preserve and protect caves for their unique environmental, biological, geological, hydrological, archaeological, paleontological, cultural, and recreational values," and direction to route trails around talus slopes. These guidelines prevent some disturbances that are a threat to species. In terms of talus slopes, Management Area 2B protects a special area in the Pinaleño Mountains that is habitat for several endemic talus snails but talus snails on other parts of the Coronado do not have similar protections. In the no-action alternative, there is no protection of talus slopes from mineral activities outside Management Area 2B.

Recreation and Special Uses – In terms of providing for species viability, the no-action alternative and proposed action have similar effects. Both provide for large areas of nonmotorized recreation use and have guidelines that protect habitat and species that are located in particularly high-use areas.

Other Plan Components – Identified bat roosts will be managed as a sensitive resource and for the enhancement of populations under the no-action alternative. Protection measures may include seasonal closures, education, and gating. Management of roosts will include consultation with State and Federal wildlife agencies. These guidelines would result in protection of bat species from the threat of disturbance while roosting.

Site-Specific Measures – The effects to species viability for wilderness, wilderness study areas, and zoological and botanical areas are the same for no action and the proposed action except that the South Fork, Birds of Prey Zoological and Botanical Area is slightly smaller. This would not have a measureable effect on population viability for any of the fine-filter species.

Climate Change – There is no mechanism in the no-action alternative for addressing the threat of climate change to populations of rare or endemic animals and plants. However, the requirement to manage for species viability has allowed the Forest Service and its partners to implement project mitigations that prevent forest management activities from adversely interacting with these climatic factors. There is no language in the no-action alternative that has prevented addressing this threat where it has been possible to do so. Implementation under the no-action alternative has, therefore, not been able to provide for the viability of species for which climate change is a threat.

Viability Conclusion – The no-action alternative does not always directly address threats to species viability but also does not contain direction that impedes the Forest Service from acting appropriately to prevent extirpation of a species from the planning area when it is within the agency's authority and ability to do so. This alternative, therefore, is able to provide for the viability of all sensitive and other forest planning species that have fine-filter threats. Species that have been extirpated in the past 20 years have not been lost as a result of the plan content in the no-action alternative, but because of outside influences or lack of ability to react in a timely manner to threats to the species. These factors would continue to influence species viability regardless of which alternative is selected. However, direction offered by the no-action alternative does not provide for viability as well as the proposed action, which uses more updated science and knowledge of species and specifically addresses the threats associated with their viability and habitat needs.

Proposed Action

In this section, the major threats are addressed, as well as the plan components and fine-filter species shown in table 105 and table 106. Forest plan components for the proposed action, alternative 1, and alternative 2 are the same. The only differences are in land usage as set-asides in alternative 1 and land

use zones for motorized recreation in alternative 2. For alternatives 1 and 2, only the issues that differ from the proposed action are addressed in those sections below.

Invasive Species – The Coronado National Forest has many nonnative species, but most are not invasive and do not pose a threat to ecosystems or population viability. About 30 species of plants have been identified as invasive, plus a small number of animals. In desert communities, buffelgrass has a huge potential to threaten native species, because it has the capacity to transform the desert into a grassland ecosystem and drastically change the historic fire regime. Thus far, it has not spread beyond the Santa Catalina Ecosystem Management Area on the Coronado National Forest. Forest plan components that address the buffelgrass threat include VDC-G-1and 2. These components are all aimed at minimizing the spread, or ultimately, eradicating the species. Species that will benefit from buffelgrass control include most Sonoran Desert species in appendix F (coarse-filter species), plus Parish's abutilon, broad-leaf ground-cherry, giant spotted whiptail, and desert bighorn sheep.

Lehmann lovegrass is well established over much of the desert grasslands across the Coronado, but is replacing a native grassland community, so many native species can still persist in its presence. Lehmann lovegrass, while an invasive, is not addressed specifically in the proposed action, because it is often beyond the ability of management to restore ecosystems once it has become established over a large area. However, there are components for rare plants and guidelines that guide management to retain native grasses wherever possible (VAC-G-1 and VGC-G-2). In the case of VGC-G-2, the important point is that if Lehmann lovegrass appears in an area of a project and the number of plants is very small, it may be possible to eradicate. If, however, there is a sea of Lehmann lovegrass, it is likely beyond our ability to manage as a whole, but it might be possible to determine mitigations in an area where the forest planning species occur, such as an exclosure. These plan components would help prevent the spread of Lehman's lovegrass into new areas and would, thereby, address the threat to these species before the community becomes inexorably altered. The fine-filter species (table 105 and table 106) for whom expansion of Lehmann's lovegrass is a threat are giant spotted whiptail, Santa Rita yellowshow, ayenia, recurved corycactus, Coleman's coral-root, beardless chinchweed, and whisk fern.

Abert's squirrel is an animal that was intentionally introduced to the Santa Catalina and Pinaleño Ecosystem Management Areas as a game animal, but it may compete with native squirrels (Mount Graham red squirrel and Arizona gray squirrel). Abert's squirrel is a habitat generalist and, as a result, habitat improvements for Mount Graham red squirrel and Arizona gray squirrel would also improve habitat conditions for Abert's squirrel. Therefore, habitat management is not sufficient to address the threat of competition and the ability to address this threat is outside of Forest Service authority. Populations can be managed by Arizona Game and Fish Department to enhance survival of native species, so the forest plan includes a management approach to encourage the agency's cooperation in this process.

There are some serious aquatic threats, including northern crayfish (*Orconectes virilis*), American bullfrog (*Lithobates catesbeiana*), and a variety of warmwater fishes (especially green sunfish, *Lepomis cyanalis*) (USDA FS 2009). The aquatic invasive species are discussed below in the "Threats to Aquatic, Riparian, Seep, and Wetland Habitats" section.

Stochastic Events – This category covers an artificial group of plants (especially) or animals that has such limited distributions that their population viability could be threatened by stochastic events. Populations of these species could be eliminated by forest management actions if the species and appropriate mitigations for it were not identified at the ecosystem management area and local level during project planning. The plan components that specifically provide for viability to rare plant populations are tailored to the species and threats found in each ecosystem management area are EMA-RIT-G-2, EMA-HUA-G-2, EMA-CAT-G-2, EMA-PIN-G-1, EMA-PEL-G-2, EMA-DRA-G-4, EMA-TUM-G-4, and EMA-CHI-G-3. These guidelines specify management activities involving ground disturbance or vegetation management to incorporate site-specific design features to benefit

habitat for, or mitigate impacts to, rare plant populations. Species that may have a threat to viability include: Coleman's coral-root, Chiricahua mudwort, copper mine milk-vetch, New Mexico bitterweed, Arizona eryngo, Arizona manihot, beardless chinchweed, Cochise woolwort, Huachuca cinquefoil, Pima pineapple cactus, Santa Rita yellowshow, Southwest monkeyflower , recurved corycactus, soft Mexican-orange, Huachuca milkvetch, Huachuca water umbel, purple-spike coral-root, Rusby's hawkweed, smooth baby-bonnets, broad-leaf ground-cherry, leafy Jacob's ladder, white-flowered cinquefoil, Porsild's starwort, Pringle's fleabane, Santa Catalina burstwort, Copper Mine milk-vetch, ayenia, elusive browallia, Chiricahua gentian, Hinkley's Jacob's ladder, and Arivaipa woodfern.

Plagiochasma wrightii and *Mannia californica* are two species of liverwort found in the Tumacacori Ecosystem Management Area and EMA-TUM-G-2 addresses searching and managing for these species in rocky stream habitats. Forest plan components that identify these species and require their inclusion in project design are adequate to provide for species viability because the plants are specifically identified for any projects within the range. The biologist on the project would then be required to follow forest plan guidance and mitigate effects to these species. If these species were not highlighted in these guidelines, they would probably be overlooked.

Vegetation Management – Treating vegetation outside the historic range of variation for ecosystem restoration goals (restoration of resiliency) is an important function of the Coronado National Forest's mission. Guidelines and standards to retain structural features and compositional integrity of forests and woodlands (and other habitat elements) are important mitigations to meet population viability objectives. Retention of large-diameter live and standing dead trees, woody debris, mesic microclimates, openings, and other features of climax forests would ensure population viability of most forest species that are not specialized (including the raptors themselves) per coarse-filter plan components.

Guidelines that specifically address vegetation management include, but are not limited to, VAC-G-4, 5, and 6; VIC-G-1, VME-G-1, VMG-G-2, VMP-G-3, 5, 9, 10, 12, and 13; VDM-G-1, and VWM-G-3. Among these forest and woodland management guidelines, there is some repetition across vegetation types (VIC-G-1and VMP-G-1 both refer to retaining paniculate agaves; the difference is that the guidelines are in different sections (VIC = interior chaparral; VMP = Madrean pine-oak)). These types of guidelines basically direct management to use the best management practices to treat woodland and forest vegetation types while retaining key structural features necessary for wildlife. Examples include stand-level treatment direction; when and where to burn woody debris; retention of snags, logs, large-diameter trees; retention of clusters; stand size; desired forest structure; and so on. These guidelines represent good habitat management for a suite of fine- and coarse-filter species, but few are critical components needed for population viability requirements of any particular species, except for the Huachuca giant skipper. The Huachuca giant skipper (an endemic insect) requires the Huachuca agave, an endemic plant species, as the larval food plant. Thus, VMP-G-1 is necessary to meet viability standards for the skipper as well as the Mexican long-tongued and lesser long-nosed bats, who feed on the flowers and fruits of agaves.

In the proposed action, mitigations for forest health activities and wildlife are sometimes tiered to recovery plans and conservation measures, which are incorporated by reference. These mitigations often support the viability of other species that are not threatened or endangered. The northern goshawk, for which there is no recovery plan or conservation agreement, benefits from project mitigations that would be implemented due to the Mexican spotted owl recovery plan because they overlap in habitat use. The northern goshawk also has guidelines that do appear in the forest plan, including ARP-G-2A and 2D, which support their unique habitat needs.

Grasslands are often managed using burning from planned or unplanned ignitions or shrub removal (e.g., mastication). VGC-G-1 and 2 are guidelines to retain native grasses and some native shrubs and would be used in these implementation activities to design mitigations that benefit grassland species,

especially those that need cover. Vegetation management fine-filter components generally do not provide for the viability of species on their own but interact with other parts of the plan to cover integrated threats to species viability. For instance, the giant spotted whiptail is a good example of a species that could succumb to various threats but benefits from multiple fine-filter components. The species is generally riparian in grasslands, but needs structure for thermoregulation. It may be outcompeted by other species in disturbed habitats (especially under drought conditions), and is localized in distribution. The plan components for vegetation management are able to address part of the threats to this species but the direction for stochastic events and invasive species also contribute to providing for its viability.

Threats to Aquatic, Riparian, Seep, and Wetland Habitats – All of these habitat elements overlap because of the presence of water, so plan components for species associated with water or the adjacent vegetation generally overlap in their ability to provide for population viability. Threats in aquatic and riparian habitats are many, including water diversion and pumping, disease, invasive species, poor water quality, and loss of surface water due to drought and climate change.

For species that have at least part of their life history in water, two sections apply: natural waters (NWS) and constructed waters (COW). NWS-G-1 through G-5and NWS objectives help to protect the integrity of natural waters, which typically have higher value to wildlife, fish, and rare plants than constructed waters. The guidelines protect integrity via a series of mitigation guidance components including minimization of sedimentation of the stream (which interferes with life history strategies of fishes and other species); bank stabilization, which confines the channel and hydrological structure fishes evolved with; excluding nonnative, invasive species; and treatment of upland habitats to reduce the threat of catastrophic wildfire. Together these natural waters components retain streams as relatively natural systems that species can persist in, and thereby ensure population viability. Species that benefit from natural water guidelines include lowland leopard frog, Mexican stoneroller, Sonora sucker, longfin dace, Arizona cymbiodytan water scavenger beetle, Cochise woodsia, and possibly Arizona cave amphipod.

Constructed waters mostly address their use for livestock drinking water, but are of value to some native species. Because most of the perennial waters are gone, the only existing surface water in many areas are stock tanks. Some species have adapted to be able to use stock tanks, including leopard frogs, tiger salamanders, and even some rare plants. Bats regularly use stock tanks as their primary source of drinking water. COW-G-2 addresses the needs of native species, such as lowland leopard frog and Townsend's big-eared bat. The function of constructed waters toward population viability is to provide surface water to some species in some areas, in lieu of natural waters. These constructed waters, when properly designed to support native species, can also support populations of Southwest monkeyflower and support its viability. However, stock tanks can be problematic if they are situated in a manner facilitating dispersal of aquatic invasive species, especially American bullfrog. The proposed action did not carry forward a guideline from the no-action alternative that encouraged a higher density of stock tanks that was contributing to the spread of invasive aquatic species. No native species have evolved with stock tanks. However, because it is unlikely natural waters will recover from human interference or climate change in the foreseeable future, stock tanks remain a resource for some species.

Wetland and riparian areas are threatened by most of the same issues as aquatics. When surface water is diverted or pumped elsewhere, the riparian and wetland vegetation dies and the species that rely on those sensitive habitats are extirpated. Thus, most of the wetland (WET) and riparian (RIA) guidelines and standards are aimed to minimizing the loss of surface water (within management control) and protecting riparian vegetation from wildfire. The guidelines and standards are WET-G-1; WET-S-1; and RIA-G-1 through 4. Species benefiting from these components include many plants associated exclusively with springs and wetlands. Species include giant spotted whiptail, Arizona cymbiodytan water scavenger beetle, Wet Canyon talussnail, copper mine milk-vetch, elusive browallia,

Chihuahuan sedge, Cochise sedge, Chiricahua mudwort, Hinkley's Jacob's ladder, whisk fern, Aravaipa woodfern, Arizona cave amphipod, Parish's Abutilon, broad-leaf ground-cherry, Bigelow's thoroughwort, Barfoot woodlandsnail, Chiricahua woodlandsnail, *Mannia californica*, *Plagiochasma wrightii*, southwest monkeyflower, and Cochise woodsia.

Higher elevation plants, including Chihuahuan sedge, arid-thorn fleabane, Chiricahua gentian, white-flowered cinquefoil, and Porsild's starwort, also benefit from guidelines designed to protect wet montane meadows, including MOM-G-1, 2, and 3. These guidelines restrict human presence on meadows and wetlands to not diminish these specialized habitats, which are the biggest threats to these species. Degraded habitats cannot support viable populations.

ISM-G-1 is a provision to remove nonnative invasive species from aquatic habitat, which would address their threat to Sonora tiger salamanders, native ranid frogs (lowland leopard and Tarahumara), northern Mexican gartersnakes, and native fish during restoration projects.

Motorized Transportation System – There are relatively few plan components addressing the effects of roads on forest planning species. However, MTS-G-1 through 3 are guidelines that protect sensitive soils, riparian areas, wetlands, and meadows from road construction, which degrades habitat rapidly through compaction and sedimentation effects. Compaction of sensitive soils and trampling of sensitive plants is a threat to numerous forest planning species, so viability is linked to retaining high-quality wetland sites. In particular, they address the threats to viability for Chihuahuan sedge, Cochise sedge, and whisk fern.

Range Management – Range management (RAM, usually referring to livestock grazing) is frequently listed as a threat in table 105 and table 106. More correctly, grazing, and especially overgrazing, can exacerbate other threats to population viability. For example, improper grazing can increase the scale and magnitude of loss of habitat, loss of food resources for native species, changes in plant communities, degraded water quality, and an increase in spread of invasive species. Activities and structures that support livestock, such as fencing and earthen stock tanks, can also threaten native plants and animals.

Historically, grazing was much more intense than it is now, and during the last 20 years, grazing pressure has been reduced and even eliminated in some areas. Most of the range management guidelines are intended to manage cattle so that they can coexist with native plants and animals. RAM-G-1 relates to intensity of grazing (keeping it within acceptable levels to manage for native species); RAM-G-2 rests burned areas from grazing; RAM-G-3 addresses needs of wildlife passage through fences; RAM-G-4 states that wildlife needs for ground cover should be met; RAM-G-5 deals with riparian function. RAM-G-6 emphasizes perpetuation of native plant species. RAM-S-1 addresses the issue of disease from livestock that transmits to bighorn sheep. RAM-S-2 and 3 target management of leopard frogs (Chiricahua and lowland) in constructed waters. Grazing is so pervasive on the landscape that most species are potentially affected (especially palatable rare plants), with the exception of those species that live in areas closed to grazing (high elevations and biologically sensitive areas, such as meadows and true desertscrub communities) or unlikely to be grazed by cattle (e.g., talus, cliffs). Thus, these guidelines (RAM-G-1 through 7) and those of the extremely rare species (see "Stochastic Events" section) mitigate the effects of cattle by managing for viability of numerous plant species. These include Parish's Abutilon, Santa Rita yellowshow, Copper Mine milk-vetch, Huachuca milk-vetch, ayenia, elusive browallia, Chihuahuan sedge, Cochise sedge, soft Mexican-orange, recurved corycactus, arid-thorn fleabane, Chiricahua gentian, Coleman's coral-root, purple-spiked coral-root, Chiricahua mudwort, beardless chinchweed, broad-leaf ground-cherry, Hinkley's Jacob's ladder, Huachuca cinquefoil, whisk fern, and Arivaipa woodfern. RAM-G-3 also provides for the viability of desert bighorn sheep and lowland leopard frog whose migration may be impacted by improperly designed fencing. RAM-G-4 also protects groundcover, which creates the suitable habitat for food sources that reduce the risk to viability for Mexican long-tongued bat and

Townsend's big-eared bat. RAM-G-5 also reduces the threat to viability for Arizona cymbiodytan water scavenger beetle from grazing.

Biophysical Features – Biophysical features include rocky features, caves, and adits. All of the rock-dwelling species were coarse-filtered out, except for Wet Canyon talussnail, barfoot woodland snail, and Chiricahua woodland snail. These species are also associated with riparian habitat elements, so population viability cannot be addressed simply by protecting talus slopes (see also the section on riparian habitats). Guidelines that address rock features include BIP-G-1 and 2 and MIN-G-1; these target the protection of talus slopes or outcrops and cliffs (habitat element important to desert bighorn sheep and American peregrine falcon). Some plants also use multiple habitat elements that include rocks, and the complex environments they occur in can make them very specialized and prone to extirpation. This includes Pinaleño mountain snail, barfoot woodland snail, Chiricahua woodland snail, Bigelow's thoroughwort, Parish's abutilon, *Mannia californica*, and *Plagiochasma wrightii*, whose other threats are addressed in the "Threats to Aquatic, Riparian, Seep, and Wetland Habitats," "Site-specific Measures" and "Stochastic Events" sections).

For species that use caves (Arizona cave amphipod, Mexican long-tongued bat, and Townsend's big-eared bat), there are three guidelines protecting cave features and their microhabitats or ensuring sensitive mines are not closed in a manner that would compromise the viability of sensitive species: BIP-G-3 and -4, and BIP-S-1. These guidelines provide for the viability of bats and other cave-associated species. The amphipod is poorly known, but there is a possibility of a conservation measure that may benefit the species if it co-occurs with other protected species in the Santa Rita Ecosystem Management Area (a noncave site).

Recreation and Special Uses – In general, recreation is currently compatible with the needs of forest planning species because the amount of recreation on the Coronado National Forest has not reached a threshold to where populations are being lost. However, some guidelines and standards have been established to guard against this possible outcome in certain circumstances. Some of the potential threats from recreation were discussed in the section on stochastic events or biophysical features (caves), and will not be repeated here. REC-G-2 is a guideline that minimizes resource damage from recreational activities that may be a threat, such as trampling to Huachuca milk-vetch. This guideline reduces the risk to viability for elusive browallia, Chiricahua gentian, Chiricahua mudwort, Huachuca cinquefoil, Porsild's starwort, and Pringle's fleabane as well. REC-G-6 is a guideline that limits rock climbing to manage for populations of desert bighorn sheep and American peregrine falcon. ARP-G-2 covers protection of raptor nests on cliff faces, so also applies to American peregrine falcon. These guidelines, in concert with others, provide for the viability of these species. These guidelines reduce the risk of recreation activities that might threaten forest planning species viability.

There are no fine-filter species plan components for special uses management, although some of the guidelines and suitability determinations benefit species.

Other Plan Components – Management for animals and rare plants (ARP) are integrated into other programs and the ARP guidelines referring to northern goshawk were discussed in the "Vegetation Management" section. ARP-G-1 and ARP-G-2 are coarse-filter components that incorporate recovery plans and conservation agreements by reference. ARP-G-5 targets bats (in general) in roosts (caves, adits, cracks in cliffs, under bark on trees in riparian areas), so for fine-filter species this includes Townsend's big-eared bat and Mexican long-tongued bat. The guideline limits human activity periods, roost site quality, and spread of disease (the potential for white-nose syndrome).

Site-specific Measures – Site-specific measures can be ecosystem management area-specific guidelines and standards or special areas, such as wilderness, wilderness study areas, zoological and botanical areas (ZBA), and research natural areas (RNA). WIL-PSR-G-1 and 2 minimize disturbance and public entry into the Pusch Ridge Wilderness; this is partially a strategy for management of desert bighorn sheep. Although it appears the sheep were extirpated, habitat quality is improved and other

plan components are in place to allow reintroduction of the species into Pusch Ridge. The other high-elevation wildernesses (in Huachuca, Chiricahua, Santa Catalina, and Pinaleño Ecosystem Management Areas) are outside the normal range of variability so do not provide for the habitat needs for fine-filter forest planning species without restoration.

The pungent talussnail is not a talus-dwelling species; it is actually associated with woody debris in Douglas-fir forests of the Santa Catalina Ecosystem Management Area, so it is addressed specifically (although not referred to by the species) in EMA-CAT-G-1, which retains mesic microhabitat conditions. Wet Canyon talussnail does inhabit talus slopes but also requires mesic microclimates and has its own special area to address its threats as well as EMA-PIN-MA.

Several ecosystem management areas have special areas that were set aside for biological resources, including rare plants and animals. There are components that address protection of biological resources in all special areas, and all have forest planning species. One of the major protections in most of these is the closure of these areas to livestock grazing. The special areas are summarized below, with a list of the species from table 105 and table 106 that potentially occur in them (these are not precisely known, so may be based on ecosystem management area occurrences):

- EMA-CHI-S-1A to 1C (Pole Bridge Research Natural Area): Mexican long-tongued bat, Townsend's big-eared bat, northern goshawk, coppermine milk-vetch, Cochise sedge, smooth baby-bonnets, arid throne fleabane, Chiricahua gentian, purple spike coral-root, Chiricahua mudwort (possibly extirpated from Chiricahua Ecosystem Management Area), Hinkley's Jacob's ladder, Porsild's starwort, Cochise woodsia, American peregrine falcon, Arizona cymbiodytan water scavenger beetle, barfoot woodland snail, and Chiricahua woodland snail.
- EMA-CHI-S-2A and 2B (Proposed Cave Creek Canyon Birds of Prey Zoological Botanical Area): Mexican long-tongued bat, Townsend's big-eared bat, northern goshawk, coppermine milk-vetch, Cochise sedge, smooth baby-bonnets, Chiricahua gentian, purple spike coral-root, Chiricahua mudwort (possibly extirpated from Chiricahua Ecosystem Management Area), Hinkley's Jacob's ladder, Porsild's starwort, Cochise woodsia, American peregrine falcon, Arizona cymbiodytan water scavenger beetle, barfoot woodland snail, and Chiricahua woodland snail.
- EMA-PEL-S-3A to 3B (Proposed Guadalupe Canyon Zoological Botanical Area): Mexican long-tongued bat, Townsend's big-eared bat, northern goshawk, coppermine milk-vetch, Chihuahuan sedge, Cochise sedge, smooth baby-bonnets, Chiricahua mudwort, American peregrine falcon, lowland leopard frog, and giant spotted whiptail.
- EMA-TUM-G-3A to 3C and EMA-TUM-S-1A (Wild Chile Botanical Area): Mexican long-tongued bat, Townsend's big-eared bat, Parish's abutilon, Cochise sedge, soft Mexican-orange, recurved corycactus, arid throne fleabane, whisk fern, *Mannia californica*, *Plagiochasma wrightii*, Cochise woodsia, American peregrine falcon, lowland leopard frog, and giant spotted whiptail.
- EMA-TUM-S-2A and B (Goodding Research Natural Area and proposed Goodding Research Natural Area extension): Parish's abutilon, Cochise sedge, soft Mexican-orange, recurved corycactus, arid throne fleabane, whisk fern, *Mannia californica*, *Plagiochasma wrightii*, Cochise woodsia, Mexican long-tongued bat, Townsend's big-eared bat, American peregrine falcon, lowland leopard frog, and giant spotted whiptail.
- EMA-HUA-S-1A and 1B (Elgin Research Natural Area and proposed Canelo Research Natural Area): Huachuca milk-vetch, elusive browallia, Chihuahuan sedge, Cochise sedge, smooth baby-bonnets, arid throne fleabane, purple spike coral-root, beardless chinch-weed, Huachuca cinquefoil, Cochise woodsia, Mexican long-tongued bat, Townsend's big-eared bat, American peregrine falcon, and Huachuca giant skipper.
- EMA-PIN-S-1A and 1B (Goudy Research Natural Area): Chihuahuan sedge, broad-leaf ground-cherry, white-flowered cinquefoil, Pringle's fleabane, Bigelow's thoroughwort, leafy Jacob's

ladder, Mexican long-tongued bat, Townsend's big-eared bat, northern goshawk, American peregrine falcon, Pinaleño mountain snail, and Wet Canyon talus snail.

- EMA-CAT-S-1A and 1B (Santa Catalina and Butterfly Research Natural Area): Pungent talus snail, Parish's abutilon, Arizona eryngo, Santa Catalina burstwort, Mexican long-tongued bat, Townsend's big-eared bat, northern goshawk, American peregrine falcon, lowland leopard frog, giant spotted whiptail, and Aravaipa woodfern.

- EMA-CAT-S-2A (Bighorn Sheep Special Management Area): bighorn sheep.

These set-asides are among the more important components for ensuring population viability. There is extensive discussion on this elsewhere in the final environmental impact statement, but the recurring theme is that set-asides act as filters from human-caused problems (introduction of nonnative species, structures, wildfire, trampling, etc.); they function as refuges for biological diversity; and are important buffers from climate change. These special areas above were selected specifically to protect a suite of sensitive species (hence each having a multiple list of species).

Climate Change – Although climate change per se is not listed as a plan component category, components for managing for climate change are found throughout the proposed action, primarily as factors that reduce climate change stress on plants and animals and their habitat elements. Examples include the components to reduce loss of surface water, treating woodlands and forests to become resilient to insect outbreaks and wildfire, retaining the microhabitat character of biophysical features, and, most importantly, retaining unaltered areas that can act as biodiversity refugia and buffers against climate change. Areas that are unaltered by human activity directly but are outside the historical range of variability because of fire suppression and the influence of past grazing management do not functionally serve these purposes. Only areas that can be managed by natural disturbance and processes (e.g., fires from unplanned ignition and insect outbreaks) serve this purpose well. The benefit of these areas is discussed in more detail under alternative 1.

Viability Conclusion – The process to address population viability was the driver to develop plan components, emphasizing objectives (actions), many of which were designed to achieve long-term restoration goals (desired conditions), so population viability requirements are met for all species, through the coarse- and fine-filter approach. Some species may have circumstances beyond the control of the Forest Service, which could result in extirpation in part or all of the planning area, but only factors within the control of Forest Service management are figured into the population viability assessment (USDA FS 2011). As an example, at the time of this writing, the Tarahumara frog is nearly extirpated from the Coronado National Forest (and United States), but the cause is a nonnative disease that cannot be controlled; the habitat is actually in very good condition to allow persistence in the absence of the disease. Therefore, the Coronado has provided for species viability but the species has not persisted for other reasons. All the species listed in table 105 and table 106 have a low risk to their species viability from the proposed action, and management under the proposed action would not contribute to a trend toward listing for these species.

Alternative 1

Alternative 1 plan components are the same as the proposed action. There would be no differential effects to forest planning species, except that there would be less area actively managed for vegetation restoration and other factors.

Invasive Species – In general, invasive species translocation would likely be reduced in remote wilderness areas, but if established would be more difficult to manage.

Stochastic Events – See the site-specific measures section for more information on rare plants and animals potentially threatened by stochastic events due to management.

Vegetation Management –There would be much less active vegetation management in alternative 1, compared to the other alternatives. See the coarse-filter discussions for implications to plants and animals.

Threats to Aquatic, Riparian, Seep, and Wetland Habitat – For aquatic and near-aquatic habitats, there are pros and cons for resident species, depending up the ecosystem management areas and recommended wilderness areas.

Motorized Recreation Land Use Zones – There would be fewer roaded areas in alternative 1 than the other alternatives, which is generally beneficial for rare plants and animals because it reduces the vectors spreading invasive plant and animal species, decreases disturbance from human activities and functions as a biodiversity refuge and climate change buffer.

Biophysical Features – There would be no differential effects to forest planning species in alternative 1 from the proposed action.

Recreation and Special Uses – Alternative 1 would allow fewer special uses and motorized and mechanized recreation than the other three alternatives because of the additional wilderness areas that it recommends. This decrease is generally beneficial for rare plants and animals functions as a biodiversity refuge and climate change buffer because it reduces the vectors for spreading invasive plant and animal species, decreases disturbance from human activities, and functions as a biodiversity refuge and climate change buffer.

Other Plan Components – There would be no differential effects to forest planning species in alternative 1 from the proposed action.

Site-specific Measure – This is the area that differs from the other action alternatives. For rare plants and animals in set-aside lands, there would be no interference from humans. With 14 additional set-aside lands, some of the plan components to manage for rare plants would no longer apply in the set-aside areas (EMA-RIT-G-2, EMA-HUA-G-2, EMA-CAT-G-2, EMA-PIN-G-1, EMA-PEL-G-2, EMA-DRA-G-4). Fine-filter forest planning species are found in all ecosystem management areas and many of the additional recommended wilderness areas and wilderness study areas of alternative 1. Since there is little proactive management for species potentially threatened by stochastic events, the addition of set-aside lands is generally beneficial. However, for sites requiring active management, this alternative is generally less desirable than the proposed action. See the section on coarse-filter for a discussion of the different recommended wilderness areas that are beneficial.

Climate Change – See discussion in section on proposed action (and refer to the revised forest plan) for information on climate change. The addition of set-asides has great value as refuges for biological diversity and buffers from climate change. However, systems that are too far out of the historic range of variation are subject to catastrophic events. See the "Vegetation Communities," "Water Resources," "Soils," and "Special Areas" sections for a discussion of the different recommended wilderness areas that are beneficial.

Viability Conclusion – Because alternative 1 has more area without active management or human interference, there would be no threats from human-caused management in the set-asides and, therefore, no increased threat to the viability of species compared to the proposed action.

Alternative 2

Alternative 2 plan components are the same as the proposed action, except that there are additional Motorized Recreation Land Use Zones.

Invasive Species – In areas of additional Motorized Recreation Land Use Zones, there is a chance for an increased rate (but probably slight) of spread of Lehmann lovegrass.

Stochastic Events – There would be no differences from the proposed action effects for species threatened by the potential for stochastic events.

Vegetation Management – There would be no differences from the proposed action effects related to vegetation management.

Threats to Aquatic, Riparian, Seep, and Wetland Habitat – There would be no differences from the proposed action effects related to aquatic and near-aquatic habitat elements.

Motorized Recreation Land Use Zone– Motorized Recreation Land Use Zones are relatively localized and there would be no differences from the proposed action effects for any forest planning species.

Biophysical Features – There would be no differences from the proposed action effects to forest planning species.

Recreation and Special Uses – Effects would differ from the proposed action in that there would be slightly more use from all-terrain vehicles, but there would be no differential effects to forest planning species.

Other Plan Components – There would be no differences from the proposed action effects to forest planning species.

Site-specific Measures – There would be no differences from the proposed action effects to forest planning species.

Climate Change – See discussion in section on proposed action (and refer to the revised forest plan) for information on climate change. There would be no differences from the proposed action effects to forest planning species.

Viability Conclusion – Refer to the viability conclusion in the proposed action section. The proposed action and alternative 2 are identical.

Management Indicator Species – Affected Environment

Management indicator species were selected based on the criteria that their population changes are believed to indicate the effects of management activities being emphasized in the plan alternatives, so that the effects of each alternative on fish and wildlife populations can be estimated (Forest Service Manuals 2605 and 2620). The Coronado used the direction in the 1982 Planning Rule provisions and Forest Service guidance documents to help identify categories of species to consider, monitoring and selection criteria, and a process to follow for selection and documentation.

A species list for management indicator species was derived from a multiagency process that included the Coronado National Forest, U.S. Fish and Wildlife Service, and Arizona Department of Game and Fish. This process considered coverage of terrestrial and aquatic species, primary potential natural vegetation types in which the Forest Service expects to focus management activities, availability and ease of obtaining monitoring data, and responsiveness to management activities. The 1986 forest plan identified a number of management indicator species. These were added to a large list of additional potential species. The entire list was then subjected to assessment criteria. Each species was assigned weighted, numerical values to determine utility and feasibility as management indicator species. Weighting categories were distribution, abundance, vegetation community, management response, monitoring for cost and logistics, and monitoring for output quality. The list was then sorted by score—with higher scores suggesting better utility and feasibility for management indicator species—and by potential natural vegetation type.

Table 107 shows the final list for the Coronado National Forest management indicator species and their associated ecological communities, as approved by the forest supervisor. The species listed were analyzed for the purposes of comparing the alternatives in this environmental impact statement. More details on the selection of management indicator species are available in a wildlife specialist's report filed in the project record.

Acorn Woodpecker

Acorn woodpeckers occur in both the Madrean encinal woodlands and Madrean pine-oak woodlands. For the purposes of management indicator species, only the Madrean pine-oak woodlands habitat is considered here. Acorn woodpecker populations, as measured in the annual breeding bird survey, are stable. Habitat trends are declining in the Madrean pine-oak woodlands, particularly the mature oak component indicative of late-successional, open pine-oak woodlands which provides the best habitat for acorn woodpecker. The quality of acorn woodpecker habitat in Madrean pine-oak woodland is assumed to relate to the condition and trends as described in the "Vegetation Communities, Fuels and Fire" section. Conditions are characterized by an increase in overstory density and a decrease in herbaceous understory compared with desired conditions. Trends reported in 2009 were a continuation of those trajectories away from desired conditions (USDA FS 2009b). In 2011, large fires burned 15 percent of the Madrean pine-oak woodlands, with 5 percent, 6 percent, and 4 percent burning under low, moderate, and high severity, respectively. Current conditions may be represented by an increase in the early-seral, resprouter-dominated stages following moderate- and high-severity fire. The understory component may have increased in areas where fires burned with low severity (Schussman and Smith 2006).

Table 107. Management indicator species and their associated ecological communities for the Coronado National Forest

Species	Indicator Habitat	Existing Habitat Acres*	Primary Reasons for Selection
Acorn woodpecker	Madrean pine-oak woodland	141,638	Widespread and common across forest and monitored in breeding bird surveys. This species requires mature oaks, which are indicative of late-successional, open pine-oak woodlands.
Mexican spotted owl	Dry mixed-conifer Wet mixed-conifer	55,623	Species and habitat relationship well documented in literature, There is a standard protocol, recovery plan, and precedent for monitoring in the "Coronado National Forest Land and Resource Management Plan" biological opinion (LRMP BO) (USFWS 2012).
Sonoran Mud Turtle	Constructed and natural waters within the grasslands, Madrean encinal woodlands, and the Madrean pine-oak woodlands vegetation communities	Lentic acreage not calculated. Associated upland acres: 1,329,899	This species is a strong indicator of standing, perennial water. It is monitored in conjunction with American bullfrog (see "Monitoring Plan").

* The acres of species habitat do not vary much by each alternative; therefore, acres of habitat will remain the same for all alternatives including the no-action alternative.

Mexican Spotted Owl

Mexican spotted owls are widely distributed on the Coronado National Forest. They are most common in mixed-conifer forests dominated by Douglas-fir, white fir, or both. For the purposes of management indicator species, only the mixed-conifer habitat is considered here. The quality of Mexican spotted

owl habitat in the dry and wet mixed-conifer is assumed to relate to the condition and trends as described in the "Vegetation Communities, Fuels and Fire" section. Conditions in the dry mixed-conifer are characterized by 78 percent more closed canopy structural classes than the desired condition, which is 100 percent mature and old trees with regeneration and open structure. The wet mixed-conifer community is closer to desired conditions, although lacking in aspen and older age classes.

In 2011, large fires burned 33 percent of the dry mixed-conifer forest, with 15 percent, 12 percent, and 5 percent burned at low, moderate, and high severity, respectively. Eleven percent of the wet mixed-conifer forest burned, with 4 percent burning with low and moderate severity and 3 percent burning with high severity. Due to the high percentage of mixed-conifer forest affected, the 2011 fire season likely had a large impact on the condition of this community. A high proportion of large-diameter snags may increase the threat of Douglas-fir beetle and recurring fire, which could impact Mexican spotted owl habitat. Areas with some residual tree cover may see high ponderosa pine and Douglas-fir regeneration. In the wet mixed-conifer, the 2011 fire season likely promoted aspen regeneration.

Sonoran Mud Turtle

The Sonoran mud turtle inhabits perennial pools of surface water. Most of the available lentic surface water is now found in constructed waters (stock tanks, drinkers, wildlife waters). These are found throughout the Coronado National Forest where livestock grazing is permitted. There are a few small artificial lakes (Pena Blanca, Parker Canyon, Rose Canyon, and Riggs Flat) in the Tumacacori, Huachuca, and Pinaleño Ecosystem Management Areas, as well as adjacent valleys. Although this habitat element was not given a trend ranking in the ecological sustainability report (USDA FS 2009b), the population viability assessment (USDA FS 2011) used a ranking of "declining" for both current and future habitat trends. Virtually all remaining waters are degraded from historical (reference) condition. There has been a nearly categorical decline of aquatic species (USDA FS 2011). Most aquatic vertebrates that rely on perennial waters (fishes and many frogs) are federally listed as threatened, endangered, candidate, or Forest Service sensitive. There has been a massive reduction in range and occupied habitat for native fish (AGFD 2001), partly because existing habitats are of such poor quality that they cannot sustain native fish populations. Sonoran mud turtles, along with some other species (notably leopard frogs and Sonora tiger salamander) have adapted to constructed waters with natural banks (stock ponds). Water quantity in stock ponds is almost exclusively dependent on surface runoff from surrounding watersheds. Runoff with low sediment load is optimum, whereas runoff with high sediment load will fill the pond and reduce its water holding capacity. The majority of watersheds on the Coronado National Forest—numbering 152—is functioning properly and expected to deliver runoff with low sediment loads. Fifty-six watersheds are functioning at risk due to added runoff from high-density roads, high recreation impacts to riparian areas, high well water withdrawals of groundwater, mining impacts causing poor water quality, and poor fire regime condition class.

Management Indicator Species – Environmental Consequences

Table 108 summarizes the expected habitat and population trends of management indicator species by alternative. Further details about how alternatives would likely affect these management indicator species are described below. Under all alternatives, habitat quantity is not expected to change.

Acorn Woodpecker

No-action Alternative – The acorn woodpecker is not specifically addressed in the 1986 forest plan. There is guidance for leaving wood structure (standing, prostrate, and live trees) used by this species. However, there are no objectives for restoration of Madrean pine-oak woodlands. One parcel would be recommended for wilderness designation, which is a continuation of current policy and would not change the trajectory of the species or its habitat. As stated in the "Vegetation Communities, Fuels and

Fire" section under the no-action alternative, departure from desired conditions in the Madrean pine-oak woodland is expected to continue. Because of this, it would result in declining populations of acorn woodpecker.

Proposed Action – In the proposed action, this species is not specifically addressed with plan components, but the Madrean pine-oak woodland habitat is addressed. This habitat is outside the historic range of variation and is expected to remain outside the historic bounds, but there is an objective to treat 25,000 acres in the next 10 years, which would benefit acorn woodpecker populations by increasing the herbaceous understory in young and old pine-oak. Two parcels would be recommended for wilderness designation, which would add 13,082 acres where human disturbance would be limited in Madrean pine-oak woodland.

Table 108. Summary of effects to management indicator species habitat quality and population by alternative

Current Condition and Alternatives	Acorn Woodpecker	Mexican Spotted Owl	Sonoran Mud Turtle
Current Condition			
Habitat Quality	Stable	Declining	Declining
Population	Stable	Declining	Stable
No Action			
Habitat Quality	Declining	Declining	Declining
Population	Declining	Declining	Declining
Proposed Action			
Habitat Quality	Increasing	Increasing	Stable to increasing
Population	Increasing	Increasing	Stable to increasing
Alternative 1			
Habitat Quality	Increasing	Increasing	Stable to declining
Population	Increasing	Increasing	Stable to declining
Alternative 2			
Habitat Quality	Increasing	Increasing	Stable to increasing
Population	Increasing	Increasing	Stable to increasing

Although current levels of human disturbance in these areas do not appear to be a factor in the species abundance, wilderness designation would preclude larger disturbances such as mining and road building. Wilderness designation would also increase planning time and costs for vegetation treatments. As stated in the "Vegetation Communities, Fuels and Fire" section, the proposed action would result in stronger movement toward desired conditions than the no-action alternative. Because habitat conditions would be improving under the proposed action, populations of acorn woodpecker are expected to increase.

Alternative 1 – In alternative 1, all of the plan components for Madrean pine-oak woodland in the proposed action would apply. Additional parcels would be recommended for wilderness designation. The effects of additional wilderness designations on Madrean pine-oak woodland are disclosed in the "Vegetation Communities, Fuels and Fire" section. The acorn woodpecker occurs in all of these parcels. Wilderness designation would benefit acorn woodpeckers in that it would effectively reduce the possibility of future habitat fragmentation. Wilderness designation would also increase planning time and costs and reduce the options available for vegetation treatments. Mechanical treatments would not be allowed in these parcels, unless justified through additional process, including 10,000 acres of mastication in the Tumacacori Ecosystem Management Area prescribed in the proposed

action. Overall, wilderness designation may hinder treatments to achieve desired conditions in the following recommended wilderness areas: Chiricahua Additions West (418 acres) and North (503 acres), Jhus Canyon (2,223 acres), Tumacacori (245 acres), Dragoon (736 acres), and Galiuro (4,104). However, since the primary treatments in acorn woodpecker habitat would be prescribed fire, the hindrance in treatments would be minimal in these areas. Because of the reduction of potential for future habitat fragmentation and the minimal hindrance in treatments, alternative 1 would have greater benefits to the acorn woodpecker populations than either the no action or the proposed action alternatives.

Alternative 2 – In alternative 2, all of the plan components for Madrean pine-oak woodland in the proposed action would apply. In addition, the Motorized Recreation Land Use Zone would be enlarged and would include 627 acres of Madrean pine-oak woodland. No additional wilderness areas would be recommended. The effects of increased acreage of Motorized Recreation Land Use Zone on Madrean pine-oak woodland are disclosed in the "Vegetation Communities, Fuels, and Fire" section. In summary, alternative 2 could result in limited loss of this vegetation community. Although 649 acres is relatively small compared with total acres of Madrean pine-oak woodland on the Coronado, there would be increased possibility of development and disturbance on these acres. Therefore, under alternative 2, acorn woodpecker populations are expected to increase at a faster rate than for the no-action alternative, but a slower rate than expected under the proposed action or alternative 1.

Mexican Spotted Owl

No-action Alternative – The 1986 forest plan has many plan components for the management of Mexican spotted owl. However, this was regionally standardized guidance that does not apply well to the topogeographic and vegetation features of the Coronado National Forest sky island habitats. The main problem is that the guidance for silvicultural treatments is too restrictive (especially the 9-inch diameter cap), which may hinder forest restoration efforts. Additionally there are no objectives for restoration of mixed-conifer forests. The no-action alternative carries forward one recommendation for wilderness designation, the Mount Graham Recommended Wilderness Area, which includes 9 percent (4,999 acres) of the mixed-conifer forest. This is a continuation of current policy and would not affect the trajectory for the species. As stated in the "Vegetation Communities, Fuels, and Fire" section, under the no-action alternative, departure from desired conditions in the mixed-conifer forests is expected to continue. This would result in declining populations of Mexican spotted owl.

Proposed Action – The proposed action includes objectives, guidelines, and standards for Mexican spotted owl that are not as restrictive as the 1986 forest plan, but retain plan components to manage for late-successional forests and primary constituent elements (large trees and snags, protected activity centers, and other features). In addition, there are plan components specifically for the mixed-conifer forest, including an objective to treat 16,200 acres to maintain species diversity and an appropriate diversity of open conditions and structural classes. This would benefit the Mexican spotted owl. An additional parcel would be recommended for wilderness designation compared with the no-action alternative; however, the Ku Chish Recommended Wilderness Area contains only 268 acres of mixed-conifer forest. Importantly, wilderness designation would preclude the use of pheromone bubble packs to protect Mexican spotted owl habitat. This is a standard treatment used to disperse Douglas-fir beetles, therefore, protecting large nest and roost trees after fires. Although the Ku Chish area is small, the inability to use pheromone treatments within it could reduce the long-term sustainability of an entire Mexican spotted owl protected activity center. As disclosed in the "Vegetation Communities, Fuels and Fire" section, the proposed action would result in improved habitat conditions in the mixed-conifer forests. This outweighs and reduces the possible need for pheromone treatments in 268 acres of recommended wilderness. Therefore, the proposed action would result in increasing populations of Mexican spotted owl.

Alternative 1 – In alternative 1, all of the plan components for mixed-conifer in the proposed action would apply. Additional parcels would be recommended for wilderness designation. The effects of

additional wilderness designations on mixed-conifer are disclosed in the "Vegetation Communities, Fuels and Fire" section. Habitat for Mexican spotted owl, as represented by mixed-conifer forest, occurs in seven of these parcels. Wilderness designation would benefit Mexican spotted owl in that it would effectively reduce the possibility of future habitat fragmentation. Wilderness designation would also marginally increase planning time and costs and reduce the options available for vegetation treatments. Mechanical treatments would not be allowed in these parcels, unless justified through additional process.

Overall, wilderness designation may impede the implementation of treatments to achieve desired conditions for mixed-conifer in the following recommended wilderness areas: Dragoon (11 acres), Jhus Canyon (302 acres), Chiricahua Addition North (398 acres), Chiricahua Addition West (7 acres), and Galiuro Addition (455 acres). This acreage is small compared to the total of mixed-conifer communities on the Coronado; therefore, the effect of wilderness designation is minimal. Because of the reduction of potential for future habitat fragmentation and the minimal impediment of treatments, alternative 1 would have greater benefits to Mexican spotted owl populations than either the no action or the proposed action alternatives.

Alternative 2 – In alternative 2, all of the plan components for mixed-conifer forest in the proposed action would apply. In addition, no parcels would be recommended for wilderness designation and the Motorized Recreation Land Use Zone would be enlarged. The mixed-conifer forest is not represented in the enlarged Motorized Recreation Land Use Zone. Therefore, the environmental consequences of alternative 2 would be equivalent to those reported for the proposed action.

Sonoran Mud Turtle

No-action Alternative – The 1986 forest plan provides little guidance for management of native aquatic species. There are frequent references to making water available for livestock and that the presence of stock ponds benefits Sonoran mud turtles. However, there are no objectives for making waters available to native species such as the Sonoran mud turtle, which can tolerate limited drying but cannot use elevated developed waters (concrete or metal drinkers). There are no specific desired conditions or objectives for improving watersheds. This alternative would not focus treatments to improve watershed functions where they are most needed, resulting in reduced watershed function than could otherwise occur (see the "Water Resources – Environmental Consequences" section). These factors combined would result in lower quality of habitat for, and lower populations of, Sonoran mud turtles.

Proposed Action – The proposed action includes objectives and guidelines that would directly benefit Sonoran mud turtle in the "Natural Waters" section of the revised forest plan, but none in the "Constructed Waters" section. Nevertheless, this species is present in constructed waters that have natural banks. Specific plan components for overall watershed condition, moving watersheds toward proper function and prioritizing treatments where needed would benefit Sonoran mud turtle habitat and populations.

Alternative 1 – Alternative 1 includes all of the plan components beneficial to the Sonoran mud turtle and its habitat described in the proposed action. In addition, 16 parcels would be recommended for wilderness designations. As stated in the "Water Resources" section, this alternative would be the most limiting for upland watershed improvement activities. Also, the ability to maintain stock ponds is impeded by wilderness designation. Therefore, alternative 1 would be the least beneficial alternative for Sonoran mud turtle and its habitat.

Alternative 2 – The environmental consequences of alternative 2 to Sonoran mud turtle populations and habitat would be similar to those described for the proposed action, with the exception of the deserts, grasslands, and Madrean oak woodland areas within the expanded Motorized Recreation Land Use Zone. In these areas, there could be increased sedimentation in stock ponds as a result of

increased development and recreational traffic on roads and trails. This would result in lower capacity for water storage in stock ponds and higher probabilities of stock ponds drying out completely. This change would adversely impact habitat and survival of the turtle.

Migratory Birds – Affected Environment

Considered for the migratory bird analysis were: (1) birds identified as priority species in the Arizona Partners in Flight Bird Conservation Plan (APIF Plan; Latta et al. 1999) and (2) birds in Bird Conservation Regions 34 of U.S. Fish and Wildlife Service's 2008 Birds of Conservation Concern (BCC; USFWS 2008b) (table 109).

The Arizona Partners in Flight Plan and the Birds of Conservation Concern identify priority species of concern. Those that occur in Coronado National Forest habitats are analyzed. However, effects to Mexican spotted owl and northern goshawk are considered under the "Federally Listed Species," "Sensitive Species," and "Management Indicator Species" sections of this chapter and are not discussed here. Important bird areas are also addressed in this analysis. There are eight important bird areas on the Coronado National Forest: California Gulch (2,042 acres), Chiricahua Mountains (292,206 acres), Huachuca Mountains (101,028 acres), Santa Rita Mountains (138,767 acres), Tanque Verde Wash/Sabino Canyon (4,770 acres), Patagonia Mountains (62,400 acres), Pinaleño Mountains (151,198 acres) and Sycamore Canyon (in the Atascosas) (2,212 acres). A proposed important bird area, Tucson Sky Islands and Sonoran Uplands (327,637 acres), is partially located on the Coronado National Forest.

Table 109. Priority migratory birds and habitat

Species	Habitat	Potential Natural Vegetation Type
Golden-crowned kinglet Pine grosbeak Swainson's thrush Three-toed woodpecker	Spruce-fir	Spruce-fir
Olive-sided flycatcher	Mixed-conifer	Mixed-conifer
Cordilleran flycatcher Flammulated owl Grace's warbler Lewis' woodpecker Olive warbler Purple martin	Ponderosa pine	Ponderosa pine
Grasshopper sparrow Swainson's hawk	High elevation grassland	Montane and subalpine grassland Great basin grassland
Black-throated gray warbler Gray flycatcher Gray vireo Piñon jay Sage sparrow	Piñon-juniper	Piñon-juniper woodland Piñon-juniper evergreen shrub
Black-chinned sparrow Sage sparrow Virginia's warbler	Chaparral	Interior chaparral
MacGillivray's warbler Red-faced warbler	High elevation riparian	Montane willow Mixed broadleaf
Bendire's thrasher Sage sparrow		Desert communities Desert grasslands

Migratory Birds – Environmental Consequences

Effects Common to All Alternatives – The primary direction for management of migratory birds is contained within the Migratory Bird Treaty Act (MBTA), Executive Order (EO) 13186, and the 2008 memorandum of understanding titled: "Memorandum of Understanding between the U.S. Department of Agriculture Forest Service and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds." The memorandum lists many actions the Forest Service shall take, such as:

- address migratory bird conservation in developing, amending, or revising forest plans;
- participate in planning efforts of Bird Conservation Regions;
- evaluate effects of agency actions on migratory birds within the environmental analysis process;
- minimize effects to migratory birds;
- cooperate with land owners;
- support studies and research;
- recognize and promote the value of migratory birds to the public; and
- promote collaboration.

Applying the actions specified in the memorandum would contribute positively to migratory bird conservation for all alternatives, including the no-action alternative, by ensuring migratory birds are considered in forest planning and project environmental analysis, and by applying approaches for identifying and minimizing take that is incidental to otherwise lawful activities.

Forest Service management activities generally would not meet the definition of "take" under the Migratory Bird Treaty Act, which is "… to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR 10.12). Vegetation removal or destruction is not considered a taking; however, activities done during breeding seasons—such as hazard tree or snag removal, timber harvest, fuels reduction, and prescribed fire—could result in unintentional take if active nests with eggs or young are present in trees and shrubs or on the ground. These activities would occur under all alternatives considered in this analysis.

No Action – Except for migratory bird habitat in desert and grassland communities, current guidance considers migratory birds and their habitats and provides direction for improvement of habitats. Unintentional take could occur from management activities that destroy nests or kill individual birds.

Considering environmental and cumulative consequences common to all alternatives and the effects disclosed above, this action is likely to result in some unintentional take of migratory birds, but it is not likely to occur to such an extent that would have a measurable negative effect on migratory bird populations.

Proposed Action – Guidance in this alternative provides for migratory bird habitat through desired conditions, objectives, standards, and guidelines for the vegetation types. Additional general direction to improve habitats and maintain viable populations in forestwide wildlife direction also applies to migratory birds. Unintentional take could occur from management activities that destroy nests or kill individual birds.

Considering environmental and cumulative consequences common to all alternatives and the effects disclosed above, this action is likely to result in some unintentional take of migratory birds, but it is not likely to occur to such an extent that would have a measurable negative effect on migratory bird populations.

Alternative 1 – Alternative 1 would propose additional wilderness areas, totaling 255,908 acres and would result in stronger guidance and protections for migratory birds than any of the other alternatives.

Considering environmental and cumulative consequences common to all alternatives and the effects disclosed above, alternative 1 is likely to result in some unintentional take of migratory birds, but it is not likely to occur to such an extent that would have a measurable negative effect on migratory bird populations. This alternative has greater positive impacts on migratory birds and their habitats than alternative 2.

Alternative 2 – Alternative 2 is not as strong as alternative 1, overall, when considering the effects disclosed above because it is likely to result in some unintentional take of migratory birds; however, alternative 2 is not likely to occur to such an extent that would have a measurable negative effect on migratory bird populations.

Bald and Golden Eagles – Affected Environment

All golden and bald eagles are protected under the Bald and Golden Eagle Protection Act (Eagle Act). The purpose of the analysis in the following section is to determine if take is likely to occur with implementation of the alternatives. Take is defined in the Eagle Act as to "…pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest or disturb." Disturb is further defined as "…to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." Bald and golden eagles are also protected under the Migratory Bird Treaty Act, which also prohibits take.

The U.S. Fish and Wildlife Service recommends using the Conservation Assessment and Strategy for Bald Eagles in Arizona (Driscoll et al. 2006) in conjunction with the Bald Eagle National Management Guidelines (USFWS 2007b) to protect bald eagles in Arizona. For golden eagles, the U.S. Fish and Wildlife Service has issued a report titled Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance (Pagel et al. 2010).

Surveys for nesting bald eagles are led by the Arizona Game and Fish Department. The Department conducts fixed-wing flights for nesting bald eagle activity early each breeding season. Based on their survey results, Arizona Game and Fish Department assigns bald eagle nest watchers to monitor sites with active nests. Nest watchers monitor occupied sites from the first week of February through fledging in June.

National bald eagle winter surveys have been ongoing since 1979. They were initiated and organized by the National Wildlife Federation from 1979 to 1991 and have been coordinated by the Raptor Research Technical Assistance Center (Bureau of Land Management) since then. Arizona Game and Fish Department is the coordinating agency for the annual statewide survey. Golden eagles are also documented if they are encountered on survey routes.

Bald Eagles

Bald eagles are not only Southwestern Region sensitive species, but they also fall under the Bald and Golden Eagle Protection Act (Eagle Act). They are winter migrants on the Coronado. They are occasionally seen around the Coronado and have been recorded at Riggs Flat Lake. No known roost sites or nest sites exist on the Coronado. Eagles are often seen perched in trees or snags near water or next to roadways where they feed on road-killed animals. However, bald eagles are highly mobile in the winter, and they can fly great distances in search of aquatic or terrestrial prey and suitable nighttime roosting habitat.

Golden Eagles

Golden eagle nest surveys were conducted by the Arizona Game and Fish Department in January and March 2012 on the Coronado National Forest. Comprehensive cliff surveys were done in the Dragoon, Winchester, Galiuro, Santa Teresa, Whetstone, Santa Catalina, and Rincon Mountains and Mount Graham.

The categories listed below are large nest (large nest of unknown species and status), occupied (two golden eagles in the area of at least one large nest), active (golden eagle incubating), and sighting (golden eagle seen but no nest found). Overall, 2 breeding areas were found (1 active nest, 1 occupied), 22 other large nests, and had 7 additional sightings of golden eagles unassociated with nests.

- **Dragoon Mountains**: one large nest.
- **Mount Graham**: one occupied (pair perched together and one large nest nearby), one sighting (golden eagle perched), one large nest.
- **Winchester Mountains**: three sightings (two golden eagles perched together but no nest found – probably a territory; one eagle perched); one large nest. Also, three prairie falcons and one other large falcon (either prairie or peregrine) sighted.
- **Santa Teresa Mountains**: one active (golden eagle incubating), three sightings (two immature and one adult golden soaring together), six large nests.
- **Galiuro Mountains**: At least 22 large nests. Also, three peregrine falcons sighted.
- **Rincon Mountains**: Two large nests.
- **Santa Catalina Mountains**: At least four large nests. Also, one prairie falcon and three other large falcons (either prairie or peregrine) sighted.
- **Whetstone Mountains**: At least four large nests.

Bald and Golden Eagles – Environmental Consequences

Effects Common to All Alternatives – Forest Service authorized management activities generally would not meet the definition of take under the Eagle Act. However, some activities could result in disturbance to eagles during the breeding season, or disturbance near roost sites in the winter. Examples include timber harvest or thinning activities; road, trail, and facility construction; prescribed burning; and special use permits near eagle nests or roost sites. All projects and activities would be evaluated at the project level. If take is likely, a permit would have to be applied for, and issued by, the U.S. Fish and Wildlife Service before the activity could occur.

No Action – While future management activities could result in unavoidable take of bald and golden eagles, this alternative provides strong guidance to be applied at the project level for minimization of disturbance. Each project would be evaluated at the site-specific level, and each would require a take permit from the U.S. Fish and Wildlife Service if take is likely.

Considering all environmental and cumulative consequences, this alternative could result in unintentional take, as defined in the Eagle Act, for bald or golden eagles on the Coronado. However, take is not likely at the project level.

Proposed Action – This alternative has some guidance to be applied at the project level for minimization of disturbance. Each project would be evaluated at the site-specific level, and each would require a take permit from the U.S. Fish and Wildlife Service if take is likely.

Considering all environmental and cumulative consequences, this alternative could result in take, as defined in the Eagle Act, for bald or golden eagles on the Coronado. Guidance to minimize

disturbance effects under this alternative would not be as strong as alternative 1, which recommends the addition of 16 new wilderness areas, totaling 255,908 acres.

Alternative 1 – This alternative has some guidance to be applied at the project level for minimization of disturbance. The designation of 16 new wilderness areas does more to reduce the likelihood of take of eagles as compared to the other alternatives.

Considering all environmental and cumulative consequences, this alternative could result in take, as defined in the Eagle Act, for bald or golden eagles on the Coronado. Guidance to minimize disturbance effects under this alternative would be stronger than alternative 2, with the addition of 16 new wilderness areas.

Alternative 2 – This alternative would allow further construction of facilities to localize the impacts of motorized recreation into more developed settings; it would also provide fewer areas for quiet and nonmotorized recreation. This alternative has some guidance to be applied at the project level for minimization of disturbance. Each project would be evaluated at the site-specific level, and each would require a take permit from the U.S. Fish and Wildlife Service if take is likely.

Considering all environmental and cumulative consequences, this alternative could result in take, as defined in the Eagle Act, for bald or golden eagles on the Coronado. Guidance to minimize disturbance effects under this alternative would not be as strong as alternative 1, with the addition of 16 new wilderness areas.

Cumulative Effects – The spatial boundary for cumulative effects analysis for the biological resources in the planning process is termed the Madrean Archipelago or Sky Island Region. It essentially corresponds to the western one-half of M321, the Chihuahuan Desert Province (Bailey et al. 1995). This ecoprovince, which includes southeastern Arizona and southwestern New Mexico, is also known by other names in other classification systems, including the Apachean Ecoregion, Mexican Highlands Province, or Madrean Archipelago. Each classification system and authority has its own boundaries and rationale for selection. For our purposes (cumulative effects for biological resources), the boundary is the western half of the M321, the extreme eastern edge of M322, the American Desert and Semideserts Province, and the adjacent Madrean Archipelago (north of the Sierra Madre Occidental) of Mexico.

We include the eastern edge of M322 because there is some Sonoran Desert Ecotype on the Coronado National Forest but only the part that has the eastern limital faunal component (not species found in the western deserts). The Mogollon Rim is not included because there is a distinctive break in typical floral and faunal elements between the Mogollon Rim and Madrean Archipelago. For the same reason, the eastern half of M321 is excluded because there is a faunal break in Hidalgo County, New Mexico; east of this line are biota typical of the Chihuahuan Desert. This Sonoran and Chihuahuan Desert interface has been discussed extensively in the literature and is often referred to as the “Cochise Filter-Barrier” (Morafka 1977). We also do not recognize the political boundaries between the United States of American and Mexico, because Mexican sky islands and valleys and Arizona and New Mexico’s sky islands and valleys are contiguous and biologically (and geologically and climatically) related. Thus, our spatial bounds of analysis are defined by the Baboquivari Mountains to the west, the Animas Mountains (New Mexico) to the east, the Gila River to the north, and the Sierra Madre Occidental to the south (northern Sonora and extreme northwest Chihuahua). There is a small buffer around this area to accommodate land management that could affect the Madrean Archipelago.

The temporal bounds of analysis include 10 years into the future and 10 years into the past. For the future, this is the same as the period covered by most forest plan objectives. Generally, all past, present, and reasonably foreseeable future projects and plans are off-forest, because on-forest projects would be implementation of the 1986 forest plan.

Several categories of factors can contribute to cumulative effects: plans, such as land and resource management plans and wildfire protection plans (for these see the section on fire management); recovery plans, including safe harbor agreements, conservation agreements, and similar action plans; recovery actions, such as salvage, reintroduction, and translocations; ground-disturbing activities, such as mines, urban development, and fire suppression. The cumulative effects of these plans range from negative to the point of removing all useable habitats to beneficial for biological resources.

The Bureau of Land Management manages the Las Cienegas National Conservation Area east of the Santa Rita Ecosystem Management Area. This is a dynamic area for biological resource management because it is one of the few riparian and aquatic sites with remnant and diverse threatened and endangered fauna. The Las Cienegas National Conservation Area has native populations of Gila chub, Gila topminnow, desert pupfish, Chiricahua leopard frog, northern Mexican gartersnake, Huachuca water umbel, Southwestern willow flycatcher, and yellow-billed cuckoo. Black-tailed prairie dogs were extirpated from the Coronado National Forest during an extermination campaign, but the Arizona Game and Fish Department has reintroduced a population to the Las Cienegas National Conservation Area. Researchers here have been part of the National Fish and Wildlife Federation's Grassland Initiative, targeting the Madrean Archipelago. Other highly biodiverse valley riparian areas include the San Pedro River and Gila Box National Conservation Areas. These have been very important venues to recovery of native fishes. BLM also has resource management plans for the Muleshoe (southern Galiuro Mountains), Gila District (Safford and Tucson Field Offices), Dos Cabezas Wilderness, Red Canyon Wilderness, and Aravaipa Wilderness. National wildlife refuge plans includes the San Bernardino and Leslie Canyon National Wildlife Refuges. These are located in a critical area for wildlife conservation because they are the only source of Yaqui fish in the U.S., as well as the only remaining genetic stock of Chiricahua leopard frogs from the vicinity of the Chiricahua Ecosystem Management Area (type locality), needed for reintroduction on the Coronado National Forest. Frogs have already been breeding in the ranarium and onsite at the Southwest Research Station (American Museum of Natural History research facility).

Buenos Aires National Wildlife Refuge was established to maintain the only populations of masked bobwhite, but they may now be extinct in the wild, so the U.S. Fish and Wildlife Service is attempting to restore lands for reintroduction. There is only one unconfirmed sighting record of this species on the Coronado National Forest, adjacent to the national wildlife refuge in the Tumacacori Ecosystem Management Area, so this species has never actually been confirmed to occur on-forest. However, most of the management the refuge does is to restore habitat and populations of other native species. The refuge is primarily valley grasslands (but also includes the Baboquivari Sky Island), and is close enough to the Coronado National Forest that we have many of the same species and management issues. For example, the Chiricahua leopard frog metapopulation in the Tumacacori Ecosystem Management Area is linked to the Buenos Aires National Wildlife Refuge, as are invasive American bullfrogs. Also, the jaguar (nicknamed Macho-B) was a resident of Arizona for over a decade and alternated between traveling in the Baboquivari Mountains and Pajaritos (on the Coronado National Forest), crossing the grasslands. Together the management of biological resources is enhanced by dual management of Federal agencies.

There are Department of Defense installations adjacent to the Coronado National Forest, and they have management plans that include natural resources. The Department of Defense is not generally recognized as a land management agency, but in fact, the installations often lie in large, remote, lightly populated areas, where the ecosystems are less disturbed than most managed lands. There are more threatened and endangered species on Department of Defense lands than any other Federal land management agency. The Coronado National Forest works very closely with the Department of Defense on conservation issues.

A different type of Federal agency that impacts wildlife habitat conditions is the U.S. Border Patrol, a social/law enforcement agency. The job of Border Patrol is not to manage for conservation of rare

species, but to control illegal immigration and drug trafficking. Unlike other Federal agencies, there typically are not biologists employed by the agency. Many of their activities are, in fact, problematic for the biological resources mission of the Forest Service. For example, they have many roads that crisscross the lands near the border, which is the area with the highest biodiversity. Agents are typically not well versed in natural resource protection and they can use a waiver for national security to implement their mission and avoid environmental review. However, Border Patrol has a public lands liaison who works directly with the forest at both the district and forest level. This relationship affords both agencies to respond to immediate impacts to the environment, plan ahead and attempt to minimize Border Patrol impacts when operations are undertaken on the forest. For most activities the Border Patrol have land management agency liaisons and consultants that work with the U.S. Fish and Wildlife Service on threatened and endangered species. Border Patrol provided startup funding for research on threatened and endangered species by the border (cameras for jaguars and ocelots). The last 10 years has also seen an upswing in illegal border activity management, including the placement of pedestrian and vehicle barrier fences, an increased network of roads, the establishment of a security infrastructure, and increased number of border agents. These factors increase disturbance of wildlife and plants and influence the migration behavior and habitat extent of far-roaming species such as jaguar.

There are two national parks in the Madrean Archipelago managed by the National Park Service: Saguaro National Park and Chiricahua National Monument. Saguaro National Park was created to manage the proliferation of native giant saguaro cactus. The Park Service manages national parks to sustain native species by habitat restoration, as well as managing for wildlife populations directly. Chiricahua National Monument is contiguous to the Chiricahua Ecosystem Management Area. Although national parks cater to ecotourists and recreation uses as a large part of their mission, they also manage their lands for ecological resiliency and biodiversity, which is complementary to the forest plan. Many of the same native and invasive species cross the boundaries of these areas and so coordination between agencies is essential in holistic conservation programs and managing threats to population viability.

The states of Arizona and New Mexico each have agencies that manage plant and animal resources, most notably the Arizona Game and Fish Department and New Mexico Department of Game and Fish. Even though New Mexico is a very small part of the bounds of analysis (and Coronado National Forest), that small portion is extremely diverse and is situated near an international wildlife corridor of connecting mountains. Arizona Game and Fish Department has a strategic plan for 2007–2012 and a State wildlife action plan. Arizona Game and Fish Department and New Mexico Department of Game and Fish manage for a variety of wildlife issues, such as game management, nongame management, wildlife diseases, reintroductions, access, and wildlife linkages (corridors). There is also the State Lands Department and Arizona State Parks system. The former has a dynamic role with urban development and socioeconomic factors. The management of these State agencies complements the Forest Service's ability to achieve wildlife objectives and to manage for populations that are resilient to stochastic events. They also provide monitoring programs and data that are essential for evaluating movement toward desired conditions and the effectiveness of mitigations directed by the forest plan. Arizona Game and Fish Department also has a recent effort to map wildlife migratory paths across ownerships, which facilitates coordination in maintaining open space between the sky islands.

Each of the counties within the cumulative effects area have governments that manage their land base for a variety of reasons, such as camping, hiking, hunting, wildlife viewing, grazing, and resource extraction. Pima County is most noteworthy because it is at the interface of the Cochise Filter and Sonoran Desert, and is the urban hub of Tucson and outlying communities. Because of the large population and rapid urban growth, Pima County developed a Sonoran Desert Conservation Plan, which allows for developers to offset environmental impacts from private land development by contributing to a fund that purchases open space and restores lands that have been impacted by past activities. The Nature Conservancy is a nongovernment organization that manages lands in Ramsey

Canyon, Appelton/Whittell, Patagonia, and Aravaipa Canyon for biological resources. Each of these land bases has management plans and active restoration efforts that support species viability on the Coronado National Forest.

Ground-disturbing activities across land management agencies in the cumulative effects area include (but are not limited to) grazing, mining, urban growth, fire management, vegetation management, and road development. The Rosemont Copper Project in the Santa Rita Ecosystem Management Area would alter about 7,000 acres of habitat and affect a much larger area indirectly from light, noise, and traffic. This project would amend the forest plan to allow for disturbance associated with the mining that could contribute to the trend toward listing for Coleman's coral-root and Beardless chinchweed (USDA FS 2011b). There are several other potential mining projects, but they are mostly in the exploratory phase (small to medium scale drilling) and so the scale of their effects and what species they might impact is still unknown.

Urbanization has been increasing rapidly in the valleys of the Madrean Archipelago, although it mostly slowed since the 2008 recession. It has resulted in increased fragmentation of habitat between sky islands and loss of habitat for some populations on private land. Fire has been changing the landscape of the Madrean Archipelago, both on and off the Coronado National Forest. The management of other Federal and State land owners has been better coordinated because of the increasing risk of uncharacteristic fire but management of private land is not always directed toward the same objectives, which can lead to ignition sources and ecosystem conditions that can increase fire intensity and effects.

More than one-half of the Madrean Archipelago is in Mexico. Every few years, there is a symposium on the biodiversity and management of the Madrean Archipelago. The proceedings are published by the Rocky Mountain Research Station. These proceedings provide a good source of information on management of the sky islands. During the first two symposia, submissions were decidedly skewed to the U.S. portion, but the May 2012 symposium had a significant percentage of contributions from Mexican researchers and land managers, so this opened the door to learning more about how lands are managed and the state of conservation of species. The vast majority of lands are not managed by public agencies; rather they are managed by private holdings and often ejidos (communal farm and ranchlands). Management of the ejidos varies greatly, usually in response to the will of the community. Many ejidos are very conservation oriented and work with researchers for conservation goals. There are some biological reserves, such as the Ajos-Bavispe National Reserve and Sonoran Wildlife Refuge. Not far south of the border are two areas that are well known as having populations of jaguars and ocelots, and serve as research centers for those cats and many other species: Rancho El Aribabi and the Northern Jaguar Reserve. There is one very noteworthy Federal Government agency that deals with conservation in Mexico: CONABIO.[47] CONABIO is not a land management agency, however. They oversee research, maintain databases, and provide information that allows ranchos and ejidos to manage their lands. There are some conservation groups in Mexico as well; premier among them is Pronatura, an environmental group that works with its citizenry to advance knowledge of conservation of Mexico's diverse flora and fauna. The Universidad de Sonora is also very involved in biological research. However, as in the U.S., there are diverse attitudes toward the environment that result in difficulties in coordinating management across ownerships and even more so in Mexico because of the different land tenure system. For example, many ranchers in Sonora are actively helping the spread of Buffelgrass into native vegetation communities (notably the deserts) because it is a resilient food source for cattle. Although the plant is a serious invasive, it also helps fatten cattle for market, so it is important from a socioeconomic standpoint.

[47] http://www.conabio.gob.mx/

As a whole, the Madrean Archipelago is a changing and diverse social and ecological environment. The ground-disturbing changes resulting from urban development, illegal border activities, and Border Patrol activities, mining operations, and intensive wildfires from past management practices (overgrazing and fire suppression) are cumulatively degrading the natural environment and reducing the biological diversity and resources. One of the most critical problems is the loss of surface water and groundwater, which is causing a decline in aquatic species. These issues are exacerbated by drying climate trends.

Conversely, there are agencies at all levels of government, as well as nongovernmental organizations and private land owners, that are focused not only on mitigating negative effects of habitat degradation and fragmentation, but are actively working and cooperating to restore damaged ecosystems and bring back the native flora and fauna. Good examples of this are the efforts to restore vanishing aquatic fauna, working on landscape-level restoration projects (such as FireScape), and maximizing limited funding through extensive partnerships. Management of lands outside the Coronado National Forest is important for all aspects of management of biological resources. Some of the areas that manage primarily for conservation of biological diversity will be the likely source of recolonization of native species onto the Coronado or linkages between areas. The increased communications with researchers and managers of Mexico is extremely important in maintaining our biodiversity, such as the source of jaguars and ocelots to reestablish in the United States.

In this context, there are few differences in cumulative effects between the alternatives. The only difference is in alternative 1, which has a large number of recommended wilderness areas. Lands that set aside large areas for low-disturbance activities, like recommended wilderness, also occur in the form of national parks, Department of Defense lands, some Bureau of Land Management lands, some State lands, and across most administrations. These lands influence the pattern of development (urban, alternative energy sources) and reduce risk from threats to wildlands, native plants, and animals. Intact, unaltered habitat is extremely important in the face of climate change. Areas that retain biodiversity and act as a buffer from climate change allow plants and animals to persist in slowly changing landscapes. As a result, the plant and animals are more likely to persist than those in rapidly changing, altered environments.

Revision Topic 2: Visitor Experiences

Recreation – Affected Environment

The Coronado offers a variety of recreational activities: camping and picnicking, hiking, wildlife and scenic viewing, horseback riding, hunting and fishing, snow sports, rock climbing, and caving. Recreational use is heavy year round. Lower elevations, which support desert and grassland vegetation, are most popular from fall through spring. Higher elevations, with their shady conifer forests, are heavily used during the warmer months.

The Coronado National Forest offers 66 developed campgrounds and picnic areas, historic rental cabins, more than 1,100 miles of trails (including the Arizona National Scenic Trail and the Arcadia National Recreation Trail), several lakes, 3 scenic byways (Sky Island National Scenic Byway, Swift Trail Parkway, and Patagonia-Sonoita Scenic Road), designated mountain bike trails, and motorized touring areas. Currently, the Forest Service has authorized special recreational uses for recreation residences in three ecosystem management areas, several organization camps, a lodge, a ski area, and numerous outfitter and guiding activities.

Sabino Canyon and Mount Lemmon on the Santa Catalina Ranger District each receive more than 1 million visitors annually. Amenities at the Sabino Canyon Recreation Area, located adjacent to metropolitan Tucson, include a shuttle tour into the canyon, picnic areas, and interpretive facilities. In addition to developed recreation sites, the Coronado offers a wide variety of undeveloped recreation

settings for visitors to explore the backcountry on primitive roads and find solitude in eight congressionally designated wilderness areas.

The Coronado and Lincoln (New Mexico) National Forests have the greatest number of recreational caves in the Forest Service's Southwestern Region. Many on the Coronado are a legacy of historic mining in southeastern Arizona, there being thousands of abandoned mines, adits, and caves across the landscape. Some of these features have been remediated to eliminate health and safety issues and are no longer available for use by caving enthusiasts. Others are closed temporarily for the protection of special-status cave-dwelling species, especially bats, during maternity roosting seasons. The Coronado National Forest allows exploration on a case-by-case basis for those caves that are gated and locked. A refundable deposit is required for users to obtain an access key.

Information collected during national visitor use monitoring on the Coronado (USDA FS 2012) indicates that the five activities most popular with visitors are hiking or walking (75.6 percent participation), viewing natural features (67.4 percent), observing wildlife (65.9 percent), relaxing (45.9 percent), and driving for pleasure (23.9 percent). Nature center activities, nature study, and picnicking are also very popular (USDA FS 2012).

The increase in recreational use of the Coronado over the past few decades has been dramatic. According to national visitor use monitoring data, there were nearly 2.8 million visits to the Coronado during fiscal year 2007, most of them from the Tucson metropolitan area and nearby communities. Other visitors originated from across North America, and about 3 percent were foreign visitors. Demographically, a majority of visitors were male (58.5 percent), most were Caucasian (89.6 percent), and 13.9 percent were Hispanic.

Several new recreational issues and trends have emerged since the 1986 forest plan was developed:

- population growth in southeastern Arizona, which has accelerated the loss of natural landscapes (open space), decreased public access to the Coronado where residential and commercial land has been developed, and increased the number of forest visitors to the point where many recreation sites fill to capacity regularly;
- exponential growth in the popularity of certain recreational activities, such as mountain biking, off-highway vehicle use, and bird watching;
- recreation activities that were virtually unheard of at the time of the 1986 forest plan, including geocaching and paintballing;
- a decline in forest health and the effects of climate change, which have increased the incidence and probability of catastrophic wildfires and facilitated major insect and disease outbreaks that affect recreational settings;
- increased illegal activities along the international border with Mexico, combined with U.S. Border Patrol activities and facilities for managing illegal activity, which have changed recreational settings and compromised visitor safety; and
- decreased Federal funds for management of national forest recreation.

The recreation opportunity spectrum provides a framework that allows the Forest Service to manage a variety of recreation environments for visitors to enjoy. The settings are defined by a number of indicators: access, remoteness, naturalness, facilities and site management, social encounters, visitor impacts, and visitor management. Opportunities are provided along the spectrum from a very high probability of solitude, self-reliance, challenge, and risk (primitive) to very social experiences where self-reliance, challenge and risk are relatively unimportant (rural or urban). In 2000, when the hand-drawn recreation opportunity spectrum maps from the 1980s were converted to data using GIS and the Coronado's recreation opportunity spectrum settings were reviewed, a new class called "roaded modified" was identified and added to the recreation opportunity spectrum mapping.

Recreation – Environmental Consequences

Effects Common to All Alternatives

Recreation would continue to be managed by direction given in the Forest Service manual and handbooks, which provide general guidance, and a forest plan that provides direction specific to the Coronado National Forest. Caves would continue to be managed to provide recreation opportunities while protecting resources using an existing plan and other directives (Forest Service manual and handbook, cave management plans, and other guidance).

Recreation settings would continue to be managed for largely the same recreation opportunity spectrum settings under the existing plan or any alternative. This would result in approximately 87 percent of the Coronado continuing to be managed for primitive and semiprimitive settings that provide low development recreation opportunities. Therefore, a natural setting would be retained on most of the Coronado with management direction under all alternatives. However, under the proposed action, alternative 1 and alternative 2, future projects implementing the plan would have to also consider the desired conditions and guidelines of the project area's land use zone (see the "Proposed Action" section). Table 110 shows the recreation opportunity spectrum settings for the Coronado National Forest.

Table 110. Percent of Coronado National Forest in recreation opportunity spectrum classes[1]

Recreation Opportunity Spectrum Setting	Acres	Percent of Coronado National Forest acres[2]
Primitive	568,463	33.1%
Semiprimitive nonmotorized	304,333	17.7%
Semiprimitive motorized	640,354	37.3%
Roaded modified	109,630	6.4%
Roaded natural	93,443	5.4%
Rural	1,520	<0.1
Urban	402	<0.1
Total[3]	1,718,145	99.9

1. Definitions are provided in the glossary on page 448.
2. Percentages were rounded to the nearest tenth of a percent, which yielded slightly less than 100 percent.
3. Because of the data source, which has land boundary errors and includes private and state land, this total is more than the total acres of National Forest System lands on the Coronado National Forest.

No Action

If no action is taken, management of recreation would continue to follow the forestwide and management area-specific goals, objectives, standards, and guidelines in the 1986 forest plan.

The 1986 forest plan contains no desired conditions for recreation settings and features on the Coronado, making it difficult for managers to identify projects, set priorities, and measure progress toward improved resource conditions.

The no-action alternative includes standards and guidelines that are no longer needed or realistic given the current budget. Many of these recommendations are no longer forest priorities and, if followed, would direct recreation resources to projects that would provide few benefits to visitors.

The no-action alternative identifies management areas based on vegetation communities and slopes that do not reflect current use patterns and management needs. Because of this, recreation in these

areas is not easily managed for improved visitor satisfaction or protection of resources. This is because designations do not take into account social considerations or factors that influence the recreation settings, such as the presence of roads, facilities, and the types of recreation uses occurring in the area.

Management area direction in the 1986 forest plan provides few specifics other than allowing for dispersed recreation in most areas, nonmotorized, nonmechanized activities in Management Area 9, and developed facilities in Management Areas 3A and 3B. This provides only limited guidance for addressing current problems such as unmanaged recreation and user conflicts. In addition, Management Area 3A areas (existing developed recreation sites) are not depicted on any maps, and Management Area 3B areas (future developed recreation sites) would continue to be unused. Because there are so few places on the Coronado with appropriate topography and high demand for additional developed recreation facilities, Management Area 3B is considered to be unnecessary. Having management direction for areas that are unmapped or unused does not provide sufficient guidance for managers to prioritize developed recreation facilities or visitor needs.

Management area direction contains confusing standards and guidelines, such as “Manage dispersed use at a level of 100 percent reduced service,” which is not helpful in managing the recreation program to improve or make progress toward a desired condition.

In addition, the 1986 plan lists new construction and reconstruction projects for recreation sites and trails. This is problematic because priorities have changed and future funding is unknown. These outdated strategies do not help the Coronado meet visitor needs, manage limited budgets, or move toward the desired conditions for developed recreation facilities and visitor satisfaction. They also provide little direction on how to improve long-term forest health, which is critical to maintaining the recreation settings desired by the public.

The lack of current, scientifically sound guidance in the 1986 plan, especially desired conditions for recreation on the Coronado, makes it difficult for managers to plan projects that will preserve valued natural recreation settings, which are so important for recreation. Occasionally, this lack of clarity creates artificial conflicts between recreation and forest health goals because recreation uses and forest management activities are perceived as mutually exclusive. There is no distinction between short-term disruptions of the natural setting and visitor access versus longer-term alteration of the natural setting by uncharacteristic disturbance and its effects on recreation use and visitor satisfaction.

The 1986 plan contains no direction with regard to the management of forest resources in response to climate change. Because of this, forest natural resources and settings would likely be vulnerable to atypical temperature and rainfall patterns. As an example, drought induced by climate change (warmer/drier climate) may alter the availability of popular water-oriented recreation destinations, such as lakes, rivers, sports fisheries, and scenic features, such as waterfalls. Also, without management direction, vegetation would be less likely to adapt to, or be resilient to, changing conditions, which, in turn, may affect forage and habitat available to wildlife. Decreased populations of big and small game may result, which would have a negative effect on recreational hunting activity.

Proposed Action

The revised forest plan would include descriptions of desired conditions that provide a long-term, strategic vision for recreation across the Coronado and desired conditions that management should move toward or strive to attain. This would help forest managers set priorities, plan projects, and work toward improved resource conditions. For example, desired conditions describe separate areas for different types of motorized recreation activities (off-highway vehicle versus quiet recreation), which would help reduce on-the-ground conflicts from different user types.

The revised forest plan would provide land use zones that better reflect public use patterns and activities, especially recreation, in various areas. Land use zones complement recreation opportunity

spectrum settings by responding to public concerns about the need for "quiet" recreation settings, acknowledge the popular recreation areas on the Coronado where management of recreation is most intense, and provide areas for noise-generating activities, such as off-highway vehicle use.

Under the proposed action, the Wild Backcountry Land Use Zone provides opportunities for solitude and challenge. The Roaded Backcountry Land Use Zone provides for dispersed motorized and nonmotorized recreation activities. The Developed Recreation Land Use Zone is popular for day trips and destination-based recreation (lakes, campgrounds, skiing), and the Motorized Recreation Land Use Zone provides specific areas in three ecosystem management areas for off-highway vehicle recreation.

The plan would include recommendations for congressional designation of four areas as wilderness: two in the northern Chiricahua Mountains (Ku Chish and Chiricahua Addition North), one in the Whetstone Mountains, and the current Mount Graham Wilderness Study Area. The effect of recommending the Mount Graham Recommended Wilderness Area for wilderness designation would result in recreation settings nearly identical to the current conditions because the area would continue to be managed for primitive recreation opportunities (for more information see section entitled "Designated and Special Areas"). Although rugged topography already limits mechanized uses in the northern Chiricahua Mountains and Whetstones, managing the three areas as wilderness would provide another layer of protection to conserve the primitive characteristics of approximately 47,575 acres of natural, nonmotorized recreation settings. Mechanized uses, such as mountain biking, would not be permissible if Ku Chish and Chiricahua Addition North were designated as wilderness. However, these areas are very rugged and have limited trails, which are mostly used for hiking and horseback riding. The Whetstones do not have any trails. Therefore, management of Ku Chish, Chiricahua North, and the Whetstones as wilderness would not significantly affect mountain bike recreation. However, it would prohibit mountain biking, a restriction that favors nonmechanized uses.

The revised forest plan includes objectives, guidelines, and management direction that provide a framework for site-specific projects consistent with recreation plans and efforts of other entities. Current recreation concerns would be addressed, such as off-highway vehicle use, impacts of rock climbing, visitor safety, trash problems along the international border with Mexico, and access to public lands.[48] Guidelines would help develop design criteria for site-specific projects and, if followed, they would protect desired recreation settings by using standard architectural and Forest Service guidelines for built improvements.

The revised forest plan contains objectives and guidelines for treatments of vegetation that would improve forest health and resilience to wildfire, disease, and insect infestation. Improvement of forest health and resilience would, in turn, protect and enhance recreational settings by preventing uncharacteristic wildfire. Such fires may restrict public access to the area for several years because of safety concerns. These fires also alter the recreation setting by decreasing diversity, removing shade, destabilizing trails, and generally lowering the scenic integrity of the surroundings.

The proposed action includes desired conditions, guidelines, and management approaches for managing trails, including the Arizona National Scenic Trail, which would guide management of the corridor and help protect the natural and recreational setting for which it was designated. Direction to manage for appropriate recreation opportunity spectrum settings, utilize interim plans (including the "Arizona Trail Management Plan"), and provide needed trailhead facilities would help protect the resource and provide for visitors along the trail while a comprehensive management plan is prepared for the entire state.

[48] However, impacts from illegal activity and Department of Homeland Security counter-activity are outside the control of the Coronado and often override forest plan direction.

Suitability tables in the revised forest plan identify land use zones where facilities that can negatively impact recreation settings (such as transmission lines, observatories, and communication towers) may be located and where they are unsuitable. These types of facilities introduce urban elements into a natural landscape. Direction in the forest plan would provide forest managers with guidance for minimizing impacts of such facilities to recreation settings on the Coronado.

Because of increased temperatures and atypical rainfall patterns, climate change in the Southwest may shorten the opportunity for some recreational uses, such as cold-weather sports, and lengthen others, such as hiking, horseback riding, motorized recreation, and camping. It may also change the distribution of hunting and fishing opportunities because of changes in vegetation structure and composition and/or surface water quality and quantity, which can, respectively, alter terrestrial and aquatic habitat.

To maintain the quality and availability of multiple recreation opportunities and accommodate the increased use expected with future population growth, the revised forest plan under the proposed action includes desired conditions and management approaches for the Coronado's response to climate change. Complimenting desired conditions are strategies for responding to changing natural disturbances such as flooding, wildfire, and insect outbreaks (see appendix A of the revised forest plan). This direction would benefit recreational opportunities as they help manage forest resources into sustainable, adaptable, resilient, and diverse ecosystems that serve as the foundation for many and varied opportunities for recreational uses into the future.

Alternative 1

Alternative 1 would affect recreational use in the same manner as described above for the proposed action, although there would be a corresponding increase or decrease in effects, depending on the specific recreational activity (e.g., quiet solitude or mountain biking), as a consequence of the proposed recommendation of 16 areas for designation as wilderness. Approximately 15 percent of the Coronado (255,908 acres) in the Chiricahua, Dragoon, Galiuro, Peloncillos, Pinaleño, Santa Rita, Santa Teresa, Tumacacori, Whetstone, and Winchester Ecosystem Management Areas would be managed for wilderness character under alternative 1. Several recommended areas have very steep topography (Ku Chish, for example), and some do not have any trails (Chiricahua Addition West and Winchester), which limits some recreational uses, such as mountain biking.

Managing for wilderness character would conserve more acres of forest in natural appearing, nonmotorized settings of very high scenic quality than each of the other alternatives. This would appeal to nature enthusiasts and those who visit the Coronado for scenic vistas.

Motorized and mechanized uses, such as motor vehicle operation and mountain biking, are prohibited in wilderness. Because it recommends more wilderness than each of the other alternatives, alternative 1 would provide greater user opportunities for solitude and challenging remote recreation and the largest area available to users for nonmotorized recreation, especially hiking and backpacking. Most of the recommended wilderness areas have very steep topography, some have no trails (Chiricahua Addition West and Winchester), and some have very little mountain biking use, so the mountain biking would be most affected in the Dragoon, northern Chiricahua, Peloncillo, northern Santa Rita, and Whetstone recommended wilderness areas. Because there is no data on mountain biking use in the areas, quantifying effects is not possible. Mountain biking would be least affected in rugged, steep recommended wilderness.

Those areas proposed for wilderness designation that support many acres of the most unique natural vegetation (e.g., coniferous forests, meadows, riparian areas) on the Coronado are the Mount Graham, Ku Chish, Tumacacori, and Whetstone Recommended Wilderness Areas. Added protection would most benefit these special recreation settings.

Recreational use under alternative 1 would attract additional visitors who favor the ambiance of wilderness. This is likely a relatively minor positive effect in those areas that simply expand existing wildernesses, and much greater benefit in areas where entirely new wilderness areas would be created. The duration and magnitude of this effect is uncertain. It is likely that users who favor quiet recreation would benefit, and those who prefer motorized and mechanized recreation would not.

Because of restrictive standards and guidelines for motorized and mechanical uses in wilderness, this alternative would marginally increase the cost and impede the accomplishment of forest health improvement projects that would benefit recreation settings, and increase the complexity of fire management. If uncharacteristic wildfire occurs, long-term recreational settings would be adversely affected. This is most problematic in recommended wilderness areas that are highly departed from desired conditions, have heavy fuel loads and high vegetation densities, and are accessible by mechanized equipment (Dragoon, Galiuro, and Mount Graham). It is moderately problematic in recently burned areas that currently have lower fuel loads but may need future vegetation treatments to maintain desired conditions (Ku Chish, Chiricahua Additions West and North, Jhus Canyon, and Tumacacori). It is not a problem in recommended wilderness currently closer to desired condition or with difficult access that makes mechanical treatments impractical (Santa Teresa Additions North and South, Whetstone, Winchester, Mount Fagan, Mount Wrightson Addition, Bunk Robinson, and Whitmire).

Alternative 1 includes the same direction regarding climate change as the proposed action. Thus, the benefits to recreation described under the “Proposed Action” heading also apply to alternative 1.

Alternative 2

Effects on recreation under alternative 2 would be the same as those of the proposed action except: it recommends only one wilderness area, the Mount Graham Wilderness Study Area, does not provide for management of forest resources in response to climate change, it recommends less acreage to be designated for research natural areas, and most notably, it increases the number of acres of forest as Motorized Recreation Land Use Zones in the Santa Catalina, Santa Rita, Pinaleño, and Huachuca Mountains (see table 8).

Alternative 2 would not provide an additional nonmotorized recreation setting in the Chiricahua Mountains because it does not recommend the Ku Chish wilderness area. As a consequence, the additional resource protection of managing this area for wilderness character would not be realized.

Under alternative 2, 45,117 acres would be managed for motorized recreation, which is 10 times the area allocated to a motorized recreation zone by the proposed action and alternative 1. Motorized trails and/or facilities for off-highway vehicles (such as loading ramps) may be added. This would enhance recreational opportunities in designated places on the Coronado for visitors who enjoy off-highway vehicle touring.

Alternatively, although the Motorized Recreation Land Use Zone is just 3 percent of the Coronado National Forest, visitors who prefer quieter settings would be displaced to other areas.

Alternative 2 provides no plan components for management of forest resources to achieve resiliency and adaptation to changes that may result from warmer, drier climate conditions, which scientists currently believe will affect the Southwest as global warming occurs. It does, however, incorporate the strategies for management of climate change described in appendix A of the revised forest plan. Given the potential effects on seasonality and types of recreation use described under the “Proposed Action” heading, alternative 2 would be slightly less effective in managing the effects of climate change on recreational uses than the proposed action and alternative 1, and slightly more effective than the no-action alternative.

Cumulative Effects

Effects Common to All Alternatives

The cumulative effects analysis timeframe for recreation is 15 years and the spatial bounds of analysis for cumulative effects to recreation is the southeastern Arizona and southwestern New Mexico sky island region, including all of Cochise and Santa Cruz Counties, southern Pinal and Graham Counties, western Hidalgo County, and eastern Pima County.

The most profound effects to open space and outdoor recreation opportunities in southeastern Arizona are not from individual projects, but from multiple events and human activities over many years, including rapid population growth, border impacts, mining, and severe wildfires. Public recreation settings are often affected as numerous individual projects with relatively minor effects occur or are approved. Cumulatively, southeastern Arizona is slowly losing its once vast wild places.

However, other lands that provide natural landscapes and open space for outdoor recreation, and other entities that support public recreation and recreation settings, help mitigate this loss, and these are described in more detail below.

Table 111 describes the actions that, when considered additively with the effects of each alternative, may cumulatively affect recreation in southeastern Arizona. In addition to the actions listed in the table, the Rosemont Project, would eliminate public recreation access to as many as 7,194 acres in the northern Santa Rita Mountains. The mine would also permanently change the recreation setting from a natural area to an industrial landscape, eliminate one of two optimum off-highway vehicle recreation opportunities on the Coronado, and displace current users who would have to drive farther to find similar alternate opportunities. Displaced users may then move into other areas on the Coronado, which could result in visitor conflicts.

Cumulative effects resulting from the 1986 plan or any of the action alternatives would be similar.

Table 111. Actions and plans that could affect recreation on the Coronado National Forest

Types of Lands/Actions/Plans	Plans	Cumulative Effects
Other public land management agencies and private entities that provide outdoor recreation opportunities similar to the Coronado National Forest (such as lands with natural settings and facilities for hiking and camping)	• Arivaipa Canyon Wilderness and Wilderness Management Plan: BLM lands that provide primitive recreation opportunities and natural scenery. • Catalina State Park Management Plan: Coronado National Forest lands managed by Arizona State Parks for recreation opportunities (camping, trails, interpretation). • Chiricahua National Monument General Management Plan: NPS lands that provide recreation opportunities (camping, trails, interpretation) and wilderness. • Colossal Cave Mountain Park: Private park that provides outdoor recreation opportunities and natural scenery. • Dos Cabezas Mountains Wilderness Management Plan: BLM lands that provide primitive recreation opportunities and natural scenery. • Gila Box Management Plan: BLM lands that provide primitive recreation opportunities and natural scenery. • Ironwood Forest National Monument Resource Management Plan: NPS lands that provide recreation opportunities (mostly dispersed) and wilderness. • Las Cienegas Resource Management Plan: BLM lands that provide recreation opportunities (developed, primitive, interpretation) and natural scenery. • Middle Gila Canyons Transportation and Travel Management Plan: BLM lands that provide recreation opportunities and natural scenery. The goals of the plan are to preserve recreation opportunities (including off-highway vehicle use), protect natural resources, and provide public access. • Muleshoe Ecosystem Management Plan: BLM lands that provide primitive recreation and natural scenery. • Saguaro National Park General Management Plan: NPS lands that provide recreation opportunities (facilities, trails, interpretation) and wilderness. • San Bernardino and Leslie Canyon National Wildlife Refuge Comprehensive Management Plan: USFWS lands that provide wildlife-oriented outdoor recreation opportunities. • San Pedro River Riparian Management Plan: BLM lands that provide recreation and natural scenery. • Tucson Mountain Park: County park that provides outdoor recreation opportunities (including camping and trails) and natural scenery.	In conjunction with Coronado National Forest land management and the forest plan, the cumulative effects would be beneficial because people would be provided with a combination of lands for a wider variety of outdoor recreation opportunities and settings throughout the analysis area.

Types of Lands/Actions/Plans	Plans	Cumulative Effects
Other public agencies, governments, and partners that may not directly provide outdoor recreation opportunities, but help visitors access the Coronado National Forest, provide direction for conserving open space, provide outdoor education, and/or provide support (including funds) for the management of recreation opportunities on the Coronado.	• Arizona Long Range Transportation Plan: ADOT plan to provide multimodal transportation throughout the State for the next 25 years (including bicycling and access to recreation). • Arizona Statewide Comprehensive Outdoor Recreation Plan (SCORP) and New Mexico SCORP: State park plans that provide outdoor recreation supply and demand information helpful for budgeting and project planning on the Coronado. Arizona SCORP also provides criteria for Land and Water Conservation Fund and Heritage grants, which help the Coronado National Forest provide public recreation opportunities. • Arizona Trail Association Strategic Plan: Organization plan that provides strategic goals for the Arizona National Scenic Trail. • Corridor Management Plan for the Patagonia-Sonoita Scenic Road: ADOT plan that provides guidance for protecting recreation, open space, and scenery across multiple land ownership. • Development Operating, Education Shooting Sports, Off-Highway Vehicle, Watchable Wildlife, and Watercraft Program Plans: Arizona Game and Fish Department plans for managing and enhancing wildlife-oriented recreation (including fishing, boating, off-highway vehicles, wildlife viewing, hunting and shooting, and public access). • New Mexico Statewide Natural Resource Assessment and Strategy and Response Plans: State plan that provides guidance for conserving landscapes, recreation opportunities, open space, and scenic values. • Sky Island Scenic Byway Corridor Management Plan: Coronado National Forest plan that provides guidance for protecting recreation, open space, and scenery. • Sonoran Desert Conservation Plan: County plan that focuses on balancing urban growth and open space (including recreation and scenery). • Swift Trail Corridor Management Plan: ADOT plan that provides guidance for protecting recreation, open space, and scenery.	In conjunction with Coronado National Forest land management and the forest plan, the effects would be beneficial because land managers (including the forest) would be provided with strategic guidance, information, and other tools that provide residents and tourists with outdoor recreation opportunities throughout the analysis area.

Types of Lands/Actions/Plans	Plans	Cumulative Effects
Fire Management Plans: City, county, and Federal plans that provide guidance for managing fire on lands near the Coronado National Forest.	Arivaca Sasabe Community Wildfire Protection Plan; Cascabel Community Wildfire Protection Plan; Catalina Community Wildfire Protection Plan; Chiricahua National Monument Fire Management Plan; Coronado National Memorial Fire Management Plan; Ft. Huachuca Integrated Wildfire Management Plan; Gila District Fire Management Plan; Graham County Community Wildfire Protection Plan; Mt. Lemmon Wildland Urban Interface Plan; Pinal County Community Wildfire Protection Plan; Saguaro National Park Fire Management Plan; San Pedro Fire Management Plan; Sonoita Elgin Community Wildfire Protection Plan	In conjunction with Coronado National Forest land management and the forest plan, the effects would be beneficial because wildfire would be managed in a way that protects public safety, improves ecosystem health, and reduces the likelihood of catastrophic fires on the Coronado. This would help keep visitors in the analysis area safe and protect recreation settings and facilities from fire damage. Some plans even mention the need to protect recreation values and wilderness character, and provide specific guidance for protecting these resources.
Municipal plans: County plans that provide guidance for economic development and regional growth, while protecting amenities including tourism and open space.	• Cochise County Comprehensive Plan • Graham County Comprehensive Plan • Hidalgo County Comprehensive Plan Update • Pima County Comprehensive Plan Update • Pinal County Comprehensive Plan • Santa Cruz County Comprehensive Plan	In conjunction with Coronado National Forest land management and the forest plan, the effects would be a combination of positive and negative. Some effects would be beneficial because the growth of communities is planned in a way that strives to balance growth with recreation and open space, which helps reduce conflict between NFS lands and nearby municipal areas. Other effects would be negative because urban growth and development contributes to loss of open space and outdoor recreation opportunities throughout southeastern Arizona (i.e., reduced supply), and increased population leads to additional demand for recreation opportunities on the Coronado (i.e., increased demand).
Other land owners and managers adjacent to the Coronado National Forest not mentioned above who provide or support outdoor recreation	NA (No plans found or consulted)	In conjunction with Coronado National Forest land management and the forest plan, the effects would be beneficial because people would be provided with a wider variety of outdoor recreation opportunities throughout the analysis area and land managers would work together to manage open space and recreation opportunities. Specific benefits would include providing access to public lands, ensuring that trail corridors continue beyond the Coronado's boundary, and working toward healthier ecosystems in the analysis area.

NPS = National Park Service; BLM = Bureau of Land Management; ADOT = Arizona Department of Transportation; USFWS = U.S. Fish and Wildlife Service

Scenery – Affected Environment

One of the most distinctive features of the Coronado is its sky island mountain ranges that rise dramatically from a sea of surrounding desert. Elevations range from 3,000 to 10,720 feet above sea level. The Coronado's 1.7 million acres are subdivided into 12 ecosystem management areas, each of which includes at least one mountain range. Visitors enjoy vast open spaces and a variety of natural landscapes, including deeply carved desert canyons, riparian corridors with towering sycamores and cottonwoods, rolling grasslands, oak woodlands, and mountaintop conifer forests. The Coronado's sky islands also provide a scenic backdrop to cities and roads in the surrounding desert.

The report of the President's Commission on Americans Outdoors (1987) states that America's most important attribute for a recreation area is natural beauty. Viewing natural scenery, sightseeing, driving for pleasure, and photographing flowers, trees, scenery, and wildlife are among the Nation's highest-ranking recreational activities (Cordell 2008). The Coronado National Forest is a regional, national, and international year-round recreation destination. According to the 2012 National Visitor Use Monitoring report, more than 67 percent of visitors to the Coronado participate in viewing natural features (scenery), the second most popular primary activity after hiking or walking. Additionally, more than 25 percent of visitors to the Coronado were reported to have traversed a scenic byway.

Although scenic quality on the Coronado is generally acceptable, its landscapes have been impacted, to varying degrees, by management of multiple resources. Resource management activities that have altered scenic resources include, but are not limited to, vegetation management, mineral extraction, roads, campgrounds and picnic areas, fire management (suppression and prescribed burning), and livestock grazing. Additionally, the Coronado's scenic integrity is vulnerable to several growing threats. Throughout the forest plan revision process, the Forest Service received many comments from the public about this topic. One comment in particular captures the opinion of many others:

> What people are valuing now is the pristine quality of the sky islands. That is what these people (new residents) are looking for. But, that pristine quality is being affected by population growth and increased pressure on the resources.

Several scenic resource issues and trends have emerged or grown worse since the 1986 forest plan was developed, including the following:

Population Growth and the Resulting Loss of Open Space and Natural Landscapes. According to the U.S. Census Bureau, Arizona's population in 1912 (the first census taken after the Coronado was established in 1905) was approximately 204,354. In contrast, in 2005, Arizona's population was more than 6 million, and the state was reported to have the fastest rate of population growth in the country (Arizona State Parks 2008). The population of southeastern Arizona continues to grow. The Tucson metropolitan area population is now more than 1 million people (Pima Association of Governments 2009). Other cities and towns and leapfrog developments near the Coronado are spreading across the landscape; in many locations, housing, resorts, and commercial development parallel the national forest boundary. Arizona's population is expected to grow to over 12 million people by 2050 (Arizona State Parks 2008).

International Border Activities. Approximately 58 miles of Coronado National Forest are adjacent to the international border with Mexico. Illegal immigration, drug smuggling, and law enforcement activities affect scenic quality and alter forest landscapes. According to the U.S. Department of Homeland Security, in each year since 1998, the U.S. Border Patrol (Tucson, Arizona, sector) has had the largest number of apprehensions in the Southwest, and in 2008, 317,709 or 45 percent of all Southwest border apprehensions. In reality, the total number of illegal border crossings is likely much greater.

In recent years, a large percentage of illegal activities have occurred on forest lands because of increased security off-forest. Impacts on the Coronado from immigration and smuggling include

the creation of numerous unauthorized roads and trails and extensive trash and debris piles. U.S. Border Patrol infrastructure and operations have necessitated the creation of numerous new roads, fences, walls, and surveillance towers. Effects from these activities now extend many miles into the Coronado, not just along the physical border with Mexico.

Communication Towers and Power Lines. As the population grows, additional communication towers and power lines are needed. Requests to site such facilities on the Coronado continue to increase. Construction of cell phone towers across southeastern Arizona's landscapes is among the most recent related activity that negatively affects numerous viewsheds. On the Coronado, there is a major electronic site in the Santa Rita Mountains that does not conform to the guidelines established in the 1984 electronic site management plan that limit the height to reduce scenic impacts. This tower is now visible on the ridgeline from many miles away.

Astrophysical Developments. Southern Arizona has clear, dark skies—features that make the area ideal for viewing the heavens. It has come to be known as the astronomy capital of the world. The Coronado's sky island mountain ranges are ideal for astrophysical sites. These facilities are generally located atop mountain peaks where dust and light pollution are minimal. Although some people consider these a sightseeing opportunity, the light-colored observation structures of these facilities contrast strongly with the natural landscape and are visible from many miles away, which negatively affects the scenery valued by most visitors. Access roads to the sites add negative impacts to scenic quality.

Off-Highway Vehicle Use and Non-National Forest System Roads. According to the Arizona State Parks Department (Arizona State Parks 2008), off-highway vehicles are four times as popular as they were a decade ago, and in the West, off-highway vehicle sales are double the national average, having increased 154 percent in 5 years. Off-highway vehicle use is an increasingly popular activity in many areas on the Coronado. In fact, off-highway vehicle recreation is one of the fastest growing activities on public lands in the Nation. While off-highway vehicle use on many National Forest System roads is an appropriate recreation activity, some users drive off road, where they create unauthorized roads. Off-road vehicle use damages fragile desert vegetation and soils, and because desert soils tend to be much lighter in color than the vegetation, creates strong scenic contrast. With little topsoil and arid conditions, scars do not heal quickly.

Mining. Rich mineral resources on the Coronado have supported mining activity since the mid-1800s, before the Coronado was officially designated. Mines and quarries often result in vegetation clearing, roads, open pits, waste rock piles, and facilities that contrast sharply with line, form, color, and texture found naturally in the landscape. Mining and mineral exploration has increased significantly in recent years. Unfortunately, reclamation of past mines has rarely been adequate to restore scenic quality. A limestone mine in the Santa Rita Mountains has left a large white scar that can be seen from at least 30 miles away in Tucson. The Rosemont Copper Project will disturb about 3,670 acres of National Forest System land.

Declining Forest and Ecosystem Health. Although wildfires and insect and disease outbreaks are natural processes, in recent years these disturbances have far exceeded the typical scale, intensity, and frequency on the Coronado. Fire suppression, drought, and climate change are the likely causal factors. Because of these events, scenic quality has been adversely affected across entire viewsheds for decades.

The Forest Service visual management system (USDA FS 1974), which was used in the 1986 forest plan, and the improved scenery management system (USDA FS 1995), which is used in the proposed action and alternatives 1 and 2, provide a framework to inventory, assess, and manage scenic resources.

In the early 1980s, scenic resources on the Coronado were mapped and visual quality objectives were established. In 2001, a new inventory of the Coronado was completed using the scenery management system in the "Scenery Management System Handbook" (USDA FS 1995). In 2012, this inventory was updated using new vegetation data and computer visibility mapping. The Scenery Management System inventory includes mapping of:

- scenic integrity (the existing condition of scenic resources);
- scenic attractiveness (the intrinsic scenic beauty of a landscape based on land form, rock form, water form, and vegetation);
- concern levels (the relative concern for scenery along roads and trails);
- visibility (the foreground, middle ground, and background areas visible from roads and trails); and
- scenic classes (the relative importance of scenery).

In 2012, recommended scenic integrity objectives (SIOs) were reviewed by the forest plan revision interdisciplinary team and forest leadership to ensure compatibility with other resources.

Scenery – Environmental Consequences

Effects Common to All Alternatives

Under all alternatives, scenery would continue to be managed by direction given in Forest Service Manuals and Handbooks, which provide general guidance; and a revised forest plan, which provides direction specific to the Coronado. Direction under the action alternatives would reference maps that show scenery integrity objectives that must be followed during project planning. The 1986 plan would reference visual quality objectives currently applicable to scenic integrity.

Coronado lands would continue to be managed primarily for natural landscapes and scenic quality. However, because national forests are managed for multiple uses and forest plans are subject to amendment, projects that have the potential to adversely affect scenic qualities may be approved pending appropriate environmental analysis and public involvement.

No Action

Under the no-action alternative, management of scenic resources would continue to adhere to the forestwide and management area-specific goals, objectives, standards, and guidelines in the 1986 forest plan.

The 1986 forest plan contains no desired conditions or vision for management of future scenic quality on the Coronado, making it difficult for managers to set priorities, plan projects, and improve resource conditions. For example, the 1986 forest plan does not mention that healthy, fire-resistant vegetation (vegetation conditions that allow fires to move through without doing major damage and that recover relatively quickly from fire) is important for long-term scenic quality.

The 1986 forest plan includes standards and guidelines that provide general guidance for mitigating project effects to scenery (such as "maintain and protect the visual integrity of the landscape"), but also contains direction for projects that are no longer needed or feasible with current funding, such as recommendations for viewshed corridor plans and an inventory of visual absorption capability.[49] Many of these recommendations are no longer priorities or are inconsistent with the current best practices in managing scenic resources.

[49] Visual absorption capability is a classification system used to denote relative ability of a landscape to accept human alterations without loss of character of scenic quality.

Management areas in the 1986 plan do not reflect current public use areas and associated landscapes, nor are there any management areas where scenic quality is the focus. Management area direction would continue, but would provide few specifics other than the number of acres to be managed for each visual quality objective. Scenic quality would not be managed in ways that improve visitor satisfaction or protect scenic resources.

Standards and guidelines would not provide specific direction for special uses, such as electronic sites and observatories, which can negatively impact scenic quality.

Visual quality objective maps would continue to be used during project planning. These maps do not reflect changes in visitor use patterns and wilderness boundaries that have been designated since the early 1980s, do not incorporate views from trails, do not reflect current public opinion (especially concerns about open space and scenery), do not incorporate existing forest uses that necessitate lesser visual quality objectives (such as existing electronic sites), and do not reflect a regional (sky island) landscape context. Additionally, visual quality objectives assume all human modifications are negative, even historic sites, well-designed buildings (such as visitor centers), and manmade features such as campgrounds. Hence, visual quality objectives do not provide adequate guidance for protecting scenic quality or moving toward desired conditions. Table 112 lists the visual quality objectives for the Coronado National Forest in the 1986 plan.

Table 112. Visual quality objectives in the 1986 forest plan

Visual Quality Objective	Acres	Percent of Forest
Preservation: Allows for ecological changes only.	399,604	22.6
Retention: Provides for management activities that are not visually evident.	213,678	12.1
Partial retention: Provides for management activities that are visually subordinate to the characteristic landscape.	507,145	28.6
Modification: Management activities may visually dominate the original characteristic landscape, but must utilize naturally established form, line, color, and texture to be compatible with the natural surroundings.	466,957	26.4
Maximum modification: Management activities of vegetative and landform alterations may dominate the characteristic landscape, but when viewed as background, they must appear as natural occurrences.	183,657	10.4
Total	**1,771,041***	**100.1****

*Total acres are based on digitized, pre-GIS maps. These acres include private lands within the national forest boundary.

**Percentages were rounded to the nearest tenth of a percent, which yields slightly more than 100 percent.

The 1986 plan contains no direction with regard to the management of Coronado National Forest resources in response to climate change. Because of this, natural resources and settings would likely be vulnerable to adverse effects of atypical temperatures and rainfall patterns, which include drought, increased number and intensity of wildfires, increased insect and disease outbreaks affecting vegetation, and decreased water yield and availability. As an example of an effect on scenic quality from the lack of climate change direction, if vegetation management and fuels reduction projects do not occur and drought is induced by climate change, it could lead to severe wildfires, which would likely negatively affect forest vegetation and the scenic quality of the landscape. Likewise, heavy runoff from extreme storms may remove understory vegetation, especially in areas that have burned, which would reduce the quality of scenic vistas.

Proposed Action

The revised forest plan under the proposed action describes desired conditions that present a vision for scenic quality and its management across the Coronado and provides goals on which management would focus. This would help Coronado National Forest managers set priorities, plan projects, and work toward an improved resource condition. For example, the revised forest plan clearly states that healthy, fire-resistant vegetation is important for long-term scenic quality.

The revised forest plan would replace visual quality objectives with the Forest Service Scenery Management System and establish scenic integrity objectives, which use current visitor use patterns and concern for scenery, recent vegetation mapping, and computer-based visibility mapping. The very high, high, and moderate scenic integrity objectives result in a relatively natural-appearing landscape.

"Research has shown that high-quality scenery, especially that related to natural appearing forests, enhances people's lives and benefits society" (USDA FS 1995). The proposed action manages more acres for very high and high scenic integrity objectives than the 1986 forest plan does for comparable objectives (visual quality objectives of preservation and retention). This would result in a more intact and attractive scenic setting for forest visitors and residents.

Scenic integrity objectives would help protect and improve scenic quality across most of the Coronado, yet in some locations scenic integrity objectives would be lower to allow for necessary and accepted land uses that have poor scenic quality, such as at electronic sites and some portions of the international border. Table 113 shows scenic integrity objectives for the Coronado as specified in the revised forest plan.

Table 113. Scenic integrity objectives in the revised forest plan under the proposed action

Scenic Integrity Objective	Acres	Percent of Forest
Very high: Landscapes where the valued character is intact, with only minor deviations (such as ecological changes, hiking trails, and occasional range fences).	447,178	25.1
High: The valued landscape character appears intact, though roads provide access to the national forest and places from which to view scenery. Activities may only repeat attributes of form, line, color, and texture found in the existing landscape character.	1,314,710	73.7
Moderate: The valued landscape appears slightly altered. Facilities in these areas are those valued by forest visitors (such as campgrounds and picnic areas) and privately owned recreation areas (such as summer homes, organization camps, lodges, and ski areas). Areas rated as moderate are relatively small. Noticeable deviations must remain visually subordinate to the landscape character being viewed.	20,725	1.2
Low: The valued landscape appears moderately altered. Deviations begin to dominate, but repeat form, line, color, or texture common to the landscape character. Areas rated as low are relatively small.	198	<0.1
Very low: Human activities may dominate the original, natural landscape character but should appear as natural occurrences when viewed at background distances. Areas rated as very low are relatively small.	1,159	0.1
Total	**1,783,970**	**100****

**Percentages were rounded to the nearest tenth of a percent, which yields slightly more than 100 percent.

Wilderness and recommended wildernesses have a scenic integrity objective of very high. Developed recreation sites (including campgrounds, picnic areas, recreation residences, and areas managed for scenic integrity objective use) usually have a scenic integrity objective of moderate. Communication

sites, astrophysical sites, transmission lines, the international border, active mines, and other utilitarian areas have scenic integrity objectives of low or very low. The remainder of the Coronado has a scenic integrity objective of high.

Four areas would be recommended for wilderness designation under the proposed action, the present Mount Graham Wilderness Study Area, and Ku Chish, Whetstone, and Chiricahua Addition North. This would afford additional protection for approximately 108,890 acres of natural settings and scenic quality in these areas because of restrictions on new development and facilities, which often negatively impact scenic quality.

Managing four areas as recommended wilderness would marginally increase the cost and reduce the ability of the Forest Service to implement forest health improvement projects that would benefit long-term scenic quality. It would increase the complexity of fire management because of restrictive standards and guidelines for wilderness, especially those with regard to motorized and mechanized uses. In turn, more careful planning would be necessary. This is most problematic in the Mount Graham recommended wilderness because it is highly departed from desired conditions and has heavy fuel loads and vegetation densities. It is moderately problematic in recently burned areas that currently have lower fuel loads but may need future vegetation treatments to maintain desired conditions (Ku Chish and Chiricahua North). It is not a problem in the Whetstone recommended wildernesses because this area is currently closer to desired condition and have very difficult access, both of which make mechanical treatments impractical.

Under the proposed action, the revised forest plan would provide objectives, guidelines, standards, and management approaches that create a framework for future site-specific projects consistent with other scenery-related plans and efforts, such as corridor management plans for scenic roads and scenic byways. These would help address current scenic quality issues with structures and activities such as off-highway vehicle use, the international border with Mexico, and communication sites, towers, and transmission lines. Land use zones and suitability tables would help direct these uses to acceptable locations on the Coronado, identify where new facilities are appropriate (and not appropriate), and along with guidelines, would help reduce impacts.

The revised forest plan would include guidelines that would result in facilities that complement and blend with natural landscapes, which would help protect natural settings valued by visitors.

Objectives and guidelines for treatments of vegetation in the revised forest plan would improve forest health and resilience to wildfire, disease, and insect infestation, which would, in turn, enhance and protect long-term scenic quality. Forest health projects usually create scenic quality changes in the short term (sometimes ranging from 3 to 5 years) in order to maintain long-term scenic quality. The proposed action allows for these short-term effects and would simplify the implementation of such projects, which would reduce the adverse effects that catastrophic wildfires have on scenic quality.

The revised forest plan would include guidelines for lessening the short-term effects of vegetation management projects. These projects benefit scenic quality in the long term by supporting more resilient ecosystems with fewer uncharacteristic disturbances. However, these guidelines allow for short-term unsightly features (such as slash piles and stumps) that detract from scenic quality but allow for the management needed to maintain scenic integrity in the long term. Guidelines in the revised forest plan would help these projects blend in with the natural landscape and would help protect scenic quality.

“Suitability” tables are included in the revised forest plan to identify locations within land use zones and specially designated areas where facilities that may adversely affect scenic quality (transmission lines, observatories, and communication towers) are not appropriate. These types of facilities, which are typically authorized by special use permits, introduce urban elements into a natural landscape. Direction in the revised forest plan would provide decision makers with guidance for minimizing the

effects of such facilities on forest scenic resources. A list of communications sites (appendix C in the revised forest plan) identifies appropriate places for facilities, which would help reduce impacts to scenic resources.

The revised forest plan under the proposed action includes desired conditions and management approaches that will guide the Coronado's future response to climate change (see proposed action, revised forest plan). Complementing desired conditions are management approaches that tier from the climate change response strategies described in appendix A of the revised forest plan. Included in these strategies is guidance that aids in planning a forest management response to extreme weather events and wildfire, both of which destroy native vegetation and scar the landscape in various vegetation communities at all elevations; and managing the restoration of resources and ultimately, scenic quality, in the aftermath of such events. Direction in the revised forest plan under the proposed action would, therefore, facilitate the adaptation and resiliency of forest vegetation to climate-induced events. Hence, the quality of vegetative landscapes on the Coronado would be maintained or improved under the proposed action.

Alternative 1

Alternative 1 would have the same effects on scenic quality listed above for the proposed action, but they would be increased because of the recommendation of additional parcels for wilderness designation. These additional areas are located in the Chiricahua, Dragoon, Galiuro, Peloncillo, Santa Rita, Santa Teresa, Tumacacori, and Winchester Ecosystem Management Areas.

Because of restrictions on the new development and facilities and motorized and mechanized uses in wilderness, management of 16 areas as recommended wilderness would enhance the conservation of natural settings and preserve scenic quality on 255,908 acres (approximately 15 percent of the national forest). Forest parcels with the greatest number of unique vegetation communities (coniferous forests, meadows, riparian areas) are in the Mount Graham, Ku Chish, Tumacacori, and Whetstone Ecosystem Management Areas.

Managing 16 areas as recommended wilderness would marginally increase the cost and reduce the ability of the Forest Service to implement forest health improvement projects that would benefit long-term scenic quality. It would increase the complexity of fire management because of restrictive standards and guidelines for wilderness, especially those with regard to motorized and mechanized uses. In turn, more careful planning would be necessary. This is most problematic in recommended wilderness areas that are highly departed from desired conditions, have heavy fuel loads and vegetation densities, and are accessible by mechanized equipment (Dragoon, Galiuro, and Mount Graham). It is moderately problematic in recently burned areas that currently have lower fuel loads but may need future vegetation treatments to maintain desired conditions (Ku Chish, Chiricahua Additions West and North, Jhus Canyon, and Tumacacori). It is not a problem in recommended wildernesses that are currently closer to desired condition or have very difficult access, both of which make mechanical treatments impractical (Santa Teresa Additions North and South, Whetstone, Winchester, Mount Fagan, Mount Wrightson Addition, and the Bunk Robinson and Whitmire Wilderness Study Areas).

Table 114 reports the scenic integrity objectives specified under alternative 1. Because alternative 1 provides the same draft revision plan direction as the proposed action regarding climate change, its benefits on forest scenic resources and integrity would be the same as those described above under the "Proposed Action" heading.

Table 114. Scenic integrity objectives under alternative 1

Scenic Integrity Objective*	Acres	Percent of Forest
Very high	599,224	33.6
High	1,162,685	65.2
Moderate	20,730	1.2
Low	204	<0.1
Very low	1,128	0.1
Total	1,783,970**	100.1***

* Refer to table 113 for definitions.

** Total acres do not exclude private lands within the national forest boundary.

*** Percentages were rounded to the nearest tenth, which yields slightly more than 100 percent.

Alternative 2

Alternative 2 would have the same effects on scenic quality as the proposed action, with the exception that alternative 2 would recommend only one wilderness area and would increase land allocations for areas for motorized recreation in Motorized Recreation Land Use Zones in the Santa Catalina, Santa Rita, Huachuca, and Pinaleño Mountains. Thus, additional protection of scenic quality in wilderness afforded by management under alternative 1 and the proposed action would not be realized, and additional effects on scenic quality may result from increased motorized recreation.

Alternative 2 may increase negative effects on scenic quality as a consequence of user-created roads and trails and construction of new facilities in the additional areas allocated for motorized recreation; and the vegetation damage and exposure of bare soils that would result from concentrated off-highway vehicle use and off-road vehicle use.

Alternative 2 provides no plan components for management of Coronado National Forest resources to achieve resiliency and adaptation to changes that may result from warmer, drier climate conditions that are expected in the Southwest. It does, however, incorporate the strategies for management of key climate change factors that can alter the landscape (see appendix A of the revised forest plan). Events that disturb the natural landscape as a consequence of climate-induced change, such as wildfire and/or extreme erosion and runoff, can significantly impair the scenic quality of the forest landscape. Because it would only follow the strategies in appendix A of the revised forest plan that guide planning for extreme events, alternative 2 would be slightly less effective in managing the effects of climate change on scenic quality than the proposed action and alternative 1, and slightly more effective than the no-action alternative (table 115).

Table 115. Scenic integrity objectives under alternative 2

Scenic Integrity Objective*	Acres	Percent of Forest
Very high	447,178	25.1
High	1,273,116	71.4
Moderate	62,336	3.5
Low	183	<0.1
Very low	1,158	0.1
Total	1,783,970**	100.1***

* Refer to table 113 for definitions.

** Total acres do not exclude private lands within the national forest boundary.

*** Percentages were rounded to the nearest tenth, which yields slightly more than 100 percent.

Cumulative Effects

The timeframe for the analysis of cumulative effects on scenic quality is the life of the forest plan (15 years), and the spatial bounds of analysis is the southeastern Arizona and southwestern New Mexico sky island region, including all of Cochise and Santa Cruz Counties, southern Pinal and Graham Counties, western Hidalgo County, and eastern Pima County.

Public lands provide a range of natural scenery and open space in addition to the Coronado National Forest. However, differences in physical settings and agency missions often result in different types of experiences. The Coronado National Forest manages most of the high-elevation areas within the cumulative effects boundary. National Park Service lands are managed for high quality scenery. The Bureau of Land Management and Arizona State parks and county parks provide scenery similar to the lower elevation lands on the Coronado National Forest. Local parks generally provide more urban settings.

The most profound effects on scenic quality in the area of potential effect are not attributed to individual projects but rather to multiple projects and human activities over many years, coupled with negative influences from rapid population growth (and associated infrastructure), illegal activities in border areas, mining, and severe wildland fires.

Scenic resources are often degraded incrementally as numerous individual projects with relatively minor effects occur or are approved. Cumulatively, southeastern Arizona is slowly losing its once vast wild places. However, other lands that provide natural landscapes and open space, and other entities that support the protection of scenic quality, help mitigate this loss, and these are described in more detail below.

Additionally, most effects to scenic resources are cumulative. As projects add buildings, utility lines, and mines to a landscape, there is an immediate decline in scenic quality that increases with every new proposed development. Most projects are permanent or leave permanent scars, and landscape character is not restored unless facilities are removed, landscapes are naturalized, or both, which is rare and can take many years.

Non-forest actions and plans that could contribute to cumulative effects to scenic quality on the Coronado are summarized in table 116.

In addition to the actions listed in table 116, the Rosemont Copper Project will have direct, large-scale, long-term negative impacts on scenic resources. This project will convert a natural appearing landscape into industrial landforms having markedly different vegetation than what is there at present. The project will also displace visitors to other areas on the Coronado, some of which may be less able to assimilate increased use. It will also degrade scenic quality further by effects on roads south of the mine, where terrain is more gentle, lending itself to off-road travel, which negatively affects vegetation, soils, and scenic integrity.

Cumulative effects resulting from the 1986 plan or any of the action alternatives would be similar.

Table 116. Actions and plans that may contribute to cumulative effects on scenic quality on the Coronado and adjacent landscapes

Types of Lands/Actions/Plans	Plans	Cumulative Effects
Other public land management agencies and private entities which provide natural landscapes with high scenic quality and open space similar to the Coronado National Forest	• Arivaipa Canyon Wilderness and Wilderness Management Plan: BLM lands that provide natural scenery. • Catalina State Park Management Plan: Coronado NF lands managed by Arizona State Parks for recreation opportunities and settings. • Chiricahua National Monument General Management Plan: NPS lands that provide natural scenery and wilderness. • Colossal Cave Mountain Park: Private park that provides natural scenery. • Dos Cabezas Mountains Wilderness Management Plan: BLM lands that provide natural scenery. • Gila Box Management Plan: BLM lands that provide natural scenery. • Ironwood Forest National Monument Resource Management Plan: NPS lands that provide natural scenery and wilderness. • Las Cienegas Resource Management Plan: BLM lands that provide natural scenery. • Middle Gila Canyons Transportation and Travel Management Plan: BLM lands that provide natural scenery. • Muleshoe Ecosystem Management Plan: BLM lands that provide natural scenery • Saguaro National Park General Management Plan: NPS lands that provide natural scenery and wilderness • San Bernardino and Leslie Canyon National Wildlife Refuge Comprehensive Management Plan: USFWS lands that provide natural scenery • Tucson Mountain Park: County park that provides natural scenery • Arizona Statewide Comprehensive Outdoor Recreation Plan (SCORP) and New Mexico SCORP: State Park plans that provide outdoor recreation (including viewing scenery) supply and demand information helpful for budgeting and project planning on the Coronado National Forest.	In conjunction with the Coronado National Forest Land and Resource Management Plan, cumulative effects would be beneficial because users would be provided with a combination of lands for a wider variety of open space and scenery throughout the analysis area.

Types of Lands/Actions/Plans	Plans	Cumulative Effects
Other public agencies, governments, and partners that may not directly provide outdoor recreation opportunities, but help visitors access the Coronado National Forest, provide direction for conserving open space, provide outdoor education, and/or provide support (including funds) for the management of recreation opportunities on the Coronado.	• Arizona Trail Association Strategic Plan: Corridor Management Plan for the Organization plan that provides strategic goals for the Arizona National Scenic Trail. • Patagonia-Sonoita Scenic Road: ADOT plan that provides guidance for protecting open space and scenery across multiple land ownership. • New Mexico Statewide Natural Resource Assessment and Strategy and Response Plans: State plan that provides guidance for conserving landscapes, open space, and scenic values. • Sonoran Desert Conservation Plan: County plan that focuses on balancing urban growth and open space (including scenery). • Swift Trail Corridor Management Plan: ADOT plan that provides guidance for protecting recreation, open space, and scenery.	In conjunction with Coronado National Forest Land and Resource Management Plan, the effects would be beneficial because land managers (including the Forest) would be provided with strategic guidance, information, and other tools that provide residents and tourists with outdoor recreation opportunities throughout the analysis area.
City, county, and Federal plans that provide guidance for managing fire on lands near the Coronado National Forest.	Cascabel Community Wildfire Protection Plan; Chiricahua National Monument Fire Management Plan; Coronado National Memorial Fire Management Plan; Ft. Huachuca Integrated Wildfire Management Plan; Gila District Fire Management Plan; Graham County Community Wildfire Protection Plan; Mt. Lemmon Wildland Urban Interface Plan; Pinal County Community Wildfire Protection Plan; Saguaro National Park Fire Management Plan; San Pedro Fire Management Plan; Sonoita Elgin Community Wildfire Protection Plan	In conjunction with the Coronado National Forest Land and Resource Management Plan, effects would be beneficial because wildfire would be managed in a way that protects ecosystem health (which would benefit scenic quality because healthy forests are scenic) and reduces the likelihood of catastrophic fires on the Coronado (which can burn vegetation and damage scenic quality). Some plans even mention the need to protect aesthetics and wilderness character, and provide specific guidance for protecting these resources.
Municipal plans (regional, county, and city): County plans that provide guidance for economic development and regional growth, while protecting amenities including scenery and open space.	• Cochise County Comprehensive Plan • Graham County Comprehensive Plan • Hidalgo County Comprehensive Plan Update • Pima County Comprehensive Plan Update • Pinal County Comprehensive Plan • Santa Cruz County Comprehensive Plan	In conjunction with the Coronado National Forest Land and Resource Management Plan, the effects would be a combination of positive and negative. Some effects would be beneficial because the growth of communities is planned in a way that strives to balance growth with scenery and open space, which helps provide continuous natural scenery beyond the national forest boundary. Other effects would be negative because urban growth and development contributes to loss of open space and scenic quality throughout southeastern Arizona.

Types of Lands/Actions/Plans	Plans	Cumulative Effects
Other land owners and managers adjacent to the Coronado National Forest not mentioned above who provide or support open space and scenic quality.	Various plans and ongoing working relationships. Includes the National Park Service (Coronado National Memorial, Ft. Bowie, and Ironwood Forest National Monument), USFWS (Buenos Aires National Wildlife Refuge), BLM (Red Canyon Wilderness and other lands), Arizona State Parks (Catalina State Park), University of Arizona (Santa Rita Experimental Range), The Nature Conservancy (Ramsey Canyon Preserve), Fort Huachuca, Appleton-Whittell Research Ranch, and the Malpais Borderlands group.	In conjunction with the Coronado National Forest Land and Resource Management Plan, the effects would be beneficial because residents and visitors would be provided with a combination of lands for a wider variety of outdoor recreation settings throughout the analysis area and land managers would work together to manage open space and scenery. Specific benefits would include providing access to scenic public lands and working toward healthier ecosystems in the analysis area, all of which benefit people who enjoy scenic landscapes.

Public Safety and Illegal Activities – Affected Environment

Public comments during the plan revision process have characterized a changing social environment both on and off the Coronado that includes illegal immigration, urbanization, regional population growth, and irresponsible use of, or disregard for, natural resources. Vandalism of natural and cultural resources continues to occur. Deliberate destruction of heritage sites by pottery hunters results in irreplaceable losses of cultural resources. Participants in plan revision meetings favor increased attention to public safety and rule violations using a combination of user education efforts and increased law enforcement.

Undocumented immigrants are the most common "illegal users" of Federal lands. The Southwest, in general, has experienced a dramatic increase in the migration of undocumented citizens since 1994. The U.S. Border Patrol has a constant presence in southeastern Arizona, both on and off the Coronado. The Nogales, Sierra Vista, and Douglas Ranger Districts of the Coronado are contiguous in certain places with the international border with Mexico and experience the highest degree of adverse effects from illegal activities, while the Santa Catalina and Safford Ranger Districts are affected to a lesser extent. Drug and human smuggling in these areas represents a significant health and safety hazard for Forest Service and recreational users. And in some cases, mounds of trash that illegal users discard degrade the scenic quality of the Coronado and present health hazards.

Law enforcement has determined that illegal users have been responsible for many large wildland fires on and off the Coronado over the past decade. And, for safety reasons, Forest Service firefighting efforts must be planned to include the potential for encounters with armed or violent groups or individuals in these areas.

Currently, areas of illegal activity are monitored by law enforcement entities using helicopters; drones; motorized vehicles, including off-highway vehicles; and horseback. Surveillance of some areas recommended as wilderness under the proposed action and alternative 1 is performed using these methods as well as surveillance equipment.

Public Safety and Illegal Activities – Environmental Consequences

No Action

Forestwide and management area-specific goals, objectives, standards, and guidelines in the 1986 forest plan, as amended, include the following:

- a goal to cooperate with state and local law enforcement agencies in the protection of visitors, their property, and National Forest System lands and facilities
- standards and guidelines requiring that appropriate measures be taken to protect caves and cultural resources

The 1986 plan direction preceded the border issues that exist today; therefore, the plan does not specifically address the type and scale of illegal activities that occur. The no-action alternative recommends one wilderness area (Mount Graham Recommended Wilderness Area). Because of wilderness restrictions, motorized access by law enforcement would not be permitted. This wilderness, however, does not experience a high degree of illegal activities that occurs in ranger districts closer to the border with Mexico. Therefore, its designation would have little impact on management of illegal activities on the Coronado and public safety.

The lack of climate change direction in the 1986 plan would have no effect on management of public safety and illegal activities.

Proposed Action

The revised forest plan includes the following direction:

- forestwide and land use zone specific goals (desired conditions) reflecting a safe experience for visitors
- specific desired condition statements for ecosystem management areas along the international border that reflect an environment where risks are natural and visitors do not feel threatened
- direction in wilderness and other management areas impacted by illegal activities to clean up trash and rehabilitate damage from unauthorized trails
- recreation and scenery management direction account for the need for developments along the border

Direction in the proposed action better addresses threats to public safety and border issues than the no-action alternative. It is similar in direction to alternatives 1 and 2, with the exception that it recommends less acreage for wilderness designation than alternative 1. The Mount Graham Recommended Wilderness Area, as noted under the "No Action" heading above, does not experience the high degree of illegal activity as those areas near the border with Mexico. Therefore, its designation would have little impact on management of illegal activities on the Coronado and public safety. The other wilderness recommended under the proposed action is the Ku Chish Recommended Wilderness Area on the Douglas Ranger District. This district has a high degree of illegal activities, and public safety is a key concern. However, this recommended wilderness area is located in very rugged terrain, and it is unlikely that designation as wilderness will have a significant effect on law enforcement monitoring in this area. Law enforcement access issues overall would not be significantly restricted under the proposed action and would be much less than restrictions resulting from alternative 1, but greater than alternative 2, which recommends only the Mount Graham Recommended Wilderness Area. Direction in the proposed action regarding management of resources in response to climate change would have no effect on public safety and illegal activities.

Alternative 1

Because alternative 1 recommends 255,908 acres of the Coronado for designation as wilderness, many areas would no longer be accessible to Border Patrol and other law enforcement vehicles. Because of wilderness restrictions, law enforcement officers would have to access wilderness on foot or horseback. Helicopter patrols may be an option if approved by the regional forester after a minimum requirements decision guide analysis is completed for such actions in specific restricted areas. Recommended wilderness areas where Border Patrol and law enforcement would be most affected by wilderness restrictions are the Tumacacori, Bunk Robinson, Whitmire Canyon, Mount Fagan, and Mount Wrightson Additions because of their proximity to the border and history of illegal activities. Wilderness areas recommended in the Chiricahua, Dragoon, and Whetstone Ecosystem Management Areas would affect law enforcement to a lesser degree, because their rugged, steep terrain is less attractive to illegal users.

Direction in alternative 1 regarding management of resources in response to climate change would have no effect on public safety and illegal activities.

Alternative 2

Because alternative 2 makes only one wilderness recommendation, its effect on law enforcement access would be less than the proposed action and alternative 1, but similar to the no-action alternative. The additional acreage offered for motorized recreation by alternative 2 may enhance the opportunity for law enforcement activities to be conducted using off-road vehicles on districts that experience a high degree of illegal activity in remote areas having difficult access or where roads do not exist.

The lack of climate change direction under alternative 2 would have no effect on management of public safety and border issues.

Cumulative Effects

Information regarding future proposed surveillance and patrol activities was requested from the Border Patrol. Because of the sensitive nature of the agency's mission, this information will not be available as input to a cumulative effects analysis.

Wilderness and Other Special Areas – Affected Environment

Wilderness and Wilderness Study Areas

Wilderness areas provide a wide variety of user opportunities for exploration, solitude, natural risk, challenge, and primitive and unconfined recreation. Wild landscapes represent the Coronado's richest concentration of quiet places, where the sights and sounds of human presence are relatively unnoticeable. Developments (fences, structures, and water-containment features) are rare; those that exist offer visitors a glimpse of past cultures and traditional land uses. In addition to recreational use, compatible uses of wilderness also include grazing, camping, hiking, and other forms of quiet recreation.

The 1986 plan describes eight previously designated wilderness areas on the Coronado, which together cover 338,318 acres: Galiuro, Pusch Ridge, Rincon Mountain, Pajarita, Miller Peak, Chiricahua, Santa Teresa, and Mount Wrightson (see maps for no-action alternative in appendix L). In addition, the three action alternatives include direction for managing these eight wilderness areas. The action alternatives also continue management of the Bunk Robinson and Whitmire Canyon Wilderness Study Areas for wilderness character.

The wilderness and wilderness study areas were created by the authority of several legislative acts: the Wilderness Act of 1964, Endangered American Wilderness Act of 1978, New Mexico Wilderness Act of 1980, and Arizona Wilderness Act of 1984. In accordance with wilderness legislation, these areas are managed to maintain wilderness characteristics, including natural conditions, primeval character, outstanding opportunities for solitude and primitive and unconfined recreation, ecological and geological processes, and other features of scientific, educational, scenic, and historic value. Recommendations for new wilderness areas are proposed in revised plans under each the three action alternatives (see chapter 2).

Wilderness use on the Coronado is reported to be about 488,000 visits annually (USDA FS 2012), second among all national forests in the Southwestern Region. Furthermore, increased wilderness visitation is expected in the future as the population of southeastern Arizona continues to grow (Coronado National Forest Wilderness Need Evaluation; USDA FS 2013). Although some wilderness areas on the Coronado do not experience high use because they are difficult to access or have few developed trails, others, such as the Pusch Ridge and Mount Wrightson Wilderness Areas, are easily accessible to visitors, are located close to more populated areas, and have developed trailheads. As a result, encounters among wilderness visitors are high in these two areas.

During the planning process for revision of the forest plan, the Forest Service evaluated land parcels relative to established inventory criteria for potential wilderness. The Coronado National Forest "Potential Wilderness Area Evaluation Report" documented this review in accordance with the "potential wilderness evaluation process" outlined in Forest Service Handbook 1909.12, chapter 70. From that evaluation, areas were recommended for congressional designation as wilderness in revised forest plans specified by the three action alternatives.

In addition to the eight previously designated wilderness areas, the no-action alternative recommends the Mount Graham Wilderness Study Area (61,315 acres) for congressional designation as a

recommended wilderness area. As explained in footnote 6 in chapter 2, this wilderness study area was established by Congress in 1984 and was recommended for congressional wilderness designation in the 1986 plan. Although the recommendation was never acted upon by Congress, all alternatives for plan revision carry forward the recommendation to designate this wilderness study area as a wilderness area. The 1986 plan also recognizes the Bunk Robinson and Whitmire Canyon Wilderness Study Areas and manages them to retain wilderness characteristics.

In addition to the eight previously designated wilderness areas, the proposed action recommends congressional designation of four areas as wilderness: Mount Graham (61,315 acres) (carried forward from the 1986 plan), Ku Chish (26,245 acres), Chiricahua Addition North (5,013 acres) and Whetstone (16,317 acres) Recommended Wilderness Areas. It also recognizes that Bunk Robinson and Whitmire Canyon Wilderness Study Areas would continue to be managed to retain wilderness characteristics.

Alternative 1 proposes 16 areas to be recommended for wilderness designation, including the three areas currently managed as wilderness study areas: Mount Graham, Bunk Robinson, and Whitmire Canyon. No recommendations for additional wilderness study areas are made by alternative 1.

Alternative 2 carries forward the 1986 plan recommendation that the current Mount Graham Wilderness Study Area (61,315 acres) be congressionally designated as the Mount Graham Recommended Wilderness Area and that the Bunk Robinson (19,062 acres) and Whitmire Canyon (12,163 acres) Wilderness Study Areas continue to be managed to retain wilderness character.

Eligible Wild, Scenic, and Recreational Rivers

There are 16 eligible wild, scenic, and recreational rivers on the Coronado, all of which were identified in a 1993 inventory and described in Resource Information Report: Potential Wild, Scenic, and Recreational River Designation, National Forests of Arizona (USDA FS 1993). In 2008, the 16 river segments were reevaluated, and they all remain eligible. The outstandingly remarkable values of eligible segments are protected by Forest Service policy. Table 6 in chapter 2 provides details about the Coronado streams that are eligible for wild, scenic, or recreational river designation, including their outstanding remarkable values.

Desired conditions for “wild” rivers are that they remain free of impoundments, with shorelines that are essentially primitive with little or no evidence of human activity. The wild river is inaccessible except by trail, and no developed recreation facilities exist. Water quality of wild rivers meets or exceeds state standards.

Desired conditions for “scenic” rivers call for shorelines that are largely primitive and undeveloped, with no substantial evidence of human activity. Evidence of human activities generally diminishes over time. Roads may reach or bridge the river. Scenic rivers are free of impoundment and improvements that occur are minimally intrusive in the landscape.

For “recreational” rivers, desired conditions are that they generally are accessible by road or trail and have expected encounters with people. Recreation opportunities vary depending on their compatibility with the outstandingly remarkable value of the eligible segment. Vegetation management is used to enhance recreation river values. Improvements may dominate the landscape, with facilities that are visually complementary with the landscape. Roads and trails provide access within the river corridor consistent with protection and enhancement of scenic, cultural and historic, wildlife, and fish outstandingly remarkable values and protection of soil and water quality. The transportation system supports interpretation, recreation, and resource management activities.

Research Natural Areas

The Coronado currently has six research natural areas (RNAs): Pole Bridge, Goodding, Elgin, Goudy Canyon, Butterfly Peak, and Santa Catalina. The special designation of research natural area preserves and conserves unique natural resources for research and education. Pole Bridge Research Natural Area was established to preserve its distinctive populations of southern Arizona pines. Goodding Research Natural Area features an extremely diverse and interesting example of Madrean pine-oak woodland with associated aquatic features along the U.S. border with Mexico. Elgin Research Natural Area occupies a unique transition zone between southwestern grasslands and oak savanna vegetation communities. Goudy Canyon Research Natural Area supports a mixed-conifer stand with Mexican white pine (*Pinus strobiformis*) on east-facing slopes and contains an excellent example of upper elevation old-growth forest (i.e., trees that are 40 inches in diameter at breast height). Butterfly Peak Research Natural Area features an extremely steep (greater than 60 percent slope), rocky scrub community in the Santa Catalina Mountains and a wide variety of deciduous and evergreen tree species that are present in various mixtures. Santa Catalina Research Natural Area was established in 1927, and was the first area designated as a research natural area in the country. It encompasses a large basin along the south side of the Santa Catalina Mountains with extensive fields of granite boulders, pine-oak woodlands, and a variety of other vegetation communities.

The proposed action and alternative 1 carry forward the 1986 plan's recommendation for three research natural areas that were never established. Two of these are expansions of previously designated research natural areas. Goodding Extension on the Nogales Ranger District would protect a population of supine bean (*Phaseolus supine*) and would incorporate more of the area's botanical diversity and populations of rare species. Pole Bridge Extension on the Douglas Ranger District would provide Chihuahuan pine forest communities for research, retain old growth to maintain Chihuahua pine communities, and help preserve and protect the genetic diversity of the Sierra Madrean pine-oak ecosystem. The third recommendation carried forward is the proposed Canelo Research Natural Area on the Sierra Vista Ranger District, which would provide a representation of oak woodlands of southern Arizona and southwestern New Mexico and would serve as a benchmark to evaluate grazing management in adjacent areas. The proposed action and alternative 1 also carry forward the 1986 plan's recommendation to reduce the existing Santa Catalina Research Natural Area to eliminate a large area heavily used for dispersed recreation. The 1986 plan originally states the Santa Catalina Research Natural Area will be reduced from 4,131 acres to 890 acres. Improved mapping technology shows that the existing Santa Catalina Research Natural Area is 4,040 acres and the proposed reduced area is 634 acres. The proposed action and alternative 1 carries forward the identical proposed boundary reduction with the corrected acreages.

The proposed action and alternative 1 propose an area in Finger Rock Canyon on the Santa Catalina Ranger District as a new research natural area (1,103 acres). This area has a biologically rich xeroriparian ecosystem that provides a corridor for wildlife movement and a refugium for rare flora and fauna, and it performs key hydrologic functions. This proposed research natural area will be dedicated to future ecological and climate change monitoring and research. It was selected for this purpose based on it having 600 vascular plants and a total of 207 species of birds, mammals, amphibians, and reptiles, which were documented over 25 years (Crimmins et al. 2010).

Management restrictions are specific to each research natural area. In general, research natural areas are protected against human activities that directly or indirectly modify their ecological integrity. In addition, all research natural areas located within wilderness are subject to the regulations and restrictions associated with wilderness management.

Inventoried Roadless Areas

Inventoried roadless areas on the Coronado are included in the acreage within the Wild Backcountry Land Use Zone and are managed to preserve roadless character. This management must maintain

natural features and landscapes with the minimum infrastructure necessary to support a range of nonmotorized uses. These areas offer recreational opportunities in the "primitive to semiprimitive" recreation opportunity spectrum (see "Recreation" section in this chapter). Settings may be primitive, with wilderness-like areas that are natural, and the areas may provide many opportunities for nonmotorized recreation, to include challenge and solitude. Inventoried roadless areas provide many dispersed nonmotorized recreation opportunities such as hiking, camping, and birdwatching, but are closer to roads and have more visitors than the most primitive settings.

Desired conditions for inventoried roadless areas include wild undeveloped character with natural settings. The sights and sounds of motorized vehicles are nonexistent in these areas. Crowds or other urban elements are not evident. Dispersed camping sites are available to those who seek them, but are used infrequently. Recreational impacts on the landscape are minimal. Vegetation within these sites is vigorous and quickly recovers from the impacts of camping activities. Opportunities for solitude and quiet recreation are readily found. Hunters enjoy a challenging and remote experience. Quiet experiences are available throughout inventoried roadless areas.

Inventoried roadless areas and effects to roadless character were considered in developing the recreation opportunity spectrum classifications explained under the "Recreation" heading in this chapter. Roadless areas that met the inventory criteria in the Forest Service handbook were considered as potential wilderness areas. Management of these areas is the same for all alternatives. All alternative plans would retain roadless character.

Wilderness and Other Special Areas – Environmental Consequences

The evaluation of effects reported in this section is focused on how each alternative plan's direction for management of designated and/or special areas affects their character, and how proposed recommendations affect current uses and management activities in a designated or special area. Effects of plan direction on specific resources are described separately by resource area in this chapter.

Effects Common to All Alternatives

Wilderness Study Areas and Recommended Wilderness

The Mount Graham Recommended Wilderness Area is common to all alternatives. It is the only recommended wilderness area in the wildland-urban interface; it is referred to in the Graham County Community Wildfire Protection Plan as a high-risk wildland-urban interface. Restrictions related to this recommended wilderness area have the potential to slightly increase the threat to life and property in adjacent areas, including numerous communication towers, residential and administrative developments, and the Mount Graham International Observatory. However, because this wilderness study area is currently managed as a wilderness, effects would not change under any of the alternatives.

No new wilderness study areas are proposed under any alternative. Therefore, effects of management for wilderness character in the wilderness study areas would remain the same for all.

Inventoried Roadless Areas

Under all alternatives, inventoried roadless areas would be managed to meet specific desired conditions, which for the action alternatives, apply to resources in the Wild Backcountry Land Use Zone. Overall, guidelines seek to preserve natural settings where the sights and sounds of motorized vehicles are not present.

Direction in all alternatives would have no effects on the characteristics of inventoried roadless areas. The recreation opportunity setting of semiprimitive nonmotorized applies to inventoried roadless areas. Activities therein must follow Forest Service policy on road construction and tree cutting, which is consistent with national Forest Service policy on preserving their roadless character.

Eligible Wild, Scenic, and Recreational Rivers

Because the 1986 plan was in effect before the designation of wild, scenic, and recreational rivers, it does not provide management direction specific to any eligible stream or segment on the Coronado. Thus, management adheres to Forest Service policy (Forest Service Manual 2354 – River Recreation Management) for maintaining free-flowing conditions and outstandingly remarkable values and is guided by other resource management direction specific to management areas in which the eligible waterways occur.

In the same manner, all action alternatives will manage the Coronado's eligible rivers according to Forest Service policy. Therefore, the conservation and preservation of eligible segments under this policy would be the same for all alternatives.

Research Natural Areas

Designated research natural areas would continue to be managed following the standards for protection and management of a research natural area (Forest Service Manual 4063.41). The 1986 plan and the revised forest plans under all alternatives would continue to support and promote the basic objectives and purposes under which these special areas were established. Relevant laws, regulations, and policies that regulate the management of these special areas would remain in place.

All alternatives reiterate the 1986 forest plan proposal for establishing the Canelo Research Natural Area extending the Pole Bridge and Goodding Research Natural Areas, and reducing the Santa Catalina Research Natural Area. Under all alternatives, research natural areas would be managed under a set of guidelines designed to move resources toward desired conditions, including having them serve as prime examples of the ecological features for which they were designated, with little evidence of human activity or disturbance. In these areas, visitor access and use occurs at levels acceptable to maintain the research values of the research natural area. Special use permits within these areas are inappropriate unless they are related to research for which the area is designated. Fire management mimics natural fire processes and is compatible with ongoing research.

No Action

Wilderness and Wilderness Study Areas

The no-action alternative provides minimal direction for managing wilderness. Wilderness management is guided by wilderness management plans. Although each designated wilderness area has a wilderness management plan, the most recent of the plans was written in 1993, and all plans need updating.

Continuing to manage wilderness and wilderness study areas under outdated management direction would have several effects on the Coronado's wilderness land base. First, the current management area standards and guidelines provide less than optimal management flexibility by combining wilderness and wilderness study areas into one management area. Furthermore, the 1986 plan provides little or no distinction between a standard and a guideline. Other standards in the 1986 plan lack clarity, such as the wilderness recreation use management guideline, which states:

> Manage wilderness use as follows: Standard - 172,499 acres (generally in riparian and other concentrated use areas); less than standard - 225,046 acres (generally in other types and low use areas).

This guideline uses outdated language and is difficult to interpret. In addition, wildlife management using the 1986 plan direction is focused on specific wildlife species rather than ecosystems or habitats, thereby limiting management options.

In general, current management area guidance for wilderness and wilderness study areas requires updating. Guidance on issues such as scenery management, for example, needs to be changed to reflect the objectives currently in use. Furthermore, the no-action alternative provides little guidance or desired conditions for wilderness education, which currently is a high priority component of wilderness management. The no-action alternative does not provide sufficient guidance regarding the protection of native plant and animal species from nonnative invasive species in wilderness and wilderness study areas. Finally, the objectives of wilderness management and language used to describe them also need to be updated to be consistent with current Forest Service wilderness management focus and objectives.

The 1986 plan contains no direction with regard to the management of Coronado National Forest resources in response to climate change. Plants and animals would be extremely vulnerable to the consequences of atypical temperatures and rainfall patterns, which include drought; increased number and intensity of wildfires; increased stress on vegetation, including insect and disease outbreaks; and decreased water yield and availability. Each of these consequences may affect one or more resources within designated wilderness and designated wilderness study areas, some more than others, depending on location and uses. As an example, in the absence of appropriate management, drought may stress native vegetation to such an extent that invasive nonnative species outcompete it for nutrients and water in a wilderness or wilderness study area, potentially changing habitat and displacing species to other nonwilderness locations. This, in turn, may diminish the visitor experience in the wilderness.

Recommended Wilderness

The no-action alternative carries forward the 1986 plan recommendation for the Mount Graham Wilderness Study Area to be designated as wilderness (figure 5). The no-action alternative also continues to manage the Bunk Robinson and Whitmire Canyon Wilderness Study Areas to maintain wilderness character. Therefore, this alternative would have no consequences other than limiting the wilderness on the Coronado to what was recommended in 1986. This would decrease the opportunities for quiet recreation that would have been available if additional wilderness or wilderness study areas had been recommended.

Because it lacks climate change direction, the 1986 plan would have the same effects on vegetation, water, air quality, and wildlife resources in recommended wilderness as those described for designated wilderness and designated wilderness study areas.

Eligible Wild, Scenic, and Recreational Rivers

The lack of climate change direction in the 1986 plan would allow climate change induced consequences on wild, scenic, and recreational rivers that are similar to those described above for wilderness. However, the effects of the natural disturbances they generate would primarily alter the characteristics of water resources and riparian areas. Warmer temperatures and drier conditions could cause streams or segments eligible for wild, scenic, and recreational river designation to dry up, making them no longer suitable for recreational uses such as boating and sport fishing. Intense flooding caused by extreme storms could significantly impair the water quality of streams, making them unsuitable for water-contact recreation. In the absence of direction and appropriate management responses to climate changed induced events, the visitor recreational experience on wild, scenic, and recreational rivers would be diminished.

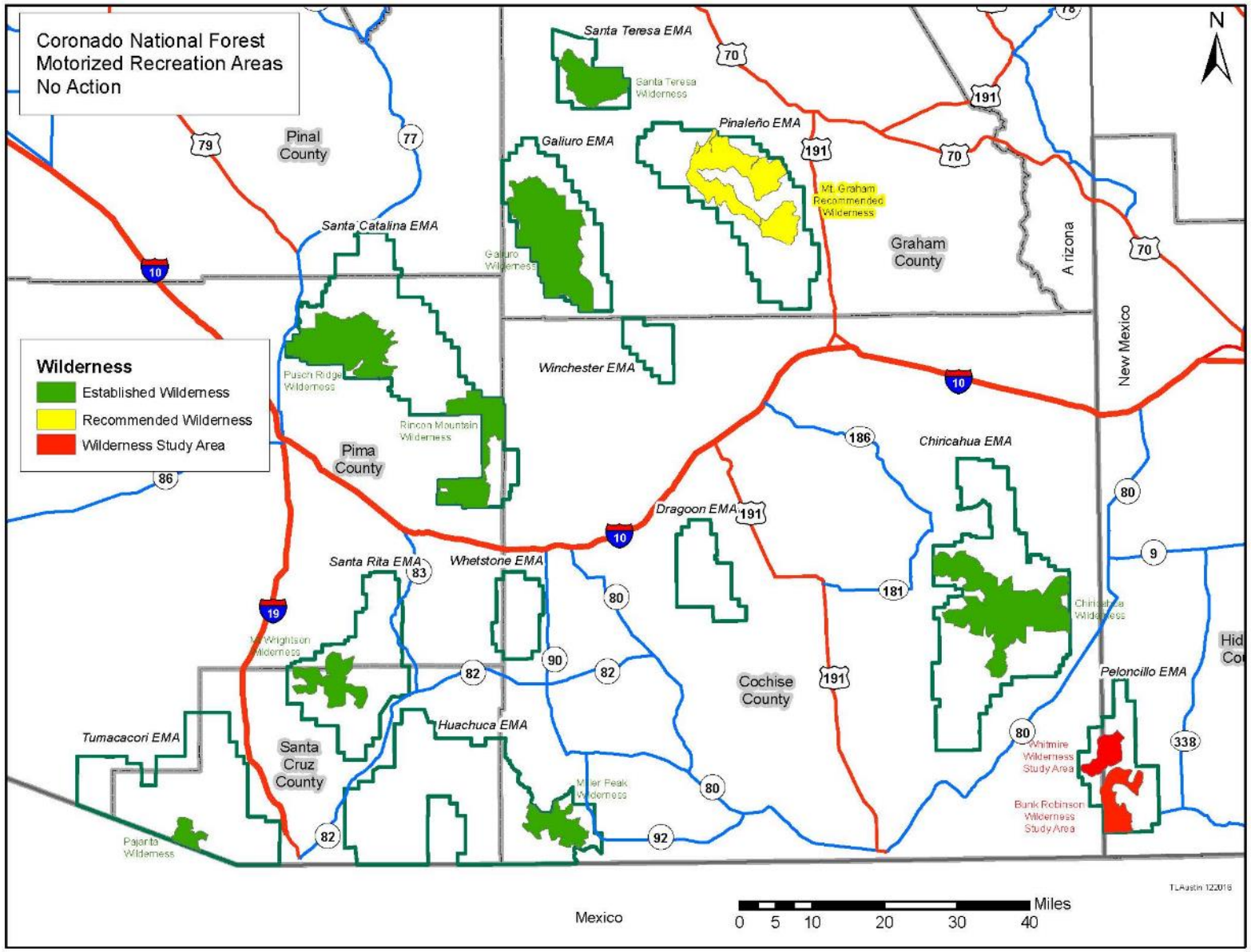

Figure 5. Wilderness areas and recommended wilderness area under the no-action alternative

Research Natural Areas

The 1986 forest plan acknowledges six previously designated research natural areas and proposes three additional research natural areas and one reduced research natural area. The research natural area proposals described in the 1986 plan were never realized. While the 1986 plan lists standards and guidelines for the management areas where research natural areas are located (Management Areas 8 and 8A), it makes little or no distinction between them. Furthermore, standards in the plan lack clarity and often fail to maintain the objectives in the establishment records. For example, the range management guideline for Management Area 8 states the following:

> Manage suitable rangeland at level A (no livestock). Management excludes livestock grazing to protect other values or eliminates conflicts with other users.

This guideline is not consistent with the content of the documents that established the Pole Bridge and Goodding Research Natural Areas, which allow light grazing to continue. While the grazing restriction may prevent possible negative impacts such as overgrazing or trammeling of natural vegetation, this guideline precludes the special use of the area that was intended when it was established.

In general, current management area guidance for research natural areas requires updating. Guidance on issues such as scenery management, for example, needs to be changed to conform with current scenery management frameworks. In addition, the objectives of research natural area management and language used to describe those objectives need to be updated to be consistent with current Forest Service management focus and objectives.

Lack of climate change direction on resources in research natural areas would be similar to those described above for designated wilderness and designated wilderness study areas. Plants and animals would be extremely vulnerable to the consequences of atypical temperatures and rainfall patterns, which include drought; increased number and intensity of wildfires; increased stress on vegetation, including insect and disease outbreaks; and decreased water yield and availability. Each of these consequences may affect one or more resources within designated research natural areas, some more than others, depending on location and uses. This may diminish the opportunity for scientists and others who use the natural resources in these areas to study plants and animals.

Proposed Action

Wilderness and Wilderness Study Areas

The Coronado's designated wilderness areas and the ecosystem management areas in which they are located are described in chapter 2. Under the revised forest plan, wilderness areas would be managed under specific standards and guidelines for designated wilderness management areas. This direction updates the 1986 plan's wilderness and ecosystem management approaches and principles and incorporates strategies that will allow management to adapt to new challenges. Wilderness values, including naturalness, undeveloped qualities, solitude, and opportunities for primitive and unconfined recreation, are expected to be better conserved under the proposed action than under the no-action alternative because of the increased clarity and guidance provided. Because alternatives 1 and 2 will include the same plan direction as the proposed action, they would have equivalent effects on wilderness management.

Increased temperatures and atypical rainfall patterns caused by climate change in the Southwest will generate natural disturbances (flooding, wildfire, and insect outbreaks) that could adversely affect the structure, function, and productivity of soils; impair water quality; decrease water yield and availability to wildlife; and stress vegetation and forest health. To maintain the quality and availability of multiple uses opportunities in wilderness and wilderness study areas and accommodate the increased use expected with future population growth, the revised forest plan under the proposed

action includes desired conditions and management approaches for the Coronado's response to climate change (see pages 19 and 20 of the revised forest plan). Complementing desired conditions are strategies for responding to changing natural disturbances such as flooding, wildfire, and insect outbreaks (see appendix A of the revised forest plan). This direction would benefit recreational opportunities as they help manage forest resources into sustainable, adaptable, resilient, and diverse ecosystems that serve as the foundation for many and varied opportunities for wilderness uses into the future.

Recommended Wilderness

The proposed recommendation of four new areas for wilderness designation (see chapter 2) would increase opportunities for a wilderness experience above recommendations under no action and alternative 2, but less than that offered by alternative 1 (figure 6). The proposed action would also restrict public access for motorized and mechanized recreation in these areas more than no action and alternative 2, and less than alternative 1. The proposed action would provide for increased wilderness visitation better than the no-action alternative and alternative 2, because recommended areas would provide a wilderness-like experience near underserved populated areas. Increases in wilderness visitation would be less, however, than that which would result under alternative 1.

Located in the Pinaleño Mountains on the Safford Ranger District, the Mount Graham Recommended Wilderness Area has been consistently managed to preserve wilderness character since its designation as a wilderness study area in 1984. Management of the area would not change with the recommendation under the proposed action. Therefore, environmental effects would remain the same as under the 1986 plan.

Both the Chiricahua Addition North and Ku Chish Recommended Wilderness Areas are in the Chiricahua Mountains on the Douglas Ranger District. No roads access the boundary of Ku Chish therefore, visitors enter on foot. Recommending these two areas as wilderness would prevent the construction of new roads or motorized trails in the area. In Ku Chish, this would not have a negative effect on visitation because steep terrain and an unreliable water supply already limit the use of three established trails for hiking and horseback riding. The Chiricahua Addition North, an expansion of the existing Chiricahua Wilderness, contains eight trails that are also used primarily for hiking and horseback riding. Thus, the recommendation by the proposed action would not affect the quality of the primitive recreation experience offered in these areas.

Portions of Ku Chish and the Chiricahua Addition North areas recently experienced uncharacteristic wildland fire (Horseshoe 2), which caused vegetation to moderately depart from its reference structure and fire regime. Because of this, there may be a need for restoration and vegetation management treatments. Motorized and mechanized uses are not permitted in wilderness; therefore, treatments would likely include prescribed fire and grazing. When managed appropriately, neither of these treatments would adversely affect the environment of the parcel.

Recommending Ku Chish and the Chiricahua Addition North areas as wilderness may impede the progress of habitat restoration and/or monitoring activities that traditionally involve motorized or mechanized equipment. However, designation of wilderness may provide additional, high quality refugia for sensitive, threatened, and endangered species. The presence of special-status species, such as the Mexican spotted owl and various bats, contributes positively to the wilderness character of the area. For more information on the impact of wilderness recommendation on wildlife species, see the "Wildlife" section in this chapter.

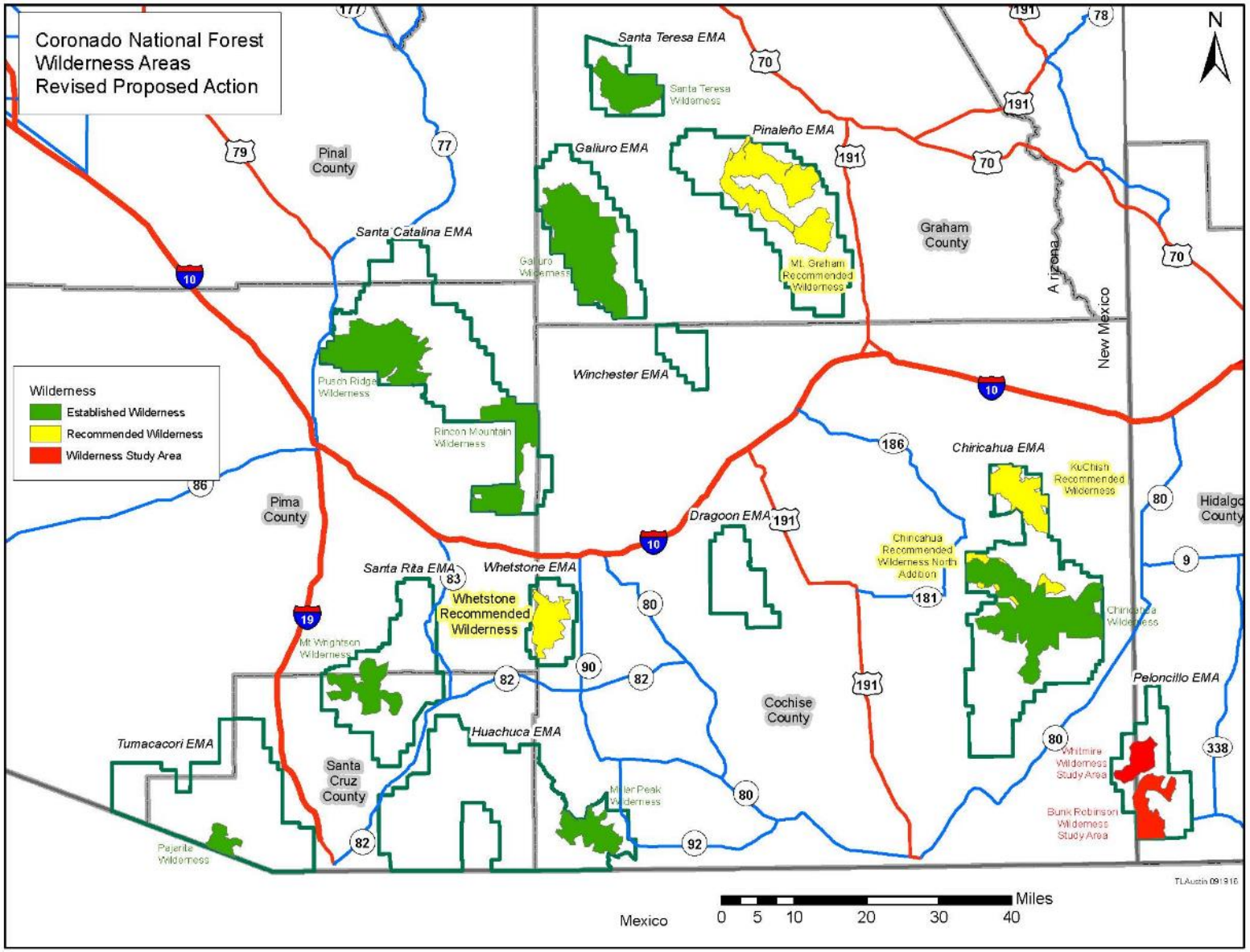

Figure 6. Wilderness areas and recommended wilderness areas under the revised forest plan

Motor vehicle use by Forest Service personnel (administrative use) in recommended wilderness would be allowed until Congress acts upon the recommendation but only if such use does not degrade the area's wilderness character. In recommended wilderness areas, the Border Patrol has the authority to supersede management restrictions on motorized vehicle use during pursuit of a crime in progress. The use of motorized and mechanized equipment and the sights and sounds associated with Border Patrol activities may negatively impact wilderness character and the wilderness experience. Illegal activities may also negatively impact the Ku Chish and Chiricahua Addition North wilderness character.

The Whetstone Recommended Wilderness Area is located in the Whetstone Mountains, which is part of the Sierra Vista Ranger District. This area has attracted high interest from the public and also rated highly in the potential wilderness evaluation. As with all recommended wilderness areas, construction of new roads or motorized trails would be prohibited. During the public involvement process, recreation users identified locations within this area that are popular for mountain bike use. In response to these comments, the initial boundary was adjusted to exclude mountain biking routes. Current recreation uses within the adjusted area are compatible with wilderness character and would be able to continue with wilderness designation.

Across all four areas recommended as wilderness areas by the proposed action, fuel and vegetation management activities may be more difficult to implement because of wilderness restrictions. This may affect the risk of fire in the wildland-urban interface. However, treatments are still possible with proper planning to use nonmechanized methods and nonmotorized access. And, the ability to use prescribed fire would be available in recommended wilderness areas in accordance with the Coronado's wilderness fire management plan. While progress in fuel treatments may be less than that accomplished under the no action and alternative 2, increases in risk of wildland fire are unlikely to be significant.

The proposed action's direction and management approaches for managing climate change in wilderness and wilderness study areas would also apply to recommended wilderness. Therefore, the benefits of developing adaptability and resiliency to climate change (see "Wilderness and Wilderness Study Areas" above) would also apply to resources in the four recommended wilderness areas.

See the Potential Wilderness Area Evaluation Report (USDA FS 2013) for more information on each area and a more in-depth discussion of the effects of wilderness and nonwilderness recommendations for each area. Also see alternative 1 analysis below for more discussion of the effects of recommending these four areas.

Eligible Wild, Scenic, and Recreational Rivers

The proposed action's direction and management approaches for managing climate change in wilderness and wilderness study areas would also apply to eligible wild, scenic, and recreational rivers. Therefore, the benefits of developing adaptability and resiliency to climate change (see "Wilderness and Wilderness Study Areas" above) would also apply to eligible wild, scenic, and recreational rivers. With appropriate management, the effects of the natural disturbances induced by climate change would be mitigated and the characteristics of water resources and riparian areas would be retained. Depletion of water supplies, streamflow, and aquatic habitat would not adversely affect recreational uses, such as boating and sport fishing. Intense flooding caused by extreme storms would not impair the water quality of streams, making them unsuitable for water-contact recreation.

Research Natural Areas

The proposed action's recommendation for designation of a new research natural area previously identified by the 1986 plan (Canelo), extension of two other research natural areas (Goodding and Pole Ridge), reduction of one research natural area (Santa Catalina) and a new recommended research natural area (Finger Rock) would enhance the preservation and conservation of these biologically rich

lands. In particular, the Finger Rock corridor provides refugia for over 600 vascular plants and over 200 species of birds, mammals, amphibians, and reptiles. Finger Rock Canyon Research Natural Area would be dedicated to ecological and climate change monitoring and research, which would have a positive impact on the ecosystem.

The proposed action's direction and management approaches for managing climate change in wilderness and wilderness study areas would also apply to recommended new research natural areas. Therefore, the benefits of developing adaptability and resiliency to climate change (see "Wilderness and Wilderness Study Areas" above) would also apply to resources in research natural areas. In addition, the proposed action recommends designation of the new Finger Rock Canyon Research Natural Area, where climate change research is anticipated to be a primary use.

Alternative 1

Wilderness and Wilderness Study Areas

Management of existing wilderness under alternative 1 would follow the plan components defined for the proposed action, which update those of the 1986 plan.

Continued management of wilderness study areas would have little effect on the characteristics and/or quality of wilderness on the Coronado, as they are currently managed to maintain wilderness character. Bunk Robinson and Whitmire Canyon Wilderness Study Areas currently have law enforcement management challenges because of restrictions on Border Patrol activities imposed by their status. This situation would not change under alternative 1.

Direction under alternative 1 for management of resources in wilderness and wilderness study areas to develop adaptation and resiliency to climate change would be the same as that of the proposed action. Therefore, the beneficial effects on resources during a period of climate change (see "Wilderness and Wilderness Study Areas" under the "Proposed Action" section above) would be the same as those attributed to the proposed action.

Recommended Wilderness

Alternative 1 would have the same consequences as the proposed action, but the effects would be increased in intensity because of the increased acreage proposed to be managed as wilderness by this alternative (see table 7 in chapter 2 and figure 7). Recommendation of additional areas to be managed for wilderness character would increase opportunities for a wilderness experience above all other alternatives. It would also, however, limit access for motorized and mechanized recreation and displace those uses to other national forest lands more than any of the other alternatives. Alternative 1 offers a wider choice of areas for wilderness and increases opportunities for visitation when compared to the no-action alternative and the proposed action.

Six recommendations are made by alternative 1 to extend the boundaries of existing wilderness areas. These are generally smaller parcels than the other recommended wilderness areas and are proposed either because they offer improved boundary management or because they present a highly manageable area that has minimal or no motorized use due to rugged terrain, remoteness, and lack of public access. Therefore, these areas are highly available for wilderness recommendation. One of these areas, the Mount Wrightson Addition is near the U.S.-Mexico border and has a high level of illegal activity that requires Border Patrol intervention. Recommending the area as wilderness may impede Border Patrol activities because of restrictions on motorized access, except during the pursuit of a crime in progress.

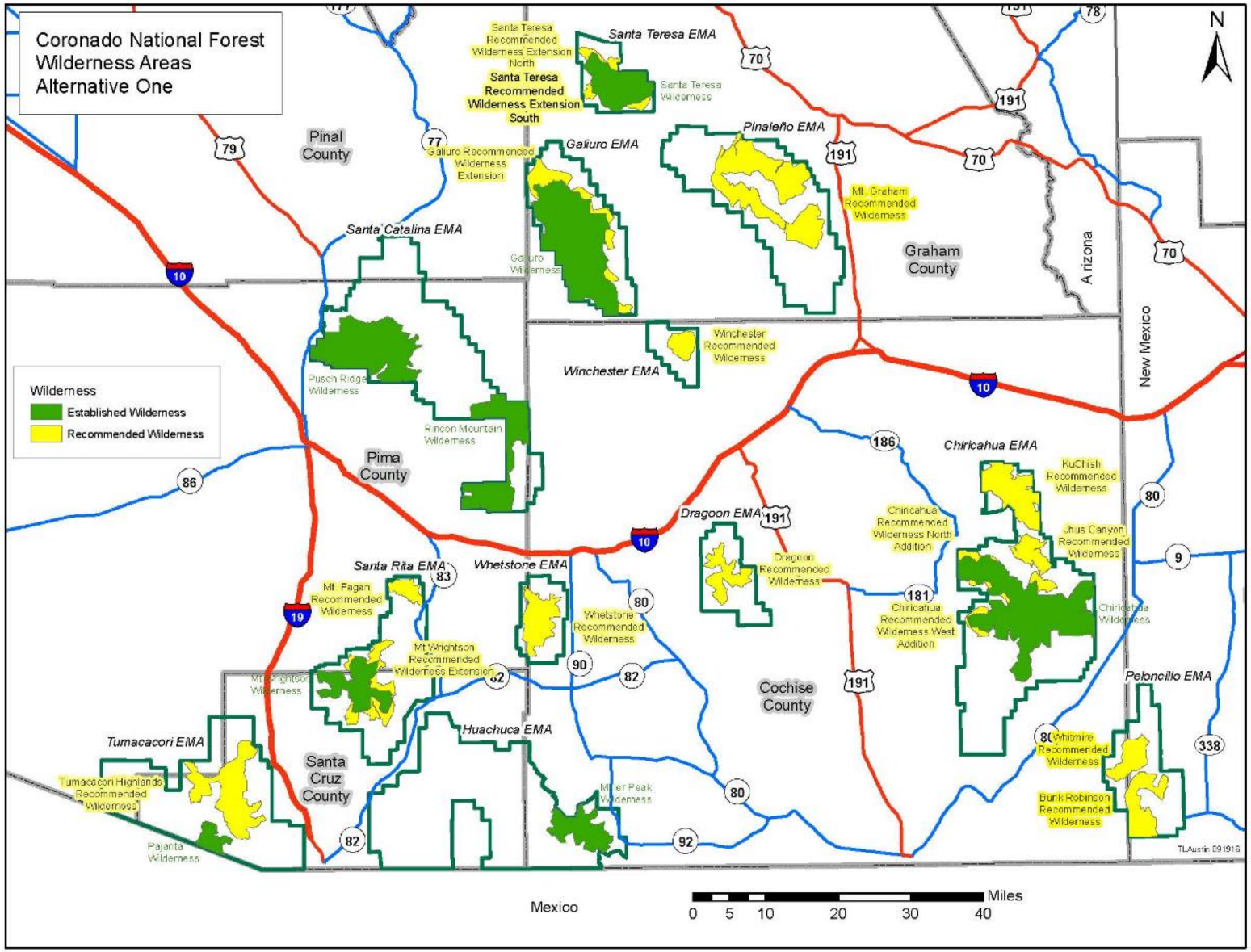

Figure 7. Wilderness areas and recommended wilderness areas under alternative 1

Illegal activity in the area may also negatively impact the wilderness character of the Mount Wrightson Addition. Visitors to this recommended wilderness area are likely to encounter trails and camps created by travelers and smugglers. The increased sights and sounds of human activity would detract from the solitude and wilderness character of the area. The remoteness and limited access associated with wilderness attract those who are seeking an escape from law enforcement. Consequently, visitors are even more likely to encounter evidence of illegal activity in border wilderness areas than they are in border nonwilderness areas. Border Patrol concerns are also associated with the Chiricahua Addition North and Chiricahua Addition West areas on the Douglas Ranger District, although to a lesser extent. Less illegal activity in these two recommended wilderness areas would have less impact on wilderness character and experiences.

In addition to limitations placed on law enforcement activity, certain wilderness extensions may impede progress in completing treatments to improve ecosystem health and reduce fuel loading at the wildland-urban interface because of restrictions on mechanized and motorized uses. Wilderness designation would require planning of alternative treatment techniques that may affect the length of time it takes to accomplish fuels treatments and the tools available for use to achieve the conditions needed to reduce risk of fire. Portions of the Mount Wrightson Addition overlap or are adjacent to the wildland-urban interface. Madera Canyon, which offers developed recreation, and includes private land with structures and administrative sites, lies northwest of the Mount Wrightson Addition. The Sonoita and Elgin Community Wildfire Protection Plan addresses locations within the recommended wilderness area in Casa Blanca Canyon where private inholdings are close to the Mount Wrightson Addition. Projects could still be accomplished using nonmechanized vehicles and equipment, but the pace of implementation would likely decrease.

Recreation activities vary across the wilderness additions that are recommended for designation. In all six of these areas, however, the current recreational uses and types of visitation are compatible with wilderness management. The Santa Teresa Wilderness Additions (North and South) as well as the Galiuro Addition are relatively isolated and, therefore, experience light visitation and limited recreational activities. Several foot and horse trails run through the area, but there are no motorized trails. Some dispersed recreation use occurs off motorized roads that border the areas, generating some degree of visitor foot traffic into the areas.

Several of the additions to wilderness areas have higher levels of recreation activity than other recommended areas. In the Mount Wrightson Addition and the Chiricahua Wilderness Additions (North and South), there is a significant amount of recreation activity on nonmotorized trails, as well as off of bordering roads. Visitation consists primarily of hiking, horseback riding, camping, and hunting. A section of the Arizona National Scenic Trail runs through the Mount Wrightson Addition. As a group, these areas have the capability to provide a moderate quality wilderness recreation experiences for visitors. Wilderness recommendation would be unlikely to change the experience, except for its effects related to the prohibition on vehicle access and uses, which would enhance the experience for quiet recreation enthusiasts and disappoint those users who favor motorized recreation.

In other recommended additions, management of threatened and endangered species and habitat in accordance with wilderness restrictions affects the timeframe and methods for proposed habitat improvement and other management projects. These manageability concerns are offset by the value added by these new areas on a regional scale. Recommended wilderness areas provide additions of underrepresented ecosystems to the wilderness system land base. In addition, they address the need for wilderness based on increasing visitor pressure on existing wilderness areas.

Finally, some recommended wilderness areas proposed by alternative 1 are areas that were of significant interest to the public or otherwise rated highly for capability, availability, and need during the potential wilderness evaluation. The Dragoon, Ku Chish, Jhus Canyon, Tumacacori, Mount Graham, Mount Fagan, Whetstone, and Winchester Recommended Wilderness Areas present a variety

of wilderness characteristics that would contribute to their value as additions to the Coronado's wilderness landscape.

In recommended wilderness areas, construction of new roads or motorized trails would be prohibited. This is consistent with current recreation offerings in most of this group of recommended wilderness areas. Recommending wilderness for these areas is appropriate for recreation quality, as most areas currently offer solitude and primitive recreation in the form of nonmotorized trails and rugged cross-country opportunities. There are a few isolated incompatible recreation uses, however. For example, there is currently mountain bike use in the Mount Fagan area, which is inconsistent with wilderness management. Mountain bike use would be permitted in recommended wilderness areas until Congress acts upon the recommendation for wilderness designation. The Winchester area, located on the Safford Ranger District, presents a highly manageable area that has minimal or no motorized use due to rugged terrain, remoteness, and lack of public access. Recommending wilderness for this area would be consistent with wilderness character.

Overall, although a few uses would be incompatible with recommended wilderness designation, most current uses of these areas are compatible with wilderness character and would be able to continue. See the Potential Wilderness Area Evaluation Report for more information on each area and a more in-depth discussion of the effects of wilderness and nonwilderness recommendations for each area.

Undeveloped character is an important component of wilderness quality. The ability to provide a quality wilderness experience for this last group of recommended wilderness areas is compromised by evidence of human use, such as grazing developments and mining remains. In the Jhus Canyon area, for example, there is obvious evidence of human activity, including historical mining sites and homesteads throughout the area. While this detracts from the area's undeveloped character, it may enhance wilderness values by adding to the unique, historical features in the area.

Additionally, some of these areas also have high levels of illegal activity, as mentioned earlier, because of their proximity to the border. The Tumacacori and Mount Fagan areas on the Nogales Ranger District require a significant Border Patrol presence. Recommending these areas as wilderness may affect Border Patrol law enforcement activities by restricting its motorized activity to the pursuit of crimes in progress. In addition, the illegal activity in the area may negatively impact the wilderness character of the recommended wilderness areas. Quality solitude and undeveloped character may be more difficult to find in these areas, as signs of ongoing illegal activity as well as evidence of Border Patrol enforcement and infrastructure collectively detract from the areas' wilderness character.

Across all 16 areas recommended as wilderness areas by alternative 1, fuel and vegetation management activities may be more difficult to implement because of wilderness restrictions. This may affect the risk of fire in the wildland-urban interface. However, treatments are still possible with proper planning to use nonmechanized methods and nonmotorized access. And, the ability to use prescribed fire would be available in recommended wilderness areas in accordance with the Coronado's wilderness fire management plan. While progress in fuel treatments may be less than that accomplished under the no action, proposed action, and alternative 2, increases in risk of wildland fire are unlikely to be significant.

Direction under alternative 1 regarding management of resources in recommended wilderness to develop adaptation and resiliency to climate change is the same as that of the proposed action (see page 360). Overall, direction for climate change under alternative 1 would benefit more than 200,000 acres of new recommended wilderness.

Eligible Wild, Scenic, and Recreational Rivers

Direction under alternative 1 regarding management of eligible wild, scenic, and recreational rivers to develop adaptation and resiliency to climate change would be the same as that of the proposed action. Therefore, beneficial effects on wild, scenic, and recreational river resources during a period of

climate change would be the same as those attributed to wild, scenic, and recreational river management under the proposed action.

Research Natural Areas

The environmental consequences associated with management of research natural areas under alternative 1 would be the same as those reported for the proposed action.

Direction under alternative 1 regarding management of resources in recommended research natural areas is intended to develop adaptation and resiliency to climate change. Beneficial effects to resources in research natural areas would be the same as those attributed to management of research natural areas under the proposed action. Designation of the Finger Rock Canyon Research Natural Area would make forest resources available for research about the effects of climate change and potential new conservation responses.

Alternative 2

Wilderness and Wilderness Study Areas

Alternative 2 would continue management of already designated wilderness and wilderness study areas under the same updated plan components as the proposed action and alternative 1, and would carry forward the 1986 plan recommendation for the Mount Graham Recommended Wilderness Area (figure 8). Thus, it would enhance opportunities for a wilderness experience and conserve and preserve the characteristics of the recommended wilderness area.

Alternative 2 does not include plan direction for management of resources in wilderness and wilderness study areas to develop adaptation and resiliency to climate change. It does, however, incorporate the strategies in appendix A of the plan for managing resources when atypical temperatures and rainfall patterns exacerbate natural disturbances. Therefore, alternative 2 would have less beneficial effects on wilderness and wilderness study areas than alternative 1 and the proposed action, but would be more effective than no action.

Recommended Wilderness

Alternative 2 does not include plan direction for management of resources in recommended wilderness to develop adaptation and resiliency to climate change. It does, however, incorporate the strategies in appendix A of the plan for managing resources when atypical temperatures and rainfall patterns exacerbate natural disturbances. Therefore, alternative 2 would have less beneficial effects on recommended wilderness than alternative 1 and the proposed action, but would be more effective than no action.

Eligible Wild, Scenic, and Recreational Rivers

Alternative 2 does not include plan direction for management of eligible wild, scenic, and recreational rivers resources to develop adaptation and resiliency to climate change. It does, however, incorporate the strategies in appendix A of the plan for managing resources when atypical temperatures and rainfall patterns exacerbate natural disturbances. Therefore, alternative 2 would have less beneficial effects on eligible wild, scenic, and recreational rivers than alternative 1 and the proposed action, but would be more effective than no action.

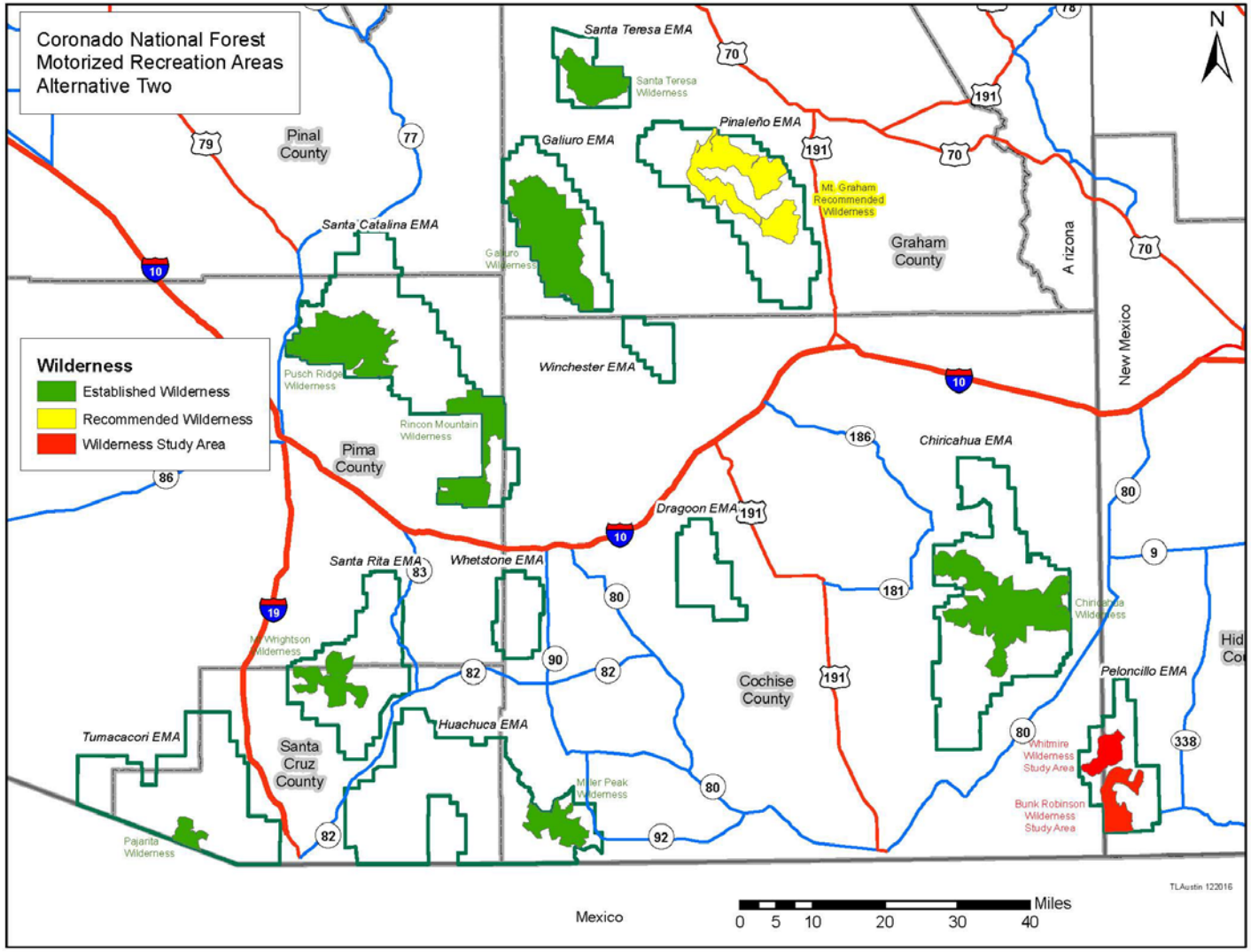

Figure 8. Wilderness areas and recommended wilderness area under alternative 2

Research Natural Areas

Alternative 2 is similar to the proposed action except that it does not recommend the proposed Finger Rock Canyon Research Natural Area. Consequently, this area within the Pusch Ridge Wilderness would continue to be managed under the guidelines established by the Wilderness Act of 1964. Because alternative 2 would not recommend the new Finger Rock Canyon Research Natural Area, this opportunity for climate change research on the Coronado would not be realized.

Alternative 2 does not include plan direction for management of resources in research natural areas to develop adaptation and resiliency to climate change. However, it does incorporate the strategies in appendix A of the plan for managing resources when atypical temperatures and rainfall patterns exacerbate natural disturbances. Therefore, alternative 2 would have less beneficial effects on research natural areas than alternative 1, and the proposed action, but would be more effective than no action.

Cumulative Effects

The spatial boundary for assessing the potential for cumulative effects from management of designated and special areas following direction specified by each of the alternatives encompasses all lands of other ownership within 100 miles of the Coronado. This includes multiple ranger districts on the Tonto, Gila, and Apache-Sitgreaves National Forests, as well as National Park Service, Bureau of Land Management, State, and private lands. The analysis includes effects from past and present actions and reasonable foreseeable actions over the life of the revised forest plan (15 years).

Because forest management has been designed to conserve special areas, there have been fewer adverse effects on special areas' natural resources than on the resources of nondesignated areas. Present management of special areas under the no-action alternative continues this trend. Future actions in special areas, especially wilderness, will be managed under all action alternatives to maintain and enhance the character and resources of each.

Actions that may result in adverse effects on natural resources on the Coronado National Forest, including those in designated and special areas, include urban development on private land, road construction, other ground-disturbing actions proposed by other agencies and local governments, fuels management projects, mining and minerals exploration, grazing, and illegal activities related to the Mexican border. The degree of cumulative effects, however, would not be exacerbated by additive effects from management of designated and special areas, because none of the alternatives propose management that would contribute measurable adverse effects. Non-forest actions would not typically affect the use of lands in special areas of the Coronado, unless they significantly degrade their natural resources.

Forest plan revisions proposed by the Kaibab, Prescott, Apache-Sitgreaves, Coconino, Tonto, and Gila National Forests could potentially impact management of regional unroaded or wild and scenic river resources. Currently, the Kaibab, Apache-Sitgreaves, and Prescott National Forests have released draft environmental impact statements that include reasonably foreseeable proposals for new wilderness areas. The Kaibab National Forest proposes two additions to existing wilderness areas as well as a small area adjacent to proposed wilderness in Grand Canyon National Park. The Apache-Sitgreaves National Forests propose additions to two existing wilderness areas. The Prescott National Forest proposes eight additional areas, totaling 43,440 acres, for wilderness designation. The proposed addition of new wilderness areas would contribute to a positive cumulative effect because additional wilderness would decrease the existing visitor pressure on the Coronado, which has a high demand for wilderness experiences because of its proximity to urban areas.

Recommendations for new wilderness areas, wilderness study areas, and research natural areas would enhance user recreational experiences and opportunities for scientific research on the Coronado under all alternatives. The greatest enhancement would result from alternative 1 because of the much larger acreage it recommends for designation as wilderness. Users who enjoy a wilderness experience and quiet recreation would benefit from management by alternative 1, while those who prefer motorized recreation would not. The proposed emphasis on motorized recreation by alternative 2 would have the

least positive impact because it recommends no new wilderness. None of the alternatives would have a significant additive effect that would contribute to cumulative effects on or off the Coronado.

Management for wilderness character by all alternatives is expected to reduce resource damage resulting from motorized and mechanized uses. Again, alternative 1 would have the most beneficial effect because it proposes the largest acreage of wilderness. None of the alternatives would have a significant additive effect that would contribute to cumulative effects on or off the Coronado.

On the other hand, because of wilderness restrictions, management of additional areas as wilderness may impede Forest Service accomplishment of fuels and vegetation management projects, which would increase the risk of uncharacteristic wildfire. It is possible that this increase would contribute to a cumulative effect when considered additively with other non-forest actions that increase the risk of uncharacteristic fire. Should such fires occur, impacts on and off the Coronado may be severe. Loss of property, injury, or mortality and effects on natural resources could occur. Because it recommends the least acreage for management as wilderness, alternative 2 would have the least impact on fuels and vegetation treatment projects.

There are currently 39 wilderness areas within a 100-air-mile radius of the Coronado, including those on other national forests, National Park Service lands, and Bureau of Land Management lands (see table 1 in USDA FS 2012). Including the Coronado wilderness areas, total regional wilderness acreage is approximately 2 million acres. As a result, the proposed addition of more wilderness areas within 100 air miles of the Coronado may contribute to a positive cumulative effect. That is, every wilderness area and recommended wilderness area on the Coronado is, on average, 62.5 miles away from another wilderness. Overcrowding in wilderness areas close to large metropolitan areas, such as Tucson, is a common concern of resource managers in the region. As a result, the addition of new wilderness areas on other national forests and lands of other ownership would contribute to a cumulative decrease in visitor pressure on the Coronado, which because of its proximity to urban areas has a high demand for wilderness experiences.

Motorized Activities – Affected Environment

Visitors to national forests and grasslands share a common interest in the enjoyment of outdoor recreation in a natural setting. On National Forest System lands, the Forest Service manages more than 300,000 miles of roads and 35,000 miles of trails that provide visitors with motorized access to recreational amenities; motorized access to those who use National Forest System lands for special purposes, such as grazing and operation and maintenance of communication sites; and administrative access to agencies for fire and land management activities.

On the Coronado, there are approximately 2,000 miles of open National Forest System roads. Some open roads are authorized for administrative or permitted use only, but most are open to the public. Five National Forest System trails on the Coronado are open for motorized use, all of them located near Redington Pass Road. Of the total miles of road in use, approximately 1,700 miles are high-clearance roads that are not designed for passenger-car use and do not require regular maintenance. Counties and other entities maintain about 170 miles of roads on the Coronado. The rest are maintained by a forest road crew on a schedule that is determined annually.

Forest roads provide access to developed recreation sites, trailheads, dispersed camping areas, day-use areas, and points of interest. They are also used for commercial operations, such as ranching, outfitting, and guiding services; to access electronic sites, summer homes, and other locations under special use permits; and for private land access. In addition, National Forest System roads offer a broad range of motorized recreation opportunities and provide access for nonmotorized activities.

An established motorized transportation system has been in place on the Coronado for many years. The system and direction regarding motorized travel originated with the approval of the 1986 forest plan (USDA FS 1986). Motorized travel on the Coronado has evolved over time. When the 1986

forest plan was written, typical vehicles on forest roads included passenger cars, pickups, and other standard-sized vehicles. Roads were used primarily to access points of interest or areas used for specific activities, such as hunting and picnicking. Increasingly, the roads themselves have become a recreational attraction, as the use of off-highway vehicles, which include four-wheel-drive vehicles, motorcycles, all-terrain vehicles, and utility terrain vehicles, has steadily increased in popularity. Those who visit the Coronado for motorized recreation particularly enjoy the opportunities available for driving loop routes. The primitive nature of some roads also makes them attractive for off-highway vehicle use.

The Arizona Statewide Comprehensive Outdoor Recreation Plan (SCORP) estimates that about 9 percent of Arizona's residents participate in off-highway vehicle use (Arizona State Parks 2008). Twenty-four percent of off-highway vehicle enthusiasts indicated that they would like to increase their motorized activities in the future. Thirty-four percent indicate they expect to drive for pleasure more. With Tucson and surrounding communities being among the fastest growing in the state, the Coronado can expect a large percentage of that increase in visitation. Many off-highway vehicle riders and drivers enjoy using forest roads because they provide a variety of scenery, challenges, and destinations. The SCORP reports many off-highway vehicle enthusiasts ride 50 miles in one day.

The rough terrain on much of the Coronado makes it unsuitable for the development and maintenance of high-density road networks. Existing primitive routes lead to interesting destinations and provide challenging four-wheel-drive experiences. There are certain locations near Tucson and other communities where route densities are relatively high, and off-highway vehicle recreation is a primary activity of the visiting public. The Redington Pass area and the east side of the Santa Rita Mountains are two locations where high levels of off-highway vehicle recreation occur and where improvements have been made to accommodate that use.

Properly managed off-highway vehicle recreation is a legitimate use of National Forest System lands. However, management of off-highway vehicle recreation became increasingly problematic in the past few decades, because the first Forest Service motorized travel regulations were developed before the increase in off-highway vehicle use and advances in off-highway vehicle technology. In December 2005, acknowledging this shortcoming and the potential for off-highway vehicle use to adversely impact forest and grassland resources, the Forest Service issued a regulation known as the Travel Management Rule (36 Code of Federal Regulations (CFR) Parts 212, 251, 261, and 295).

The Travel Management Rule clarifies current Forest Service policy regarding motor vehicle use and provides management direction that allows sustainable access by motor vehicles, including off-highway vehicles, on national forests and grasslands. Some, but not all, Forest Service units have established systems of roads, trails, and areas that are managed for motorized use. The Travel Management Rule does not require them to change existing plans and considers previous travel management decisions as having been incorporated into each designated system without additional or retroactive transportation analysis planning and environmental analysis.

The Travel Management Rule requires each national forest and grassland that does not have a designated motorized travel system to establish one and for that system to be documented on a publicly available motor vehicle use map that will be updated annually. Designations to motorized travel systems may include the limited use of motor vehicles within a specified distance (corridor) of certain designated National Forest System roads solely for dispersed camping or big game retrieval (36 CFR 212.51(b)). Once a motor vehicle use map is published, all motor vehicle travel that is inconsistent with its designations is prohibited (36 CFR 261.13). Motor vehicle use maps are now available to the public at each ranger district of the Coronado free of charge.

The density of roads on the Coronado currently varies from no roads in wilderness areas and other roadless areas to relatively high road densities in developed recreation areas and the two popular off-highway vehicle recreation areas in Redington Pass and the Santa Rita Mountains. Guidance from the 1986 forest plan limits road density to no more than 1 mile of road per square mile of land. However,

that guidance applies to the entire forest—including inventoried roadless areas and wilderness areas—where road density is limited by statute.

The increase in the general public use of the forest transportation system, the proliferation of unauthorized roads, and the increase in the popularity of recreational off-highway vehicles has compounded issues related to visitor experiences that were less prevalent when the 1986 forest plan was developed. These issues include, but are not limited to, the following:

- effects of off-highway vehicle use on other recreation activities, including the loss of quiet places to camp, recreate and view wildlife
- ability of the Forest Service to adequately maintain the current road system for public use
- adequacy of the road system for desired motorized recreation uses (e.g., availability of long distance loop routes, off-loading areas, and informational signing)
- adequacy of the road system for access to trailheads and other nonmotorized recreation opportunities
- preservation of unroaded areas in which to enjoy nature and engage in quiet, nonmotorized recreation

Many unauthorized (not National Forest System) roads on the Coronado are the result of off-road driving where it is prohibited. The Forest Service has taken action to enforce regulations and block these roads, but many still exist. Some of these unauthorized roads may have been created as a result of legitimate permitted uses, such as range improvement projects or fuelwood cutting, and have become useful for general forest access. Some are historic roads that were never added to the Coronado National Forest road system. There have been many unauthorized roads developed near the international border. These are difficult to close because they are regularly used by the U.S. Border Patrol, and many have been identified as high priority for Border Patrol use. Over 390 miles of unauthorized roads have been identified on the Coronado to date during a transportation analysis planning process that preceded the creation of motor vehicle use maps for each ranger district.

Motorized Activities – Environmental Consequences

Effects Common to All Alternatives

No direct (on-the-ground) effects would result from direction given in the 1986 forest plan, the proposed action, alternative 1, and alternative 2.

On the Coronado, cross-country motorized travel was prohibited in the 1986 forest plan. A 2010 amendment was made to the 1986 plan, making direction consistent with language in the Travel Management Rule, and changing transportation system direction from that in the 1986 plan to individual district motor vehicle use maps. A motor vehicle use map prepared for each district on the Coronado National Forest, which will be updated annually, shows the designated roads and motorized trails on each ranger district. Unauthorized roads will not be shown as open for motorized travel on the motor vehicle use maps. The Travel Management Rule direction is common to all alternatives; therefore, cross-country motor vehicle travel would be prohibited by all of the alternatives.

Under all alternatives, future changes in the miles of National Forest System roads and motorized trails would be evaluated site specifically as needs are identified and in accordance with the transportation analysis process and Travel Management Rule requirements. Public involvement and environmental analysis reviews for site-specific transportation projects are common to all alternatives. Impacts from changing the number of miles in the current motorized transportation system would vary according to use, location, road maintenance level, and other factors.

No roads would be constructed in the eight designated wilderness areas (338,318 acres) and the Mount Graham Recommended Wilderness Area (61,315 acres), or 20 percent of the national forest. Also, the Bunk Robinson and Whitmire Canyon Wilderness Study Areas, which comprise 31,225 acres, would

continue to be protected from road development. Inventoried roadless areas would also be excluded from road construction as provided by the 2001 Roadless Area Conservation Rule.

The proposed action and alternative 1 include direction for management of resources in response to climate change. No action and alternative 2 do not. The effects of climate change may compound damage that exists as a consequence of motor vehicle travel. However, whether or not the alternatives and no action contain climate change direction would not, in general, affect the Coronado's motorized transportation system.

No Action

This alternative would have no change on the environment affected by the current motorized transportation system on the Coronado. The current levels of maintenance would stay the same, and roads would be decommissioned or closed in compliance with the 1986 forest plan or the current Travel Management Rule. This alternative presents the public the most motorized access to the national forest because there are no additional special areas that would reduce motorized access and no land use zone or management area restrictions on providing additional public access for motorized vehicles.

The 1986 forest plan provides direction to provide and maintain a transportation system that fulfills the needs of the public. If this direction continues to be followed, adverse effects would continue to occur. These include fragmentation of habitat, noise disturbance to species, and sedimentation impacts to watersheds. In addition, the widespread access to motor vehicles in the 1986 forest plan places heritage sites at risk to vandalism and illegal pottery or artifact searching and collection.

Management of motorized transportation would continue under forestwide and management area-specific goals, objectives, standards, and guidelines in the 1986 forest plan. Current guidance for the density of existing and new road construction as 1 mile of road or less per square mile would continue to apply forestwide outside of wilderness and other protected areas, regardless of site-specific management objectives. When new access to the national forest is acquired, building new roads may require a forest plan amendment because of the potential to increase road density beyond the guideline limits. This alternative would result in the most even distribution of roaded areas across the Coronado and would, therefore, provide fewer areas for quiet recreation and lower disturbance areas for wildlife.

The 1986 plan has no specific objectives for eliminating unauthorized roads, with the consequence that user-created routes remain on the ground longer than necessary, continuing to cause resource damage. The plan also has no objective for realignment or removal of roads in wetlands or meadows, the consequence of which is roads remaining in place and causing continued erosion, soil compaction, decreased infiltration, and habitat loss or disturbance.

The no-action alternative has no objective for the construction of hardened road surfaces at stream crossings where there are impacts to the surrounding vegetation, wildlife species, and watersheds.

Road construction across mountain meadows would be prohibited, which would continue to protect the hydrological and soil conditions of this resource.

Proposed Action

The revised forest plan under the proposed action would provide the following direction, which would have the effects described below.

Permanent road development would be prohibited on four recommended wilderness areas totaling 108,890 acres, in addition to already designated wilderness, wilderness study areas, and inventoried roadless areas. This would have the effect of keeping erosion and sedimentation produced by roads out of these designated areas. This would positively impact the surrounding vegetation, wildlife species, and watersheds that might otherwise be disturbed by vehicle presence and use by decreasing noise and ground disturbance. It would also allow for quiet recreation. It is difficult to build roads in

the proposed Ku Chish, Whetstone, and Chiricahua North Recommended Wilderness Areas. The rugged terrain and the expense make this option indifferent from the existing condition.

Permanent roads in the Wild Backcountry Land Use Zone, which comprises about 35 percent of the national forest, would be constructed only to restore motorized access where it previously existed but was lost because of the lack of legal access. Increased miles of National Forest System roads would generally equate to increased motorized access and ecological impacts from roads and decreased opportunity for more primitive recreation. The ecological consequences of adding roads would result in decreased wildlife habitat connectivity, increased sedimentation, and impacts to plants and archaeological sites. The exact magnitude is difficult to assess at the plan scale because the effectiveness of achieving these effects is largely dependent on site-specific situation and design features.

In the remaining land use zones, which comprise about 38 percent of the national forest, changes to the motorized transportation system would be proposed in site-specific management actions that would be subject to direction in many different components of the revised forest plan. The ecological consequences of adding roads would result in decreased wildlife habitat connectivity, increased sedimentation, and impacts to plants and archaeological sites. The exact magnitude is difficult to assess at the plan scale because the effectiveness of achieving these effects is largely dependent on site-specific situation and design features.

Specific objectives in the revised forest plan under the proposed action would identify miles of non-National Forest System roads to be eliminated each year. Removing these roads from the landscape would result in less motorized travel off the roads and trails designated on the motor vehicle use map, and it would protect wildlife, recreation, and other unique resources by reducing the influence of roads and unauthorized motorized travel. Also, removing these roads would improve watershed conditions by decreasing the number of roads that are poorly maintained or located. When roads are in poor condition, continued use increases soil erosion by water and wind. Decreasing this source of sedimentation would improve watershed conditions without decreasing administrative or public access.

Specific guidelines for realignment or removal of roads in wetlands and meadows would result in better protection of sensitive plant and animal species and soil hydrology, improved water quality, increased biological diversity, increased productivity and forage yields, increased infiltration, and subsurface flow.

Guidelines are provided regarding the avoidance of road construction or maintenance in wetlands or meadows, or across sensitive soils, and mitigation measures if this cannot be avoided. This would have the effect of making roads less expensive to maintain in such areas; allowing for stream stability; reduction of erosion due to roads; and allowing habitat to flourish. Indirect routes do a better job of protecting sensitive wildlife and vegetative species and erosive hydrologic soils.

Alternative 1

Alternative 1 reiterates the direction in the proposed action. In addition, it recommends designating 147,018 acres more wilderness than the proposed action. Therefore, its effects on motorized transportation would be the same as those of the proposed action except for those associated with management of additional wilderness. Acreage recommended as wilderness would be unavailable for permanent road construction. Most of it, in fact, would be included in a Wild Backcountry Land Use Zone. As a consequence, proposed road construction to restore land access to specific areas of the Coronado may be impeded or denied.

Restrictions on motorized use in wilderness would result in less disturbance from vehicle and human presence than any of the other alternatives. On the other hand, the same restrictions would decrease motorized access to remote recreational opportunities. All road obliteration or closure proposals would be reviewed for effects on a site-specific basis in environmental analysis. A smaller road system is

generally correlated with increased wildlife habitat connectivity, reduced sedimentation, and impacts to plants and archaeological sites, decreased vandalism and theft of archaeological sites, and less noise disturbance to wildlife.

Alternative 2

Alternative 2 proposes that the Motorized Recreation Land Use Zone be enlarged in comparison to the proposed action and alternative 1. This would increase the area that could potentially be developed for off-highway vehicle facilities by 40,255 acres more than the area specified by the proposed action and alternative 1, and could result in a net increase in motorized trails, loading ramps, parking areas, or other facilities. The increased area is planned for designation at previously disturbed sites to minimize potential resource impacts. However, increasing motor vehicle use also increases the potential for ecosystem impacts and reduces the degree of quiet recreation available on the Coronado.

Cumulative Effects

The land management plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Because the land management plan does not authorize or mandate any site-specific projects or activities (including ground-disturbing actions), there can be no direct effects. However, there may be implications, or long-term environmental consequences, of managing the forests under this programmatic framework.

The bounds of cumulative environmental consequence analysis for the Coronado are the nearby national forests; State and county highways that access and traverse the Coronado; cities encompassed by the Coronado; easements to access inholdings; Pima, Pinal, Santa Cruz, Cochise, and Graham Counties encompassing the Coronado; and designated highways on the Coronado.

Areas proposed for treatment would result in increased traffic and greater variety of vehicles, including heavy equipment. This would result in a need for more frequent road maintenance and possibly road improvements in order to accommodate this increased activity safely.

Completed, proposed, and planned road projects on and in close proximity to the Coronado are included in the following regional road and transportation improvement plans:

- ADOT State Transportation Improvement Program FY 2011-2014 (ADOT 2010)
- ADOT Tentative 5-Year Transportation Facilities Construction Program 2012-2016 (ADOT 2010a)
- Pima County Regional Transportation Authority Roadway Improvement Plan (Pima County 2013)
- Cochise County Davis Road Project (Cochise County 2013)
- Santa Cruz County Palo Parado Road Project (Santa Cruz County 2012)

Road improvement and widening projects on and off the national forest could have an impact on the Coronado. Projects on and in close proximity to National Forest System lands could result in increased easements and could facilitate ease of access onto the national forest. Projects outside the national forest could decrease driving times to access the Coronado. In general, it is expected that these projects could result in more visitors to the Coronado and increased road maintenance needs. Increased visitation has variable effects depending on whether or not it occurs in an area with adequate capacity to provide recreation opportunities that are consistent with visitor expectations or not. However, on a forestwide scale, it is difficult to know the outcomes of increased visitation without site-specific information.

The Coronado road system could be impacted by the projects surrounding the national forest; however, the effects would be minimal. The major effects of alternatives 1 and 2 on the road system stem from changing recreation opportunity spectrum classifications, proposed special areas, and

management areas. These areas would be located in the more remote sections of the Coronado and would not be impacted by projects on primary travel arterials through the state. The increase in ease of access to the Coronado provided by some projects could increase traffic volumes on roads in close proximity to major arterials that travel through the Coronado. This possible increase would not change the maintenance level of the roads, but could possibly increase the maintenance needed to keep the road in the proper condition, because increased traffic increases sedimentation and runoff on the road surface. Increased traffic can also increase dust for nearby homeowners and recreation visitors. Visitor expectations of road maintenance would also be expected to increase with traffic. Despite the possible increase in traffic volume, the sizes of the roads would not be altered due to the desired conditions stating that the need for public access must be balanced with the mitigation of ecological impacts.

The no-action alternative would not affect any state, county, or city transportation systems. Any alterations in the size of the Coronado National Forest road system in this alternative would be provided in the guidelines of the 1986 forest plan. In addition, the possible changes to the National Forest Road System brought about by alternatives 1 and 2 would not affect the overall municipal transportation system throughout the region. With few exceptions, such as National Forest System Road 61 (Washington Montezuma Pass) or National Forest System Road 39 (Ruby Road), National Forest System roads are not used as primary travel routes between cities and towns. The loss of road mileage due to the changing recreation opportunity spectrum classifications, proposed special areas and management areas would neither increase or decrease traffic volumes on primary arterials such as Interstate 10 or Interstate 19.

The National Forest Road System is a part of the overall transportation system throughout the state of Arizona. Forest roads connect to collector roads as well as arterials throughout the state. The jurisdiction and maintenance responsibilities are divided between the State, county, and Forest Service using easements, permits, and cooperative maintenance agreements. For further information on this topic, refer to the “Land Ownership Patterns and Land Uses” section on page 383.

Revision Topic 3: Access to National Forest System Lands

Access to National Forest System Lands – Affected Environment

For many years, the Forest Service has worked diligently to acquire permanent legal access[50] to specific areas of the Coronado where none presently exists. This is because it does not have written title that authorizes vehicular travel on roads occurring on private or non-Federal property within, adjoining, or adjacent to the Coronado boundary.

Vehicle access to non-forest roads within, and adjacent to, the Coronado is essential for both public use of the national forest and administrative use for resource management activities. Because of the unique topography of Arizona’s sky islands, National Forest System roads, public roads,[51] and private roads are dispersed among 12 geographically distinct ecosystem management areas of the Coronado. To complicate matters, embedded within the Coronado are private lands, state trust lands, and lands managed by other agencies and municipal jurisdictions.

At boundary points with non-forest land, public access and often, Forest Service access, has often been blocked, gated, locked, or otherwise made unavailable by private and other land owners. Owners who block access essentially create a “national forest in my back yard,” a scenario that provides little benefit to the public. Issues have been exacerbated by conflicts arising when Coronado National Forest users travel off road to circumvent a road that has been closed to public use by the land owner in order to reach their destination.

[50] Also referred to as “written title.”

[51] County, State, and other Federal.

At present, written title has been obtained by the Coronado to just one-third of the 300 public and administrative vehicular access routes from beyond the proclaimed national forest boundary, where most access needs predominate. In addition, the Forest Service estimates that about 1,000 miles of road right-of-way easements are needed on lands of other ownership and other Federal lands to ensure an adequate legal right of public and administrative access to the Coronado's road and trail system.

During the past 25 years, private land owners have challenged the ownership status of many long-established national forest access routes through their lands and where no legal right of public access (written title) exists, they have closed such roads to public use. Private land owners are hesitant to grant right-of-way easements for perpetual public access across their lands for a variety of reasons, including, but not limited to, the following:

- impacts from off-highway vehicle use
- undocumented alien and smuggling traffic
- litter, vandalism, and privacy issues
- perceived potential liability (although Arizona Revised Statute 33-1551 and New Mexico Statute 17-4-7 limit a private land owner's liability when providing recreational and educational access); and in some cases
- a desire for exclusive use and control of the adjoining National Forest System lands

Options being considered to meet current and future access needs where no written title exists include relocating National Forest System roads, reopening, and reconstructing National Forest System roads that have been previously decommissioned, or building new roads where long-established administrative and public access routes have been closed by private or other land owners.

Access to National Forest System Lands – Environmental Consequences

Effects Common to All Alternatives

The proposed action and alternative 1 provide plan direction for management of natural resources vulnerable to climate related changes. No action and alternative 2 do not. However, because climate change direction has no influence on resolution of issues related to public and administrative access to the Coronado, effects of this direction, or lack thereof, would be the same for all alternatives.

No Action

Since the current plan became effective in 1986, the Forest Service has had no organized strategy for acquiring written title to about 200 access points into the Coronado from beyond the proclaimed national forest boundary.

The 1986 forest plan does not specify desired conditions for public and administrative vehicular access to those areas of the Coronado where it is presently lacking. It includes standards and guidelines that are no longer relevant to current access issues. In addition, the plan contains an out-of-date list of locations where access, easements, and rights-of-way are needed. Access to some of these locations cannot be resolved because of current budget conditions; at other locations, access issues have been negated by changing user needs. The plan's lack of desired conditions and inaccuracies in areas where access is needed make it difficult for Coronado National Forest managers to identify projects, set priorities, and measure progress toward improved access.

Because the plan is almost 30 years old, direction regarding acquisition of access does not consider changes in user demand corresponding to population growth nor does it reflect the evolution of public interest in newer and different recreational activities and use patterns. For example, some people visit for a quiet recreational experience, while others prefer the energetic and challenging nature of motorized recreation. Vehicular access to the Coronado for quiet recreation is best satisfied by

nonmotorized means, while roads are preferable for access to motorized recreation. Because the 1986 plan does not differentiate between conflicting uses such as these, plans for acquiring access would not incorporate these considerations. The consequence would be that the visitor experience may not be optimum for either use.

Where access is needed, users who value quiet recreation would benefit from the 1986 forest plan's recommendation for one wilderness area, because the Wilderness Act imposes a restriction on motorized and mechanized uses in wilderness. Thus, access to wilderness would have to be by nonmotorized, nonmechanized means, such as on foot or horseback. These restrictions, however, would not favor those users with limited mobility who would have to find an alternate means of access.

If the 1986 plan continues to be followed, issues related to access would continue to affect activities associated with public uses, such as grazing, exploration for mineral deposits, recreation, and special uses of National Forest System land; and administrative uses, such as fire suppression and management of forest vegetation, roads, facilities, and infrastructure.

If permanent legal access is unavailable, ranchers may be unable to successfully maintain grazing allotment improvements, such as fences, stock tanks, pipelines and other facilities. Likewise, access for mineral exploration activities may be impossible for those who hold mining claims on public land or who must travel on national forest lands to access claims on other lands. Without access to preferred destinations for hunting, hiking, birding, rock climbing, horseback riding, off-highway vehicle use, and other recreation, outfitter/guide services authorized by special use permits and private recreational users would be displaced to other forest locations. Alternatively, if vehicular access is not accommodated for the uses described above, users may choose to illegally circumvent areas that are blocked or gated/locked by operating their vehicles off National Forest System roads that are legitimately open to motorized use. The results from off-road travel include damage to soils, vegetation, water resources, and habitat, among other resources, and the establishment of user-created roads that will likely be traveled by others who find their destination inaccessible in the same general area, increasing resource damage.

Inability to administratively access areas of the Coronado also affects fire management actions and those that treat vegetation to reduce fuel loading, maintain or construct roads, and maintain, repair or construct facilities and infrastructure. If current plan direction continues to be followed, acquisition of access for these purposes is uncertain, because the 1986 plan contains an out-of-date list of locations where written title, easements, and rights-of-way are needed.

Proposed Action

The revised forest plan under the proposed action provides a strategic vision for permanent legal vehicular access to approximately 200 locations on the Coronado where access is presently lacking. It establishes desired conditions for achieving a level of access that will accommodate all essential administrative uses and most public uses.

Desired conditions in the revised forest plan would guide the administrative planning process for acquiring access, with emphasis on tailoring both vehicular and nonmotorized access to specific areas and the uses they support. The revised forest plan would not define specific points of access, but would allow room for flexibility in negotiating access to general areas. As a result, when vehicular access has been successfully acquired, user conflicts and resource damage caused by off-road travel would be minimized (see the "No Action" section.)

Where access is needed, users who value quiet recreation would benefit from the proposed action's recommendation for one more wilderness area than no action and alternative 2 and restrictions on motorized and mechanized uses in wilderness. Thus, any access to wilderness would have to be by nonmotorized, nonmechanized means, such as on foot or horseback. These restrictions, however,

would not favor those users with limited mobility who would have to find an alternate means of access.

If revised plan direction is followed, permanent legal access to, and within, the Coronado National Forest by public and administrative users would be achieved at most locations. This would reduce conflicts between public and administrative users and private and other land owners who have blocked access to national forest lands. It would also facilitate access for permittees to grazing improvements, mining claim holders to their claims, recreational users to their preferred destinations, and Forest Service personnel to locations essential to fire suppression and management of vegetation, water resources, habitat, and other forest resources.

If the proposed action is implemented successfully, the Coronado would be easily accessible on a system of arterial, collector, and local roads and trails that are interconnected with public roads, highways, and trails adjacent to, adjoining, and within the national forest.

Alternative 1

Alternative 1 would have the same effects as described above for the proposed action with one exception. Additional effects would result from its recommendation that Congress designate additional acreage on the Coronado as wilderness. Because of Wilderness Act restrictions on motorized and mechanized uses in wilderness, 16 parcels of National Forest System land would be precluded from having vehicular access of any kind, as well as access by mechanical means, such as mountain bikes.

Users who value quiet recreation would benefit under alternative 1 more than the other alternatives, because of restrictions on motorized and mechanized uses. Vehicular access would not be permitted except under certain circumstances and with regional forester approval. Access to wilderness would have to be by nonmotorized, nonmechanized means, such as on foot or horseback. These restrictions would not favor those users who have limited mobility, causing them to find an alternate means of access.

Designation of wilderness may affect those members of the public who currently have motorized access to their property under special use authorizations. Their ability to access private land using motorized transportation may be affected by wilderness restrictions if, and when, Congress designates a parcel as wilderness. However, the Forest Service is required by law to permit access to private land users within the national forest boundary. This conflict would have to be resolved if and when such issues arise.

Access to implement forest health projects may also be affected by the additional wilderness recommended under alternative 1.

Alternative 2

The effects of alternative 2 would be the same as those of the proposed action with one exception. Alternative 2 would recommend only one wilderness area. Therefore, the benefit to quiet recreation enthusiasts because of wilderness restrictions, which would affect both access to and travel within wilderness, would be less than the proposed action. There would be corresponding decrease in effects on those with limited mobility who cannot access wilderness by motorized or mechanized means.

The increased acreage allocated by alternative 2 would have no adverse effects on land access issues on the Coronado. Depending on where access is needed, motorized recreation zones may facilitate access to the national forest by off-highway vehicle, especially in locations of rugged terrain.

Cumulative Effects

The geographic area that may be cumulatively affected by direction given in each alternative plan and the 1986 plan regarding access to the Coronado would include all of the national forest and adjacent

lands in Pima, Graham, Santa Cruz, Cochise, and Pinal Counties in Arizona; and Hidalgo County in New Mexico. The timeframe of analysis would be the life of the plan.

The sky islands of the Coronado play an important role in the Forest Service's ability to successfully manage land boundary management issues and provide for public access. Private and other agency managed land are intermingled among roads, highways, and the national forest. The Coronado shares common boundaries with six counties, as well as:

- Arizona State Land Department;
- New Mexico State Lands Office;
- Arizona State Parks Department;
- National Park Service (Saguaro National Park East, Coronado National Memorial, and Chiricahua National Monument);
- Bureau of Land Management;
- U.S. Fish and Wildlife Service (Buenos Aires National Wildlife Refuge);
- Fort Huachuca Military Installation;
- San Carlos Apache Indian Reservation; and
- United Mexican States.

Lands managed by the Arizona State Land Department (ASLD) are of particular interest with regard to access.

The Arizona State Land Department manages a significant amount of State Trust property adjacent to the Coronado according to its mission, which differs markedly from that of the Forest Service. That is, department manages State Trust lands and their resources to enhance the land value and optimize economic return for trust beneficiaries in a manner consistent with sound stewardship, conservation, and business management principles that support socioeconomic goals now and in the future. In contrast, the Forest Service mission is to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people.

State Trust lands are generally not open to the public without a permit (or lease), which is issued by Arizona State Land Department for a fee. An exception to this is when an individual user is actively hunting or fishing in season with a valid hunting or fishing license issued by the Arizona Game and Fish Department or New Mexico Department of Game and Fish. Use of roads across State Trust lands to the Coronado by public land users in Arizona requires either a permit purchased and held by an individual user or family, or a public road right-of-way purchased from the Arizona State Land Department by private individual(s), agencies, or other entities.

Cumulative effects from providing access in and to the Coronado have historically occurred when the Forest Service has sought to obtain rights-of-way easements from the Arizona State Land Department to relocate and construct a new road alignment across State Trust lands. However, because of impasses between both agencies regarding indemnification and differences in Federal and State appraisal requirements, the Forest Service is currently unable to acquire perpetual, exclusive rights-of-way from the Arizona State Land Department for proposed new road alignments as well as for existing road alignments across State Trust lands.

The mission of the New Mexico State Land Office also differs from that of the Forest Service, making acquisition of land in New Mexico for access to the Coronado difficult as well. This office is responsible for administering 9 million acres of surface and 13 million acres of subsurface land for the beneficiaries of its trust. Each acre of land is designated to a specific beneficiary, with public schools receiving more than 84 percent of the acreage. The goals of the trust are to optimize revenues while protecting the health of the land for future generations.

Private lands are present both in and around the Coronado. There are desirable parcels of private land within the national forest boundary that may be acquired directly, by exchange, or by donation. Cumulative positive effects result from a Federal land management agency's acquisition of isolated private inholdings within its legislated boundaries, because the efficiency of managing these areas increases with the need for fewer rights-of-way and other land issues across the greater landscape.

Private investors continue to submit applications to county governments for permits to construct subdivisions that adjoin several of the Coronado's ecosystem management areas. However, most of these investors are not willing to agree to provide permanent legal public access. In fact, they often advertise their properties as having "exclusive or private access to the adjoining forest." These actions contribute to denial or blocking of public access to the Coronado and the "forest in my backyard" philosophy.

When considered in combination with the encumbrances on access attributed to issues with other agencies and private land owners, alternative 1 is the only alternative that has the potential to contribute to cumulative effects related to legal land access issues facing the Coronado. Its restriction on motorized access to new areas proposed as wilderness would restrict motorized use in specific locations. However, this limitation was considered during the evaluation of various parcels for designation as wilderness. For the most part, areas currently having access issues were determined to be less viable than others for recommendation as wilderness. Thus, it is not likely that cumulative effects on land access would result from additional wilderness management under alternative 1.

Revision Topic 4: Preservation of Open Space

Land Ownership Patterns and Land Uses – Affected Environment

In the area surrounding the Coronado, land use varies from farming and ranching in rural areas to dense concentrations of residential, industrial, and commercial uses in and around urban centers. Preservation of open space is a predominant land use issue in the planning area, given both the public's desire to maintain the "rural character" of county lands and the need to accommodate rapidly growing populations and municipalities. As county comprehensive plans indicate, planners struggle to balance the growing demands for housing, recreation, and water supplies with the preservation of a shrinking natural resource base that contributes to Arizona's highly valued rural character and open space.

The debate over preservation of open space has gained increased attention as regional efforts, such as the Sonoran Desert Conservation Plan in Pima County, Arizona, and the Malpai Borderlands group in Cochise County, Arizona, and Hidalgo County, New Mexico, draw support from diverse stakeholders. Voters in Pima County, Arizona, have strongly supported bond issues for the acquisition of land or development rights in order to preserve open space. The Malpai Borderlands Group has effectively protected 75,000 acres of private land from development through conservation easements.

Land ownership across the six-county area surrounding the Coronado National Forest differs from overall ownership patterns for the States of Arizona and New Mexico in that there are relatively large amounts of private acreage and State Trust land. These other land ownerships are likely to have a considerable influence on future development patterns throughout the region.

In the 6-county planning area as of 2005, Hidalgo County, New Mexico, and Cochise and Santa Cruz Counties, Arizona, were reported to have the highest percentage of private land while Pima and Graham Counties, in Arizona had the lowest. The percentage of State Trust land was greatest in Pinal and Cochise Counties, Arizona. The largest percentage of National Forest System land is located in Santa Cruz County, Arizona. The highest percentage of land owned by Native American tribes is in Graham and Pima Counties, Arizona.

Land ownership within and along the boundaries of the Coronado National Forest (see figure 9) presents unique challenges to Forest Service managers. The noncontiguous nature of the Coronado

results in a large proportion of boundary interface with lands of other ownership as compared to other national forests in Arizona. For example, the Coronado has 0.39 mile of boundary per square mile of national forest land compared with 0.11 mile per square mile for the Coconino National Forest, and between 0.23 and 0.28 mile per square mile for the rest of the Arizona national forests. In addition, the Coronado National Forest shares 60 miles of international boundary with the Republic of Mexico. There are also an estimated 56,000 acres of private lands and lands of other ownership within the Coronado's proclaimed boundaries. Most of these lands are either patented mining claims or lands settled under homesteading laws. As the population of the area increases, private lands in and around the Coronado are increasingly subject to subdivision and development.

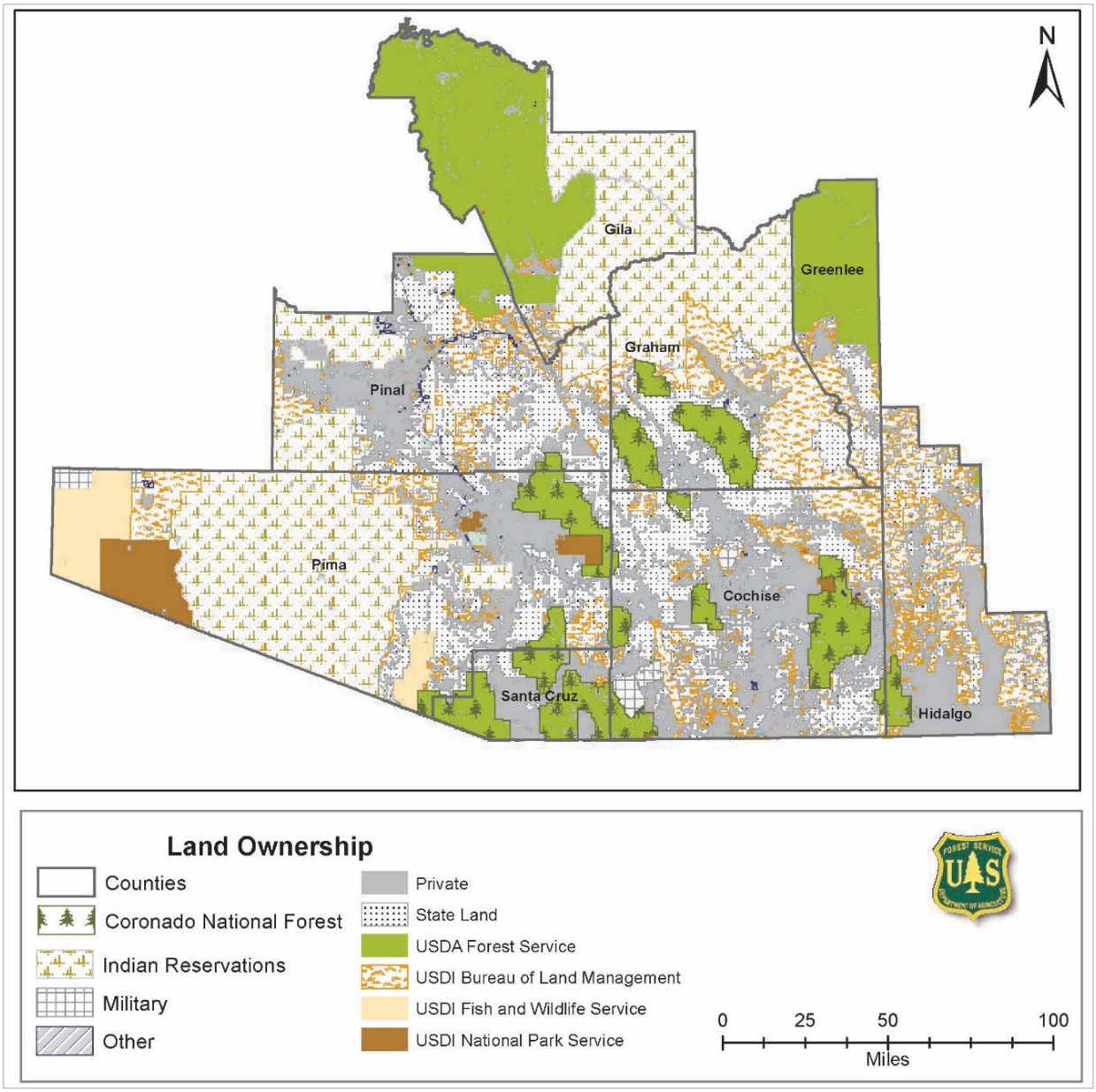

Figure 9. Land ownership in southeastern Arizona, including the Coronado National Forest (see also figure 1)

Land ownership patterns that developed as a result of homesteading laws persist today in and around public land. Within and along the national forest boundary, private lands generally occupy small, flat, and fertile areas with natural water sources. Much of the homesteaded land in and around the Coronado is today associated with grazing allotments. According to a recent survey of Coronado livestock grazing permittees, 81 respondents (61 percent of those surveyed) collectively own 274,276 acres of private land related to their livestock operations (Conley et al. 2007). The average private land holding of respondents was 3,657 acres. Considering the number of nonrespondents (39 percent), it is reasonable to speculate, based on information from those who responded, that a significant amount of additional private land is associated with the remaining Coronado National Forest grazing allotments.

As awareness of the ecological benefits provided by ranch lands increases, there is a potential for recognition that the "production" value of ranch lands is greater than what is reflected solely in the market for beef cattle (Brunson and Huntsinger 2008). That is, ranch lands provide benefits in the form of open space and wildlife habitat, as well as production of forage for livestock. These values are increasingly being capitalized through the sale of conservation easements and other transfers of development rights. Access to national forest grazing lands is likely a key to sustaining ranching on private and State Trust lands in southeastern Arizona and Hidalgo County, New Mexico. Given the relatively high percentage of these lands in proximity to the Coronado, future uses will be highly relevant to forest management.

Land Ownership Patterns and Land Uses – Environmental Consequences

No Action

The 1986 forest plan references maps in the land ownership adjustment plan that prioritize lands desirable for acquisition. The maps have not been revised to show completed lands adjustments or changing priorities. Important opportunities to acquire properties with high resource values may be lost because the maps are not updated regularly. Open space values are not addressed in the 1986 plan, although there are classification criteria to identify important resources for acquisition or retention.

Proposed Action

The proposed action identifies open space as a desired condition in the following sections of the revised forest plan: "Range Management," "Land Ownership Adjustments and Boundary Management," "Species Diversity and Viability," and "Scenery" and "Recreation." In the "Range Management" section of the revised forest plan, the desired condition statement recognizes that providing forage for livestock production is a key component to preserving open space in southeastern Arizona and southwestern New Mexico. By supporting livestock production on working landscapes with an extensive, low impact land use, the proposed action would help preserve large areas of unfragmented open space. These open spaces would sustain biological diversity and ecological processes and help to preserve the rural cultural heritage in the planning area. The proposed action continues to allow livestock grazing on 1.5 million acres.

The management direction provided in the proposed action for land ownership adjustments and boundary management will help to prioritize land ownership adjustments, and lead to better decisions for preserving open space within the national forest boundaries. There is also a suggested management approach that the Forest Service should work with willing land owners, communities, local governments, and partners to promote voluntary open space conservation. This management direction is consistent with the Forest Service open space conservation strategy, and should result in more lands in the planning area being protected from fragmentation and development.

Proposed action wildlife components emphasize wildlife habitat linkages along the national forest boundary that extend into neighboring lands. This will result in consideration of maintaining these

linkages in all future actions and activities. Land use decisions that favor the maintenance of wildlife linkages will result in protection of open space.

Scenic quality components emphasize the aesthetic and recreational enjoyment of vast, open natural landscapes, which means that Forest Service activities will be conducted with maintenance of open space as a goal where possible. The interconnected nature of recreation activities on National Forest System lands and adjacent open land, such as trails, is recognized in the proposed action. This will bring attention to help preserve the recreation experience provided across ownerships. Overall, the proposed action is preferable to the no action because it is proactive in conserving open space through explicit goals and management approaches.

Alternative 1

The effects of alternative 1 would be the same as those for the proposed action.

Alternative 2

The effects of alternative 2 would be the same as those for the proposed action.

Cumulative Effects

Cumulative effects for open space are described at the end of the "Topic 4" section.

Land Ownership Adjustments and Boundary Management – Affected Environment

The current complicated and fragmented land ownership pattern within and adjoining the Coronado National Forest combined with rapid population growth and increased development of private land in southeastern Arizona and southwestern New Mexico and the nature of the noncontiguous sky islands that comprise the Coronado, has resulted in the loss of traditional public access routes, conflicts in land uses within and adjacent to the national forest boundary, higher administrative costs, and unique challenges for forest management. Much of the non-Federal (private, State, county, and other ownership) land scattered throughout the Coronado are small rectangular or irregular shaped parcels ranging between 20 and 640 acres in size. In addition, the Coronado is the only national forest in the Nation that adjoins the international boundary with Mexico. Effects from illegal activities and U.S. Border Patrol tactical and law enforcement activities extend many miles into the Coronado, not just along the actual physical border.

Certain National Forest System lands in individual ecosystem management areas may be better suited for private uses because administration is more costly due to the complexity of the adjoining and surrounding land ownership pattern or the permitted use on them. Conversely, some non-Federal lands in or adjoining an ecosystem management area have national forest characteristics; acquisition of these lands would protect public access, open space, and scenic resources; reduce ecosystem fragmentation, improve landscape-level management of forest resources, and eliminate the need to encumber the surrounding National Forest System lands with special use authorizations for roads and private infrastructure.

Since 1986, the Coronado participated in 24 completed land exchanges. Approximately 16,725 acres of non-Federal (private and State) lands valuable for public access, open space, scenic qualities, and the protection of natural resources were acquired by the United States, acting by and through the Forest Service, Department of Agriculture. In exchange for the non-Federal (private and State) lands, the United States conveyed approximately 5,522 acres of National Forest System lands into non-Federal ownership that had essentially lost their national forest character.

The interspersion of private lands within the Coronado and development of private lands adjacent to, adjoining, and within its boundaries has resulted in increased occupancy trespass and the need to survey and post property boundaries to standard. Only about 15 percent (approximately 230 miles) of

the approximately 1,600 miles of property boundary (about 942 miles of exterior and 658 miles of interior property boundaries) between National Forest System and non-Federal lands have been marked and posted to Forest Service standard.

Appropriations for land and interests in land purchases have always been extremely limited and highly competitive. Donation of non-Federal lands is very infrequent, and the authority to sell National Forest System lands has very limiting requirements. Whenever possible, land exchanges and Small Tracts Act[52] cases will continue to be the primary methods used for land ownership adjustments on the Coronado National Forest.

Land Ownership Adjustments and Boundary Management – Environmental Consequences

No Action

The 1986 plan includes a low-priority guideline that recommends attempted acquisitions of land from willing private owners to provide open space for recreation. It also emphasizes consolidation of small, private landholdings into economically viable units, therefore, encouraging development, rather than preservation of open space, within the national forest boundary.

The 1986 forest plan, as amended, identifies a classification system of lands with criteria for land acquisition and lands available to convey. The 1986 plan includes categories for land acquisition, each with separate detailed criteria. These detailed criteria are helpful for evaluating land adjustment cases and providing information to potential proponents about how land adjustment proposals may be considered, however, they are too detailed for the programmatic nature of modern forest plans.

The 1986 forest plan includes a list of specific lands to acquire, many of which have not yet have been acquired. The list has not been modified to keep up with lands adjustments or with changed priorities. Important opportunities to acquire properties with high resource values may be lost because the list of high priority properties is not updated regularly. Open space values are not addressed in the 1986 plan, although there are classification criteria to identify important resources for acquisition or retention.

Specific boundary and landline direction is stated in the plan but timeframes are not reflective of current limitations in budget and the flexibility of the Forest Service to determine priority work. Encroachments continue to occur and long-term encroachments are not resolved. Goals for boundary line posting and maintenance have not been met, which increases the potential for new encroachments as adjacent non-Federal land is developed. Not resolving existing and long-term encroachments results in the appearance of the national forest being privately owned and promotes additional encroachment further into National Forest System lands. Encroachments can adversely impact cultural resources, wildlife habitat, soil, and water resources. Adverse impacts on encroached lands generally result from illegal vehicle use, road and trail building, or other disturbances. These disturbances cause the removal of vegetation and compaction of soil, both of which result in accelerated water runoff and soil erosion. Wildlife habitat degrades as fewer plants are available for food or cover. Cultural resources on encroached lands are susceptible to collection, direct destruction by vehicle impact or other means, or indirect destruction caused by soil erosion.

Proposed Action

The proposed action includes guidelines that describe characteristics of lands to be acquired or conveyed, instead of identifying specific lands to be acquired or conveyed. The criteria in the 1986 plan are replaced with guidelines that are more focused on specific resources and less specific to

[52] Small Tracts of 1983: Give regional foresters the discretionary authority to sell, exchange, or interchange certain National Forest System lands or interest to resolve certain encroachment problems and management problems associated with mineral survey fractions and unused rights-of-way (see 36 CFR 254, subpart C)

location on the landscape. This action focuses on acquisition of specific resources but does not address the more indirect effects of development of inholding that do not have key resource values, such as requests for improved road access and infrastructure needs which could impact scenery, recreation experience, and general wildlife habitat values. Without site-specific direction for acquisitions and conveyances, managers will have to rely on clear understanding of the resource characteristics of inholdings when evaluating land ownership adjustments. However, managers will have more flexibility to consider opportunities for land exchanges as they arise, and shift priorities without changing or amending the forest plan.

Removing the list of lands to be conveyed also removes direction to limit treatment and other resource activities on parcels that were identified as such. Eliminating this restriction allows for fuel treatments and other management activities on parcels nearby communities and better achieves vegetation objectives or community wildfire protection plan objectives.

The proposed action identifies open space values to be retained as a desired condition. This statement could be interpreted by communities and neighbors as any National Forest System land they consider valuable for their open space, and would lead to support for proposals for acquisition of inholdings.

The proposed action continues to allow for conveyance of lands to meet community and public needs and adds loss of wildland character to the list of lands that could be conveyed. This could provide incentive for non-Federal neighbors to protect those values in order to reduce the potential for land exchange or sale, which would result in more lands adjacent to the Coronado retaining wildland character.

The proposed action has guidelines for prioritizing landline location surveys. The highest priorities include suspected encroachments. This will encourage early response to encroachments, and should reduce the damage caused by unauthorized uses along the national forest boundary. Overall, the proposed action is preferable to the no action because it is proactive in conserving open space through explicit goals, guidelines, and management approaches.

Alternative 1

The effects of alternative 1 would be the same as those for the proposed action.

Alternative 2

The effects of alternative 2 would be the same as those for the proposed action.

Cumulative Effects

Conversion of private parcels from farming and ranching to more urban land uses has outpaced population growth over the last several decades (USDA FS 2005a). Hansen et al. (2005) report that low density rural home (exurban) development is the fastest growing form of land use in the United States and has been since 1950. This trend is mirrored in the analysis area and has serious implications for management of the Coronado National Forest. In the assessment area, this shift has been especially dramatic in Pinal County. While recent county comprehensive plans reflect the positive values of open space (appendix B) and have initiated zoning strategies to encourage it, many areas along national forest boundaries have already been slated for subdivision. There is increasing awareness of the important role of State Trust lands in conserving natural resources; however, these lands are subject to disposal in order to generate funds for public benefit. Given the relatively high percentage of private and State lands in proximity to the Coronado National Forest, future uses will be highly relevant to forest management.

Exurban development can create disproportionately high ecological and economic impacts per housing unit because each rural residence occupies more land than urban residences (USDA FS 2007a). Development along the boundaries has the potential to result in further restrictions in the ability of the public to gain access to the Coronado National Forest (see “Topic 3” and the following

section). It has also been shown that exurban development has significant negative impacts on native species that may manifest over several decades (Hansen et al. 2005) and can extend several hundred meters beyond the developed area (Lenth et al. 2006). Fire management is more expensive and complicated. There are more frequent human-caused fire ignitions along national forest boundaries with more development, and there are also more structures needing protection. Development of any kind severely restricts the ability of the Forest Service to use fire for ecosystem restoration purposes. Because the Forest Service is required to coordinate management activities with neighboring owners, increased numbers of owners along boundaries will complicate resource planning on the Coronado, and make administration of Forest Service lands more expensive. As open space outside national forest boundaries becomes scarcer, the values of open space within the Coronado will become higher. This could lead to increased visitation to the Coronado as people seek places to enjoy open space.

As noted above, the 1986 forest plan does not recognize open space as a value to be conserved. The proposed action and alternatives 1 and 2 are proactive in conserving open space through explicit goals, guidelines, and management approaches. For this reason, the action alternatives would be more effective in mitigating the cumulative effects associated with exurban development.

Revision Topic 5: Communities, Collaboration, and Partnerships

Communities

Background

Between the 15th and 19th centuries in what is now Arizona, the Athabaskan (including Apache and Navajo), Hispanic, and Anglo-American cultures converged on the Native American communities already living in the area, particularly the O'odham people (formerly Papago-Pima). In 1540, Francisco Vasquez de Coronado entered what is now the southern boundary of the United States. Coronado was in search of gold and other precious minerals that legends claimed were in the area. While Coronado never found his treasure—it would be centuries before the mining industry boomed in region—his entrance laid the foundation for Spanish colonization over the next 300 years.

In the 18th and 19th centuries, O'odham populations declined due to emigration; high mortality rates in the face of Mexican and Spanish settlement, which brought disease and confrontations; and appropriation of riverine farmlands. The Apache groups resisted Euro-American settlement and colonization until the second half of the 19th century. The 1848 Treaty of Guadalupe-Hidalgo ended the U.S. war with Mexico and brought California, New Mexico, and northern Arizona under U.S. control. The 1853 Gadsden Purchase incorporated southern Arizona, including modern-day Coronado lands, into the United States. For nearly 40 years, continued aggression between the Apaches and westward-bound Americans kept the area sparsely populated. U.S. military conquest of Native American groups opened the doors to large-scale Anglo settlement. In the latter 19th century, mining activities and the arrival of the Southern Pacific Railroad brought many more Euro-Americans to the area. Demand for natural resources increased over this period.

The present-day Coronado National Forest had its origins in 1902 when the Santa Rita, Santa Catalina, Mount Graham, and Chiricahua Forest Reserves were established to protect timber and watershed resources. Today, the scattered holdings of the Coronado National Forest cover over 2,600 square miles of land ranging from 3,000 to over 10,000 feet in southeastern Arizona and southwestern New Mexico. The Coronado's variety of elevations allows for year-round recreational uses (USDA FS 2008).

Communities – Affected Environment

The Coronado National Forest extends into six counties: 5 in southeastern Arizona (Cochise, Graham, Pima, Pinal, and Santa Cruz Counties) and 1 in southwestern New Mexico (Hidalgo County). These 6 counties form the study area for the social and economic analysis.

Existing social and economic conditions are necessary to establish the baseline from which to estimate potential consequences of Forest Service management actions. The proceeding section analyzes the current conditions and trends related to the social and economic environment of the planning area, including population and demographic changes, potential environmental justice populations, employment and income conditions, and the Coronado's contribution to the local economy.

Population and Demographics

This section highlights population and demographic trends in the study area. Population is an important consideration in managing natural resources. In particular, population structure (size, composition, density, etc.) and population dynamics (how the structure changes over time) are essential to describing the consequences of forest management and planning on a social environment (Seesholtz et al. 2004). Population increases may lead to conflicts over land use, travel management, recreation activities, and values. These are conflicts that Forest Service managers attempt to balance when making management decisions.

Population Growth

The 6-county region is home to 1,576,913 people (U.S. Census Bureau 2010). Table 117 provides county-level population figures for 1990, 2000, and 2010.

All 5 Arizona counties experienced population growth between 1990 and 2010. The highest growth rates occurred in Pima and Pinal Counties. Pima Country grew approximately 47 percent between 1990 and 2010. Pinal County experienced the most dramatic growth; the population more than tripled between 1990 and 2010, with the majority of the growth occurring during the last decade. In contrast, Hidalgo County (New Mexico) lost population during period. Although population remained relatively steady in the county between 1990 and 2000, between 2000 and 2010 Hidalgo County lost more than 17 percent of its population.

High population growth rates may signal expanding economic opportunities, desirable amenities, or both. Much of the growth in Pinal County can be attributed to its central location between the Phoenix and Tucson metropolitan areas. Indeed, since 1997 the percentage of income earned outside of the county by its residents has rapidly increased. This finding suggests that Pinal County is absorbing much of the growth of its neighboring metropolitan areas (U.S. Bureau of Economic Analysis 2006).

Table 117. Population growth, 1990-2010, for counties in the Coronado National Forest planning area

County	1990 Population	2000 Population	Percent Change 1990-2000	2010 Population	Percent Change 2000-2010
Cochise (AZ)	97,624	117,755	20.6	131,346	11.5
Graham (AZ)	26,554	33,489	26.1	37,220	11.1
Hidalgo (NM)	5,958	5,932	-0.4	4,894	-17.5
Pima (AZ)	666,880	843,746	26.5	980,263	16.2
Pinal (AZ)	116,379	179,727	54.4	375,770	109.1
Santa Cruz (AZ)	29,676	38,381	29.3	47,420	23.6
Arizona	3,665,228	5,130,632	40.0	6,392,017	24.6
New Mexico	1,515,069	1,819,046	20.1	2,059,179	13.2
United States	248,709,873	281,421,906	13.2	308,745,538	9.7

Source: U.S. Census Bureau, 1990, 2000, and 2010

Changing population size may affect demand for recreation and other resources on the Coronado National Forest. Population growth may place particular pressure on popular recreation sites near

urban centers. Additionally, population growth may lead to the expansion of the wildland-urban interface, which affects the cost and difficulty of managing wildfire. Shrinking population, as in Hidalgo County (New Mexico), may indicate fewer economic opportunities. Economic opportunities on National Forest System lands, therefore, may be particularly important to community livelihoods in areas with low or negative population growth.

Median Age

Table 118 provides the median age for the counties, states, and the Nation. In general, the age patterns in the planning area are similar to state and national trends. Cochise and Hidalgo Counties have the oldest populations, with a median age above 40.

Table 118. Median age in the planning area of the Coronado National Forest

Location	Median Age (2010)
Cochise County (AZ)	39.7
Graham County (AZ)	31.6
Hidalgo County (NM)	40.9
Pima County (AZ)	37.7
Pinal County (AZ)	35.3
Santa Cruz County (AZ)	35.6
Arizona	35.9
New Mexico	36.7
United States	37.2

Source: U.S. Census Bureau 2010, table DP-1

In contrast to the older populations in Cochise and Hidalgo Counties, Graham County has the youngest population in the planning area. Graham County's residents are younger than both the State and national medians, as well. The low median age in Graham County is likely due to the presence of the San Carlos Reservation, where the average age is only 21.9 years (U.S. Census Bureau 2000).

A population's age may affect community values and uses associated with national forest lands. The range of median ages across the planning area suggests diversity among Coronado users. For instance, older populations are more likely to demand easily accessible recreation opportunities to allow for participation by individuals with limited mobility. Median age may also influence the composition of personal income in a county. Older populations are more likely to collect investment earnings and age-based transfer payments. The relationship between age and income is discussed below, in the "Employment and Income" section.

Educational Achievement

Table 119 lists the educational achievement by county. Hidalgo and Santa Cruz Counties have the lowest percentages of high school graduates. Both counties have a substantially smaller proportion of high school graduates among their residents than their respective states. Far fewer planning area residents hold a bachelor's degree or higher. In all counties expect Pima, the percentage of adults with at least a bachelor's degree is below the State and national rates.

Table 119. Educational attainment by county in Coronado National Forest planning area (percent of persons age 25+, 2010)

Location	High School Graduate	Bachelor's Degree or Higher
Cochise County (AZ)	84.8	21.4
Graham County (AZ)	81.8	13.4
Hidalgo County (NM)	77.7	15.6
Pima County (AZ)	86.8	29.6
Pinal County (AZ)	83.7	17.9
Santa Cruz County (AZ)	70.9	17.3
Arizona	85.0	26.3
New Mexico	82.7	25.5
United States	85.0	27.9

Source: U.S. Census Bureau 2010, table DP02

High educational attainment rates signal economic opportunities for educated adults. Pima County, which has the highest percentage of residents with at least a bachelor's degree, is home to the University of Arizona and a number of professional services and high-tech industries. Areas with more educated populations tend to be more resilient to economic changes. Changes to forest management, therefore, are less likely to affect the economic well-being of highly educated counties.

Forest Use

Table 120 reports Coronado National Forest visitor activity participation. Hiking/walking, viewing natural features, and viewing wildlife are activities in which more than half of Coronado National Forest visitors engage. Hiking/walking is the most common main activity (the primary purpose of the visit), followed by viewing natural features, driving for pleasure, and relaxing.

These findings suggest that Coronado National Forest visitors engage in a diverse range of activities, including both motorized and nonmotorized uses in developed and undeveloped areas.

Table 120. Percentage of participation in various activities on the Coronado National Forest

Activity	Participate in Activity (Percent)	Participate as Main Activity (Percent)	Average Hours Participation
Hiking/Walking	75.6	52.1	2.7
Viewing Natural Features	67.4	9.3	2.6
Viewing Wildlife	65.9	4.6	2.8
Relaxing	45.9	5.3	7.7
Driving for Pleasure	23.8	6.0	2.8
Nature Center Activities	17.2	0.8	1.7
Nature Study	15.7	0.7	2.1
Picnicking	12.8	3.3	3.4
Visiting Historic Sites	8.5	0.6	2.5
Some Other Activity	6.9	4.5	2.2
Developed Camping	6.4	3.5	29.9
Off-highwayVehicle Use	4.5	1.1	3.8
Fishing	3.7	2.5	6.7
Hunting	3.2	3.1	12.4

Activity	Participate in Activity (Percent)	Participate as Main Activity (Percent)	Average Hours Participation
Motorized Trail Activity	3.2	1.3	2.2
Primitive Camping	3.1	0.7	22.7
Gathering Forest Products	2.7	0.2	3.0
Bicycling	1.9	1.1	4.6
Backpacking	0.9	0.1	73.9
Other Nonmotorized	0.7	0.1	8.3
Nonmotorized Water	0.5	0.0	0.0
Resort Use	0.5	0.0	30.0
Other Motorized Activity	0.5	0.3	1.1
Horseback Riding	0.1	0.0	2.7
No Activity Reported	0.0	0.1	--
Snowmobiling	0.0	0.0	0.0
Motorized Water Activities	0.0	0.0	0.0
Downhill Skiing	0.0	0.0	0.0
Cross-country Skiing	0.0	0.0	0.0

Source: USDA FS 2012 (National Visitor Use Monitoring Survey)

Environmental Justice

In 1994, President Clinton issued Executive Order (EO) 12898. This order directs Federal agencies to focus attention on the human health and environmental conditions in minority and low-income communities. The purpose of EO 12898 is to identify and address, as appropriate, disproportionately high, and adverse human health or environmental effects on minority and low-income populations (see glossary, page 444 for specific definitions).

Environmental justice is the fair treatment and meaningful involvement of people of all races, cultures, and incomes, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The goal of environmental justice is for Federal agency decision makers to identify impacts that are disproportionately high and adverse with respect to minority and low-income populations and identify alternatives that would avoid or mitigate those impacts. The emphasis of environmental justice is on health effects and/or the benefits of a healthy environment. The Council on Environmental Quality (CEQ) has interpreted health effects with a broad definition: “Such effects may include ecological, cultural, human health, economic or social impacts on minority communities, low-income communities, or Indian Tribes … when those impacts are interrelated to impacts on the natural or physical environment” (CEQ 1997).

Table 121 shows the poverty rate for the planning area counties, Arizona, New Mexico, and the U.S. Most planning area counties have poverty rates above the State and national rates. Pinal County is the sole exception, where 13.5 percent of the residents live below the poverty rate. This is below both the State and national poverty rates. Graham, Hidalgo, and Santa Cruz Counties have the highest poverty rates, with more than one-fifth of the population living below the poverty rate. Environmental justice issues are more likely to arise in these counties and management actions that could negatively affect the economic well-being of Graham, Hidalgo, and Santa Cruz Counties merit particular scrutiny.

Table 122 breaks down race and ethnicity for each of the six counties. Data for Arizona, New Mexico, and the U.S. are also included to enable comparisons. All planning area counties have a larger percentage of Hispanic/Latino residents than the Nation; however, this trend is also present in both New Mexico and Arizona. Santa Cruz and Hidalgo Counties have sizable Hispanic/Latino

populations, even relative to their states' percentages. Graham and Pinal Counties have the largest percentages of American Indian/Alaska Native residents.

Table 121. Poverty rate, 2010, in the Coronado National Forest planning area

Location	Poverty Rate
Cochise County (AZ)	15.7
Graham County (AZ)	20.0
Hidalgo County (NM)	22.6
Pima County (AZ)	16.4
Pinal County (AZ)	13.5
Santa Cruz County (AZ)	25.2
Arizona	15.3
New Mexico	18.4
United States	13.8

Source: U.S. Census Bureau 2010, table DP03

Table 122. Race and ethnicity in the Coronado National Forest planning area and at larger geographic scales

Location	White	Black	American Indian/Alaska Native	Asian	Hawaiian / Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino
Cochise County, AZ	78.5	4.2	1.2	1.9	0.3	9.9	4.0	32.4
Graham County, AZ	72.1	1.8	14.4	0.5	0.1	8.2	2.8	30.4
Hidalgo County, NM	85.3	0.6	0.8	0.5	0.0	11.0	1.8	56.6
Pima County, AZ	74.3	3.5	3.3	2.6	0.2	12.3	3.7	34.6
Pinal County, AZ	72.4	4.6	5.6	1.7	0.4	11.5	3.8	28.5
Santa Cruz County, AZ	73.5	0.4	0.7	0.5	0.0	22.9	2.0	82.8
Arizona	73.0	4.1	4.6	2.8	0.2	11.9	3.4	29.6
New Mexico	68.4	2.1	9.4	1.4	0.1	15.0	3.7	46.3
United States	72.4	12.6	0.9	4.8	0.2	6.2	2.9	16.3

Source: U.S. Census Bureau 2010, table DP-1

Economic Conditions and Trends

Employment and Income

Employment and income data are key measures of the economic well-being of a local area. All counties in the planning area have a median household income below the median for their state and the Nation. Table 123 lists the median household income for planning area counties, Arizona, New Mexico, and the U.S. Hidalgo and Santa Cruz Counties have the lowest median household incomes, which is consistent with their low educational attainment rates, relatively high poverty rates, and concentration of minority residents.

Table 123. Median household income by county in the Coronado National Forest planning area

Location	Median Household Income (2010)
Cochise County (AZ)	$44,876
Graham County (AZ)	$41,683
Hidalgo County (NM)	$36,733
Pima County (AZ)	$45,521
Pinal County (AZ)	$51,310
Santa Cruz County (AZ)	$36,519
Arizona	$50,448
New Mexico	$43,820
United States	$51,914

Source: U.S. Census Bureau 2010, table DP03

The relatively low median household income across the planning area suggests that residents may be more vulnerable to economic changes. Lower median household incomes correspond with fewer household assets to allow consumption smoothing during difficult economic circumstances. Economic consequences must be considered in the local context—a small absolute change in income will have a relatively larger effect in poorer areas.

Nonlabor income includes investment income (i.e., dividends, interest, and rent) and transfer payments (e.g., Medicare and unemployment insurance benefits). Nonlabor income accounts for a higher percentage of total personal income in all planning area counties than it does in either the states or the Nation. Table 124 displays the role of labor and nonlabor income in total personal income for 1970 and 2009. The role of nonlabor income has increased across all considered geographies since 1970. However, the change has been most dramatic in the planning area. In 1970, nonlabor income accounted for only 18 percent of total personal income in Cochise County. By 2009, however, this figure had more than doubled to 43 percent. Similarly, substantial changes occurred in other planning area counties. For Arizona, New Mexico, and the United States, the change in nonlabor income has been less pronounced.

Table 124. Percent contribution of labor and nonlabor income to total personal income, 1970 and 2009, in the Coronado National Forest planning area

Location	1970 Labor	1970 Nonlabor	2009 Labor	2009 Nonlabor
Cochise County (AZ)	82	18	57	43
Graham County (AZ)	76	24	50	50
Hidalgo County (NM)	77	23	56	44
Pima County (AZ)	71	29	55	45
Pinal County (AZ)	80	20	60	40
Santa Cruz County (AZ)	73	27	51	49
Arizona	74	26	62	38
New Mexico	78	22	62	38
United States	77	23	65	35

Source: U.S. Bureau of Economic Analysis 2011a, REIS table CA05N

Nonlabor income is not tied directly to employment; therefore, it can be more resistant to economic downturns. However, as the most recent recession demonstrated, asset markets can be quite volatile, and nonlabor income that depends on investment returns may be unstable.

The increase in nonlabor income reflects the changing demographic profile of the planning area. Retirees rely on nonlabor income, including age-based transfer payments (e.g., Social Security and Medicare) and investment earnings. High percentages of nonlabor income likely indicate higher concentrations of retirees. If the influx of retirees into the planning area continues, the growing role of nonlabor income in the economy can also be expected to continue. Older users may have different needs and preferences. Retirees have more leisure time than working-age adults have and may, therefore, be avid national forest users. Retirees are also more likely to have mobility concerns, which make easily accessible sites more important. The demographic and economic characteristics of planning area residents will mediate the consequences of management actions.

The communities of southeastern Arizona and, to a lesser extent, southwestern New Mexico, have long been dependent upon the Coronado's natural resources for commodity production, tourism, traditional use, and aesthetic enjoyment. Table 125 displays the economic contribution of activities on the Coronado National Forest to the local economy.

Overall, Forest Service activities on the Coronado are responsible for approximately 0.2 percent of total employment (1,226 jobs) and 0.15 percent of labor income ($43 million) in the 6-county area. Government, lodging and food services, retail trade, and agriculture support the most jobs related to the Coronado. The discrepancy between national forest-related jobs relative to labor income (0.2 percent versus 0.15 percent) indicates that jobs related to national forest activities compensate less than jobs not related to such activities. The high concentration of jobs in the retail trade, agriculture, and accommodation and food services industries is consistent with the discrepancy. Many jobs in these industries use low-skilled labor, seasonal labor, or both. Therefore, jobs in these industries provide lower wages than jobs in other industries.

Livestock production is an extensive and historic use of public lands in Arizona both on and off the Coronado. Although the number of grazing permittees on the Coronado has been stable since 2001, the number of cattle permitted to graze national forest land has decreased. This change was the result of adjustments to permits made as part of an adaptive management strategy to conserve natural resources. Livestock production on public lands has also been associated with nonmarket values, such as open space and ecological services (see "Revision Topic 4").

The collection of forest products also provides market and nonmarket values. Products include, but are not limited to, fuelwood, sawtimber, ferns, and beargrass. Collection of forest products is a relatively minor use on the Coronado National Forest. However, the collection of certain forest products, such as beargrass, is quite significant to the traditional and cultural practices of Native Americans. In addition to collecting, forest products are often offered as a byproduct of other management activities, such as vegetation management.

With a recent trend in the market value of minerals and metals, commercial mining activity has increased in Arizona, including requests for approval to explore and mine on the Coronado. Despite this trend, the Coronado has recommended the withdrawal of several areas from mineral entry in order to protect and preserve their natural resource values and integrity. Mining activity on the Coronado is addressed in detail in the "Minerals" section of this document.

Table 125. Economic contribution by sector in the Coronado National Forest planning area

Industry	Employment (jobs)		Labor Income (thousands of 2009 dollars)		Output (thousands of 2009 dollars)	
	Area Totals	FS Related	Area Totals	FS Related	Area Totals	FS Related
Agriculture	7,881	58	$192,851	$838	$1,265,853	$9,066
Mining	4,118	0	$451,206	$8	$2,359,341	$81
Utilities	2,888	3	$283,799	$351	$1,451,849	$1,793
Construction	35,423	6	$1,709,314	$315	$4,687,514	$634
Manufacturing	29,630	18	$2,498,139	$553	$12,956,414	$6,044
Wholesale Trade	13,815	30	$829,141	$1,811	$2,234,724	$4,881
Transportation and Warehousing	14,544	19	$635,164	$816	$1,700,535	$2,034
Retail Trade	70,530	108	$2,069,147	$2,938	$4,833,536	$7,604
Information	9,966	11	$472,642	$456	$2,711,087	$2,735
Finance and Insurance	23,099	15	$902,422	$600	$3,510,501	$2,431
Real Estate and Rental and Leasing	23,120	18	$639,302	$497	$8,384,408	$6,047
Prof, Scientific, and Tech Services	39,566	35	$2,430,513	$1,663	$4,723,496	$5,633
Management of Companies	3,127	3	$193,263	$192	$509,802	$506
Administration, Waste Mgmt., and Removal Services	40,238	25	$1,248,329	$744	$2,510,247	$1,523
Educational Services	6,638	5	$189,332	$145	$355,703	$277
Health Care and Social Assistance	68,877	41	$3,267,727	$1,968	$6,148,271	$3,656
Arts, Entertainment, and Recreation	11,507	56	$212,096	$1,337	$707,766	$5,223
Accommodation and Food Services	45,089	424	$900,076	$9,979	$2,688,780	$29,765
Other Services	36,593	30	$832,785	$712	$2,090,966	$1,805
Government	136,165	321	$8,892,563	$17,732	$11,264,448	$7,038
Other					$0	$14,246
Total	622,813	1,226	28,849,810	43,654	$77,095,242	$113,021
Forest Service as Percent of Total	–	0.20%	–	0.15%	–	0.15%

Source: Minnesota IMPLAN Group 2008

FS = Forest Service

Economic Diversity

Economic diversity generally promotes stability and greater employment opportunities. Highly specialized economies (i.e., those that depend on very few industries for the bulk of employment and income) are prone to cyclical fluctuations and offer more limited job opportunities. Determining the degree of specialization in an economy is important for decision makers, particularly when the dominant industry can be affected by changes in policy. For Forest Service decision makers, this is

likely to be the case where the forest products industry or the tourism and recreation industries, for instance, are reliant on the local national forest.

Figure 10 provides a breakdown of employment by industry in the study area. The study area economy is quite diverse, with no single sector dominating the local economy. Government, retail trade, and the health and social services sectors are the largest employment sectors in the local economy. These industries are consistent with findings discussed in the demographic section; namely a substantial government presence due to public land management, a large retiree population that consumes health and social services, and amenities that attract tourists who contribute to the retail trade sector.

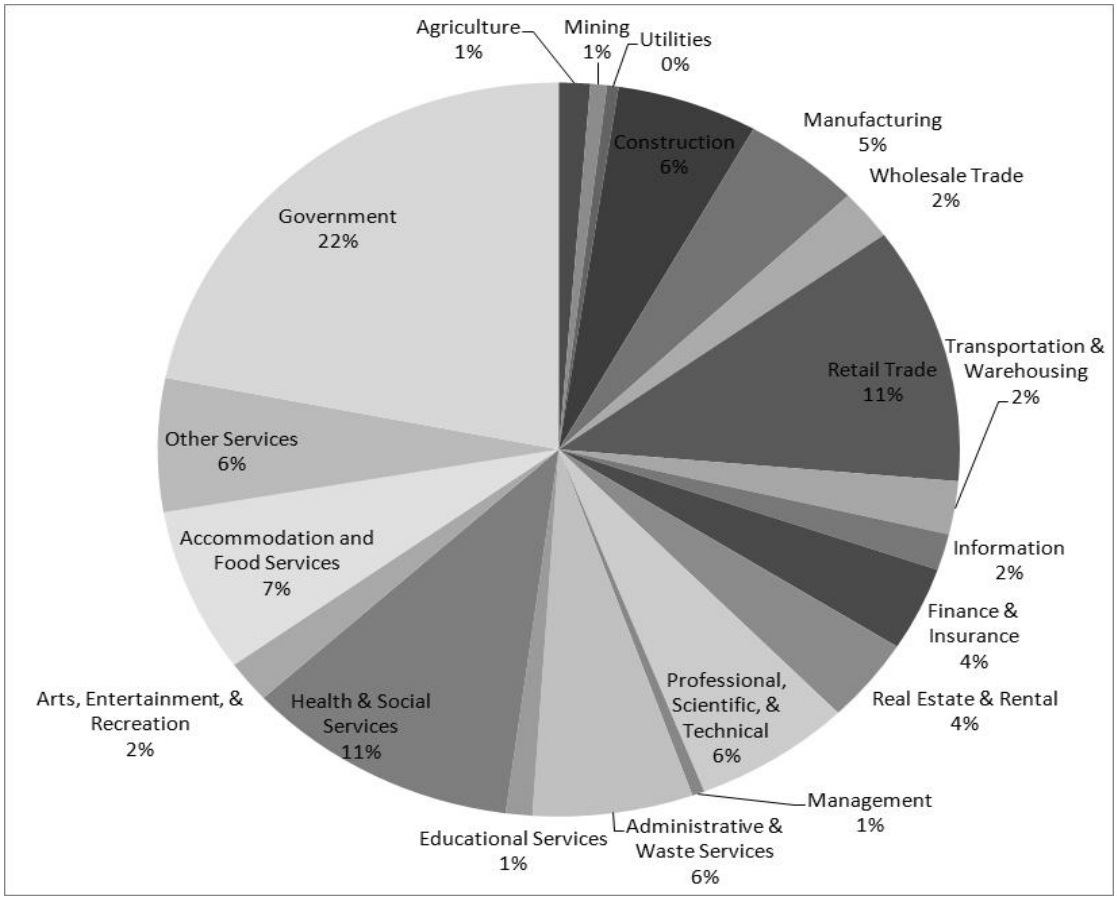

Figure 10. Employment by industry in the Coronado National Forest planning area
(Source: Minnesota IMPLAN Group 2009)

The Interior Columbia Basin Ecosystem Management Project identified communities that were specialized with respect to employment. This method is applied here using the ratio of the percent employment in each industry in the region of interest (study area) to an average percent of employment in that industry for a larger reference area (Arizona). For a given industry, when the percent employment in the analysis region is greater than in the reference area, local employment specialization exists in that industry (USDA FS 1998a). Using this criterion applied with 2009 data, the study area can be characterized as specialized with respect to several industries, particularly government, mining, and utilities (Minnesota IMPLAN Group 2009). Figure 11 provides the employment specialization index for all industries in study area.

Whereas figure 10 considers the study area in isolation, figure 11 compares industry concentration in study area to the state as a whole. The numbers on the x-axis (horizontal) of figure 11 show the degree of specialization in the local economy. A score of one indicates that the study area and the State are equally specialized in the sector. A score above one indicates that the study area is more specialized in the sector than the State. A score below one indicates that the study area is less specialized in the sector than the State. As the two figures demonstrate, these two methods of data analysis can suggest quite different results. Mining accounts for just 1 percent of employment in the study area—a relatively modest figure until it is put in the context of the State. A resident of the study area is more likely to be employed in the mining sector compared to residents of Arizona as a whole.

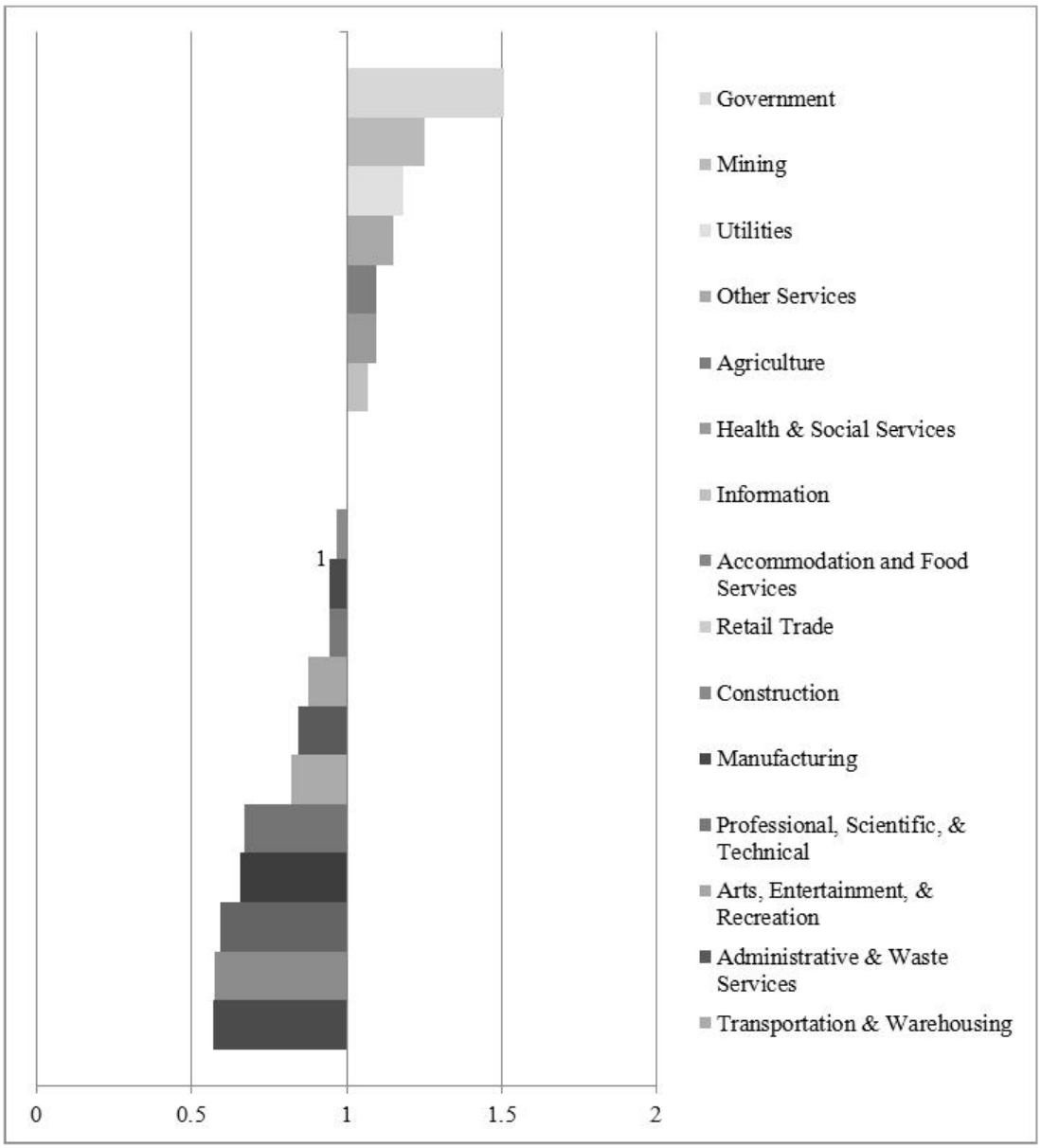

Figure 11. Employment specialization in the Coronado National Forest planning area
(Source: Minnesota IMPLAN Group 2009)

Government employment in the study area is large in both absolute and relative terms: it accounts for the largest percentage of employment in the study area, and it accounts for a higher proportion of

employment in the study area relative to the State. Public lands (national forests, national parks, BLM managed public lands, and state owned lands), military installations, and tribal lands are present throughout the study area. The study area also has a large number of State and local government employees—approximately 80 percent of government employees in Arizona work for State or local government (U.S. Bureau of Economic Analysis 2011b). All of these features contribute to a relatively large government presence.

Payments to States and Counties

The Forest Service makes payments to states and counties that contain national forest lands. These payments fall into two categories: payments in lieu of taxes[53] (PILT) and Secure Rural Schools and Community Self-Determination Act of 2000[54] (SRSCS) payments. Table 126 displays the payments to counties from the Coronado National Forest.

Table 126. Payments to states and counties in the planning area by the Coronado National Forest

Location	SRSCS (FY09)	PILT (FY10)	Total FS Payments
Cochise County (AZ)	$619,188.40	$1,011,056.48	$1,630,244.88
Graham County (AZ)	$921,101.56	$949,891.84	$1,870,993.40
Hidalgo County (NM)	$134,860.77	$57,026.22	$191,886.99
Pima County (AZ)	$436,531.80	$682,364.33	$1,118,896.13
Pinal County (AZ)	$50,304.92	$39,938.47	$90,243.39
Santa Cruz County (AZ)	$839,839.96	$312,144.52	$1,151,984.48
Coronado NF	$3,001,827.41	$3,052,421.86	$6,054,249.27

SRSCS = Secure Rural Schools and Community Self-Determination Act; PILT = payment in lieu of taxes; FS = Forest Service (Source: USDA FS 2010 and Department of Interior PILT 2010)

Federal agencies do not pay property taxes; therefore, payments in lieu of taxes are distributed to counties to compensate for the local services that support activities on Federal lands. These services include law enforcement, road maintenance, and fire departments. SRSCS payments are intended to improve public schools, maintain infrastructure, improve the health of watersheds and ecosystems, protect communities, and strengthen local economies.

Communities – Environmental Consequences

The previous sections reported past and current social and economic conditions. The following section will consider the potential consequences of alternative management scenarios on the social and economic environment, in accordance with the 1982 Planning Rule. Section 219.12(h) of the 1982 rule directs the planning team to **"**evaluate the significant physical, biological, economic, and social effects of each management alternative that is considered in detail. The evaluation shall include a comparative analysis of the aggregate effects of the management alternatives and shall compare present net value, social and economic impacts, outputs of goods and services, and overall protection and enhancement of environmental resources."

[53] P.L. 94-565, 1976

[54] P.L. 106-393

Economic Impact Analysis

Economic impacts were modeled using IMPLAN Professional Version 3.0.[55] Data on use levels under each alternative were collected from the Coronado's resource specialists. In most instances, the precise change is unknown. Therefore, the changes are based on the professional expertise of the Coronado's resource specialists (1982 rule, 219.12(g)).

Regional economic impacts are estimated based on the assumption of full implementation of each alternative. The actual changes in the economy would depend on individuals taking advantage of the resource-related opportunities that would be supported by each alternative. If market conditions or trends in resource use were not conducive to developing some opportunities, the economic impact would be different than estimated here.

Economic impact analysis estimates the employment and labor income consequences of Forest Service management actions. Current management of the Coronado contributes approximately 1,226 jobs and $44.5 million dollars in labor income to the economy of the 6-county area. Table 127 and table 128 identify the estimated jobs and income associated with each alternative. Under all alternatives, no significant change to the economic impact of national forest management (see table 127) is anticipated.

The consistency of employment and income effects between alternatives does not indicate that management would be consistent between alternatives. Alternative 1 proposes an increase in the acres of recommended wilderness areas, and alternative 2 would increase motorized recreation opportunities. However, in economic terms, these actions are not expected to create a net change in employment or income in the local economy.

For instance, different recreation emphases (i.e., wilderness recreation or motorized use) are not expected to cause a change in the amount of recreation that occurs on the Coronado National Forest. However, these management actions are expected to change the distribution of recreational uses (e.g., more motorized use and less nonmotorized use under alternative 2). Analysis of visitor expenditure profiles revealed that differences in visitor expenditures between recreational use types are generally not statistically significant (White and Stynes 2010). In other words, a change in the distribution of recreational use would not lead to a difference in local economic effects.

As noted under the "Affected Environment" heading, activities on the Coronado account for approximately 0.2 percent of employment in the study area. Labor income includes employee compensation (i.e., salaries and wages paid to employees) and proprietors' income (i.e., business owners' income). Forest-related labor income accounts for 0.15 percent of labor income in the study area.

[55] IMPLAN (IMpact analysis for PLANning) is an input-output model which estimates the economic impacts of projects, programs, policies, and economic changes on a region. IMPLAN analyzes the direct, indirect, and induced economic impacts. Direct economic impacts are generated by the activity itself, such as the value of cattle grazed on the forest. Indirect employment and labor income contributions occur when a sector purchases supplies and services from other industries in order to produce their product. Induced contributions are the employment and labor income generated as a result of spending new household income generated by direct and indirect employment. The employment estimated is defined as any part-time, seasonal, or full-time job. In the economic impact tables, direct, indirect, and induced contributions are included in the estimated impacts. The IMPLAN database describes the economy in 440 sectors using Federal data from 2008.

Table 127. Comparison of total Forest Service-related jobs by alternative and resource area

Resource	No Action	Proposed Action	Alternative 1	Alternative 2
Recreation: nonlocal only	680	680	680	680
Wildlife and Fish: nonlocal only	64	64	64	64
Grazing	107	107	107	107
Timber	0	0	0	0
Minerals	0	0	0	0
Ecosystem Restoration	2	2	2	2
Payments to States/Counties	55	55	55	55
Forest Service Expenditures	363	363	363	363
Total Forest Management	1,271	1,271	1,271	1,271

Source: IMPLAN 2008

Table 128. Comparison of Forest Service-related income by alternative and resource area*

Resource	No Action	Proposed Action	Alternative 1	Alternative 2
Recreation: nonlocal only	$20,336	$20,336	$20,336	$20,336
Wildlife and Fish: nonlocal only	$2,019	$2,019	$2,019	$2,019
Grazing	$1,883	$1,883	$1,883	$1,883
Timber	$0	$0	$0	$0
Minerals	$0	$0	$0	$0
Ecosystem Restoration	$69	$69	$69	$69
Payments to States/Counties	$2,603	$2,603	$2,603	$2,603
Forest Service Expenditures	$17,548	$17,548	$17,548	$17,548
Total Forest Management	$44,458	$44,458	$44,458	$44,458

* Measured in thousands of 2009 dollars (source: IMPLAN 2008)

Financial Efficiency Analysis

A financial efficiency analysis, which is a type of cost-benefit analysis, was completed using the program QuickSilver Version 6.[56] Input to this financial efficiency analysis incorporated Forest Service program revenues and expenditures. This analysis does not account for all costs and benefits of forest management—in order for the Coronado to meet adaptive management objectives, the new plan will not prescribe specific management activities. This allows the flexibility to manage resources under ever-changing environmental conditions.

The current resource programs managed by the Coronado generate revenue from sale of forest products, permits for various activities, and leases for minerals. The programs generating revenue are recreation, range, minerals, and timber.

Table 129 presents the expected annual revenue and expenditures. The figures are based on 3-year averages (fiscal years 2009 to 2011) to reduce the effect of year-to-year variations. No alternative is

[56] QuickSilver is a financial efficiency analysis tool that compares the anticipated Forest Service expenditures and revenues, by alternative, over the life of the forest plan. Refer to the socioeconomic specialist report, located in the project record, for further details.

expected to alter the expenditure streams. While the type of expenditures is likely to vary between alternatives, the sum of expenditures is not expected to change.

Table 129. Expected annual revenue and expenditures from Coronado National Forest management

Resource Program	Revenue	Expenditures
Grazing	$225,990	$925,692
Recreation	$331,600	$2,999,963
Minerals	$0	$269,953
Timber	$17,600	$159,449
Land Use/Power	$352,157	$288,840

For instance, how recreation funding is disbursed would differ between alternative 1, which emphasizes wilderness recreation, and alternative 2, which emphasizes motorized recreation. In addition, Federal budget allocations will be the chief determinant of Forest Service expenditures. Changes in management between alternatives are unlikely to drive future differences in expenditures. Due to the uncertainty of future budgets, it is not possible to predict changes in future expenditures.

In summary, the expenditures do not vary between alternatives because (1) changes in national forest management would shift expenditures, not change the net amount and (2) Federal budget allocations will be the chief determinant of future expenditures. Federal budget allocations will not be affected as a result of Coronado National Forest management actions.

The revenue streams do not change between alternatives for the same reason that economic impacts do not vary. Different management emphases (e.g., wilderness or motorized recreation) may shift revenue, but is not expected to change net revenue. If national forest management makes motorized recreation more attractive, but nonmotorized recreation less attractive, some recreation receipts would increase while others decrease. This would not change the net revenue coming in to the Coronado. Nevertheless, the consistency among the financial efficiency figures does not indicate a lack of variation between alternatives. Present net value (PNV) is the discounted sum of benefits minus the discounted sum of costs. A federally prescribed discount rate of 4 percent is used in this analysis (Forest Service Manual 1900). Inflation is also a variable that can affect the present net values associated with each alternative. However, due to the uncertainty of future inflation, OMB Circular A-94 recommends the avoidance of making assumptions about the inflation rate whenever possible. Thus, for the purposes of this analysis, inflation is left at zero.

Table 130 provides present net values in dollars by alternative. No alternative is expected to affect the value of Forest Service receipts. Any change in program revenues would occur as a result of supply and demand, based on tastes and preferences of stakeholders in the study area. This would occur regardless of the chosen alternative. Therefore, the same revenue streams used for the no-action alternative are assumed to carry though under the action alternatives. As explained above, the differences between alternatives are unlikely to affect Forest Service expenditures. Therefore, the present value of costs is consistent across alternatives.

Table 130. Summary of present net value, present-value benefits, and present-value costs by alternative

Present Net Value	No Action	Proposed Action	Alternative 1	Alternative 2
Present Net Value	($46,144,923)	($46,144,923)	($46,144,923)	($46,144,923)
Present Value-Benefits	$9,057,377	$9,057,377	$9,057,377	$9,057,377
Present Value-Costs	($55,202,300)	($55,202,300)	($55,202,300)	($55,202,300)

Source: QuickSilver 2010

Social Impact Analysis

The social impacts analysis uses the baseline social conditions reported earlier, the Coronado National Forest National Visitor Use Monitoring profile (USDA FS 2012) and information from the economic and social sustainability assessment (USDA FS 2008c) to discern the primary values that the Coronado provides to area residents and visitors.

Social effects are measured in terms of the interaction of identified values with estimated changes to resource availability and uses. The sky islands of the Coronado are known for their unique natural and cultural resources. Area residents and visitors attach numerous values to the Coronado National Forest. For some, National Forest System lands provide economic opportunities in rural communities. To others, the Coronado National Forest is valued for leisure. These generalized classifications, however, do not capture the nuances of peoples' values. Furthermore, many individuals are likely to rely on the Coronado National Forest for both economic opportunities and leisure pursuits.

A number of social values have been identified with Southwestern Region forests, including: (1) preservation of open space, (2) protection of ecosystem service and other national forest-related amenity values, (3) economic opportunities from both commodity and noncommodity sources, (4) accessible and varied outdoor recreation opportunities, and (5) traditional tribal uses, such as gathering boughs and visiting sacred sites (USDA FS 2008c). Lands recommended for wilderness is the main source of potential social and economic variation among the alternatives.

Most of the land in the study area is publicly owned (Arizona Department of Commerce 2008). This suggests that Forest Service decisions, and other Federal actions, may have a substantial effect on social and economic well-being of the communities in the study area, such as providing recreational opportunities, clean water and healthy ecosystems, and employment.

Table 131 lists the acres most likely to support nonmarket and ecosystem service values on the Coronado National Forest by alternative. Designated wilderness, recommended wilderness, wilderness study areas, very high scenic integrity values, primitive recreation opportunities, and eligible wild and scenic river segments serve as a proxy for relatively undisturbed areas that contribute to resource protection values. Loomis and Richardson (2001) identify numerous values related to wilderness and other protected lands, including increases in amenity-based migration, education and research activities, and individual and community health benefits.

Alternative 1 is expected to appeal to people and groups who seek additional primitive recreation opportunities, the protection of national forest resources, or both, as it has the greatest acreage with related values. The proposed action provides the second-highest acreage, followed by alternative 2 and no action.

Table 131. Nonmarket value areas of the Coronado National Forest, acres by alternative

Nonmarket Values	No Action	Proposed Action	Alternative 1	Alternative 2
Designated Wilderness, Recommended Wilderness, and Wilderness Study Areas	430,824	457,090	593,742	457,090
Visual Quality Objective: Preservation/Scenic Integrity Objective: Very High	399,604	425,865	598,739	399,608
Recreation Opportunity Spectrum: Primitive	120,723	510,630	510,630	510,630
Eligible Wild and Scenic River Segments	26,412	26,412	26,412	26,412

Environmental Justice

Forest management is most likely to affect low income and minority groups in Graham, Hidalgo, Pinal, and Santa Cruz Counties. Particular attention is paid to the above identified counties, due to the higher percentages of low income and minority residents.

The study area has large shares of minority residents and high poverty rates. These findings raise the likelihood of observing disproportionate adverse effects to low income residents, minority residents, or both. However, an analysis of the decisions to be made under the alternatives did not identify environmental justice consequences. Since all alternatives continue to support similar levels of employment and income, none of the decisions is expected to exacerbate the poverty rate or disproportionately worsen the economic well-being of low-income individuals. None of the alternatives is expected to disproportionately adversely affect racial minority individuals, ethnic minority individuals, or both.

No Action

The no-action alternative would support approximately 1,271 jobs and $44.5 million in labor income in the local economy on an average annual basis. Table 127 and table 128 detail the breakdown of employment and income by resource area. Among national forest uses, recreation is the largest contributor to employment and income in the local economy, accounting for approximately 50 percent of the Coronado National Forest's economic impact.

The present net value of the no-action alternative is estimated to be negative $46,144,923. This figure is the discounted sum of program revenues minus program expenditures over a 15-year period. The present net value is estimated to be equivalent across all alternatives.

The no-action alternative does not provide climate change direction. As a result, this alternative does not systematically respond to climate change, which may make forest resources more vulnerable to disturbances and may cause resource conditions to depart further from desired conditions. Vegetative vulnerability can lead to disruptions in forest product markets, reduce forage availability, change water supply, and degrade recreation opportunities. These consequences could change resource availability and use on the Coronado, which would alter the economic effects estimated above. For example, higher frequency and intensity of drought could reduce grazing-related employment and income.

Proposed Action

According to the economic impact analysis, the proposed action is predicted to have the same economic effect as the no-action alternative. Table 127 and table 128 provide the estimated jobs and income supported by national forest management under the proposed action. Recreation, Forest Service expenditures, and grazing are the largest contributors to employment from Forest Service activities. Recreation, Forest Service expenditures, and payments to states/counties are the largest contributors to labor income from Forest Service activities. While grazing accounts for approximately twice as many jobs as payments to states and counties, its contribution to labor income is lower due to the relatively low-wage nature of many jobs in the agriculture sector.

The stream of benefits and costs is also expected to remain the same under the proposed action. Table 130 shows that the present net value of the proposed action is negative $46,144,923. This figure may be affected by the specific projects that are implemented. However, information on potential projects is not currently available. Future project-level National Environmental Policy Act analyses may provide more detailed efficiency analyses.

The proposed action recommends specific management approaches to improve resource resiliency to climate change. This direction may decrease climate related threats to socioeconomic well-being in the plan area, including the risk of uncharacteristic wildfire to human health and property. Direction

that improves resource resiliency would better preserve the economic and social values of the Coronado, such as the local economic activity that results from visitor spending and livestock grazing.

Changes to national forest visits and uses are unlikely to result in economic consequences under the proposed action compared to current conditions, and diverse opportunities will remain on the Coronado.

Alternative 1

The primary difference between alternative 1 and the proposed action is its increased emphasis on wilderness character. Alternative 1 recommends 16 wilderness areas on the Coronado. However, along many measures, alternative 1 would continue current management. As with the proposed action, alternative 1 is not expected to change current conditions or trends. The economic effects of recreation, forest product and mineral extraction, and grazing on the Coronado are not expected to differ across alternatives. However, proponents may be hesitant to propose projects in recommended wilderness areas. The increase in recommended wilderness areas could cause fewer individuals to take advantage of economic opportunities on the Coronado, even if resource availability does not change. The observed employment and income consequences, therefore, may be lower than the effects estimated here. As table 127 and table 128 show, alternative 1 supports the same employment and income levels as the proposed action and the no-action alternative.

The flow of costs and benefits of national forest management are expected to be the same as the proposed action and current conditions. Table 130 shows that the present net value of alternative 1 is negative $46,144,923.

Alternative 1 recommends specific management approaches to improve resource resiliency to climate change. This direction may decrease climate related threats to socioeconomic well-being in the plan area, including the risk of uncharacteristic wildfire to human health and property. Direction that improves resource resiliency would better preserve the economic and social values of the Coronado, such as the local economic activity that results from visitor spending and livestock grazing.

Numerous values have been associated with protected areas, such as those identified in table 127. Species habitat, nutrient cycling, and the cultural/spiritual values are several of the many ecosystem services and other nonmarket values that these areas provide. However, several factors on the Coronado National Forest complicate the assessment of the economic consequences of designated wilderness and other protected areas, namely:

1. Relative scarcity – a number of protected areas already exist on the Coronado. The marginal value of each additional acre is expected to decrease. The marginal values are unknown, so a monetary estimate of value is not possible.
2. The self-limiting nature of parts of the Coronado means that, in practice, many nondesignated areas are already protected from motorized access. In these instances, special resource protections are unlikely to add value.
3. Potential unintended consequences may counteract the economic benefits. Several potential unintended consequences have been identified, which may degrade ecosystem health. Potential consequences include increased difficulty of trash pickup, increased difficulty of ecosystem restoration treatments, and increased difficulty of fuels management, which may increase the probability of catastrophic fires. The balance of tradeoffs is difficult to analyze given the presence of low probability high-cost events (e.g., catastrophic fire).

Despite this uncertainty, alternative 1 is expected to improve the quality of life of individuals who value the Coronado National Forest primarily for resource protection.

Alternative 2

The primary difference between alternative 2 and the other alternatives is that it creates a larger Motorized Recreation Land Use Zone. However, along most measures, alternative 2 continues current management. As with the proposed action and alternative 1, alternative 2 is not expected to change current conditions or trends. The economic effects of recreation, forest product and mineral extraction, and grazing on the Coronado are not expected to differ across alternatives. However, proponents may be hesitant to propose projects in recommended wilderness areas. The increase in recommended wilderness areas could cause fewer individuals to take advantage of economic opportunities on the Coronado, even if resource availability does not change. The observed employment and income consequences, therefore, may be lower than the effects estimated here. As table 127 and table 128 show, alternative 2 supports the same employment and income levels as the proposed action, alternative 1, and the no-action alternative.

The flow of costs and benefits of national forest management are expected to be the same as the other alternatives and current conditions. Table 130 shows that the present net value of alternative 2 is negative $46,144,923.

Alternative 2 provides limited climate change direction. As a result, this alternative does not systematically respond to climate change, which may make forest resources more vulnerable to disturbances and may cause resource conditions to depart further from desired conditions. Vegetative vulnerability can lead to disruptions in forest product markets, reduce forage availability, change water supply, and degrade recreation opportunities. These consequences could change resource availability and use on the Coronado, which would alter the economic effects estimated above. For example, higher frequency and intensity of drought could reduce grazing related employment and income.

Alternative 2 is expected to improve the quality of life of individuals who primarily value motorized national forest access. However, as all alternatives provide diverse and plentiful recreation opportunities, the social consequences of alternative 2 are not expected to meaningfully differ from the other alternatives.

Cumulative Effects

The geographic scope for the social and economic cumulative effects analysis is the six-county region identified in the "Affected Environment" section.[57] This analysis considers how past, present, and reasonably foreseeable future actions on lands throughout the region may interact with decisions made under the proposed plan to affect the social and economic environment. The social and economic analysis of the proposed plan is unique among the resources and uses in that the effects occur primarily off the Coronado. In this way, the indirect effects described above are cumulative in nature – they evaluate the role of Forest Service decisions under the proposed plan both on and off the Coronado National Forest. However, the indirect effects analysis does not address how actions taken on adjacent lands will affect the social and economic consequences of the proposed plan. Cumulative effects in this section are common to all alternatives.

The proposed plan would allow for mining activities under all alternatives. It is reasonably foreseeable that mining activities will increase on and near the Coronado National Forest. The Rosemont Copper Project will significantly expand mining activities within the social and economic analysis area. The spillover activities (e.g., increased employment in mining support activities) could lead to higher local employment from other mining activities that will occur under this project on the Coronado National Forest.

[57] Cochise, Graham, Pima, Pinal, and Santa Cruz Counties in Arizona and Hidalgo County in New Mexico.

The recreation related effects identified in the social and economic environmental consequences section may be influenced by trends and activities that occur off the national forests. In fiscal year 2010, Arizona State Parks closed 13 of its 28 parks. Although most of these parks have reopened, a number are open on a reduced schedule. Furthermore, the possibility of future closures remains due to ongoing budget uncertainty. The reduction in recreation opportunities on state lands may increase demand for recreation on the Coronado National Forest. Under all alternatives, the proposed plan supports diverse recreational opportunities on the forests. Increased recreational use on the Coronado National Forest would lead to a higher economic impact than predicted in the indirect effects discussion. However, other adjacent lands (Bureau of Land Management, National Park Service, and other National Forest System lands) continue to emphasize the provision of recreation opportunities in their land and resource management plans. These actions may counterbalance the consequences of reduced opportunities elsewhere in the State.

Under the proposed plan, portions of the Coronado National Forest may provide a corridor to support reasonably foreseeable alternative energy development in the region. This could facilitate alternative energy development in the region, which would support local area employment.

Special Use Authorizations – Affected Environment

Currently, the Coronado National Forest administers over 620 special use authorizations for a wide variety of activities on National Forest System lands, including, but not limited to: outfitting and guiding, research, various types of utility lines, communications sites, road permits and easements, and recreation residences. Also included are permits for campground, marina and general store facilities, filming, and numerous recreation events. The Coronado also authorizes military, law enforcement, and Department of Homeland Security support activities using special use authorizations.

Uses for which authorizations may be granted include, but are not limited to, those listed below:

- Privately owned improvements authorized for groups (such as organizational camps)
- Noncommercial, privately owned improvements authorized for individual use (such as recreation residences)
- Hotel, motel, and resort
- Concessions involving government owned improvements
- Recreation events
- Concession services (except outfitter and guide service)
- Outfitter and guide service
- Winter recreation
- Crops and agricultural improvements
- Range facilities not associated with a grazing permit
- Signs marking and preserving points of public interest
- Sanitary systems
- Service uses (including schools and public service buildings)
- Feasibility, site, and resource survey
- Research – research study
- Research – weather station
- Research – experimental and demonstration, weather modification
- Research – observatories
- Military training and education centers
- Cultural resources nondisturbing and disturbing use
- Treasure hunting
- Construction camps and residence
- Storage of timber and timber products, fuel, sand, gravel, ore, construction supplies, materials, equipment, highway department sheds and storage, and other items not an integral part of a use under another category
- Manufacturing
- Arts
- Sites related to timber activities on lands outside national forest
- Wind power facility
- Electric distribution
- Electric transmission
- Marine
- Railroads
- Pipeline – nonenergy related

- Tramway and conveyor
- Communication sites
- Telephone and telegraph lines
- Water transmission
- Water impoundment
- Water development
- Water measurement

Special Land Uses

Because the Coronado is home to many unique species of fauna and flora, it attracts scientists from around the world, many of whom apply for a special use permit that authorizes them to conduct a variety of research studies on National Forest System lands. Special use permits are also issued by the Forest Service for land uses that support utility distribution and transmission lines in specific designated corridors at various locations on the Coronado. These provide (but are not limited to) telephone, fiber optic, electric, water, and gas services within an intermingled ownership of private and public lands. These include small-scale utilities as well, such as water systems managed by homeowners associations. Resource monitoring activities, such as weather stations, by State and Federal agencies is also authorized by special use permit.

Seven sites on the Coronado facilitate long-distance communications in southeastern Arizona under special use authorizations. Many road use permits and easements authorize ingress and egress to private inholdings within the national forest boundary. Easements are granted to State and/or county agencies as special use authorizations to maintain their roads on National Forest System land. Special use permits are issued to authorize facilities that support military training and surveillance and Department of Homeland Security (Border Patrol) surveillance facilities and road use.

Special Recreational Uses

The occupancy of National Forest System lands for the purpose of constructing family oriented, privately owned recreation residences was granted by the Act of March 4, 1915. Currently, 243 seasonally occupied recreation residences are permitted on 3 of 5 ranger districts on the Coronado. No authorizations are being granted for new residences.

Across the Coronado, special use permits establish terms and conditions for operation of campground, marina, and general stores in developed recreation areas.

On the Coronado, outfitter and guiding permits have been granted to service providers for, but are not limited to, the following recreational activities: bird watching, hunting, hiking, horseback riding, rock climbing, jeep and van touring, bicycling, and outdoor/environmental education. Outfitting and guiding services on the Coronado have noticeably increased over the past few decades. In 2010, 58 outfitter and guide permits were authorized on the Coronado. Based on recent history, the demand for these permits is expected to increase. Traditional commercial guiding for large game and game bird hunting will continue but will most likely not increase substantially.

Suitability Criteria for Special Uses

The 1986 plan allows for the widest range of special use authorizations and permitted sites of all the alternatives. No suitability criteria were established for special uses in the 1986 plan. Thus, proposals for new special use permits undergo a general consistency review against the plan's resource-based guidelines. Applications are accepted if the use meets the special uses screening criteria (36 CFR 251) and is determined to be consistent with the plan. The no-action alternative does not provide direction on a mechanism to set capacity limits or to determine what level of resource impacts is acceptable.

In contrast to 1986 plan direction, the three action alternatives include components for management of special uses suitable in proposed land use zones, designated and recommended wilderness and research natural areas, and other special areas. Determinations of the suitability were made based on the desired conditions and standards and guidelines that apply to each zone or area. Table 144 in appendix G provides an example of suitability determinations of specific lands for selected special

uses. The table includes neither all potential special uses nor all areas of the Coronado for which special use permits may be requested.

Suitability determinations are intended to balance public needs for national forest land use with public needs for recreational uses. For example, in the Developed Recreation Land Use Zone, outfitter/guide permits and recreation events are generally not suitable because they may constrain the use of this zone by the public. Exceptions may be made if the terms and conditions of a special use permit can mitigate an incompatibility.

Some special uses are suitable only in designated areas. Special use permits for communication sites, which may be suitable in several management areas or zones, are issued only for facilities at currently occupied communication sites. Thus, they would not be allowed to occur at random sites in management areas.

Certain special uses may be authorized by exception only when the use is unavoidable and/or would not result in a trend away from desired conditions. For instance, in the Wild Backcountry Land Use Zone, concessionaire managed government sites, electrical transmission lines, weather stations and experimental research are generally incompatible with the desired conditions for the zone. Authorization of the special use may be granted, if the only feasible site for it to be located lies within the Wild Backcountry Zone, if the scale of use can be minimized so it does not visibly alter the natural character of the zone, or both.

Special Use Authorizations – Environmental Consequences

No Action

Outfitter/guide permits would be issued in accordance with direction in the 1986 plan. The effects of these activities on forest resources are generally not adverse, and outfitter/guide permits are not renewed if an operator does not comply with terms and conditions of the permit.

The 1986 plan would allow permits to be accepted without a capacity limit. Without a limit, various components of utility linear infrastructure, such as pipelines and power transmission lines, may become unwieldy in number, and depending on the location, their presence may increasingly disturb wildlife and disrupt the natural setting that supports scenic integrity and recreation activities.

Special land and recreation uses are governed by direction specific to individual resources and management areas in the 1986 plan. In general, effects on resources are minimized by mitigation and avoidance requirements specified in terms and conditions of permits that reflect standards and guidelines developed to conserve and preserve forest resources.

The 1986 plan provides no direction regarding management of resources to develop their adaptability and resiliency to climate change. Scientific predictions for the Southwest include atypical temperature and rainfall patterns that could adversely affect soils, water resources, vegetation, plant and wildlife species, and recreational settings (see the various resource headings under Topic 1 for specific effects of climate change). Degradation of resources may decrease the desirability of some areas for specific uses authorized by special use permits, such as outfitter and guide services. For example, changes in vegetation in riparian areas may reduce populations of species that attract bird watching and nature tours offered by outfitters and guides.

Requests for special use permits for other special uses that do not depend on the integrity of natural resources, such as utility infrastructure, road use and maintenance, and siting and operation of communication sites, would not be expected to change.

Proposed Action

The revised forest plan under the proposed action establishes desired conditions, an objective, and standards and guidelines that apply to various types of special use authorizations. Desired conditions are as follows:

> Special use activities on National Forest System lands provide needed services to communities that cannot be reasonably accommodated on non-Federal lands. These activities supplement and complement services that the Coronado provides. Any negative environmental, social, and visual impacts are minimized; the permit area and duration are the minimum necessary to accommodate the use.

Recreation-based special uses of the Coronado are widely dispersed in pattern and have minimal adverse effects on resources in specially designated areas and recreation settings. They are generally short term and, therefore, have a low potential for displacing other uses of national forest land. Even in wilderness, which has restrictions on motorized and mechanized activities, some special uses may be appropriate, depending on the proposed activity.

As reported for the no-action alternative, recreation activities authorized by special uses generally have minimal adverse effects on natural resources. Under improved direction in the revised forest plan, natural and recreation settings affected by special uses would be better conserved than under the 1986 plan and would remain more intact in terms of habitat connectivity, scenery, and visitor experience.

Direction in the revised forest plan under the proposed action prohibits the following special uses on the Coronado: concessionaire operated private lodging (such as timeshares and hotels); long-term, full-time residences; religious facilities; fossil fueled power plants; and weighing and scaling stations. In the past, applications for these uses have not been approved because the actions could not meet screening criteria. The restrictions imposed under the proposed action would continue to constrain the type of permitted activities that would be approved in the future.

Special conditions related to prohibited uses apply to 5 permanent residences on the Santa Catalina Ranger District near Oracle, Arizona, which were approved in the late 1940s as part of a benefit offered to World War II veterans; and a Native American religious facility on the Nogales Ranger District. The latter is specifically excluded from suitability requirements of the revised forest plan, which would allow it to continue to operate as long as permit terms and conditions continue to be met. The proposed action indicates that special use permits for these 5 residences would not be renewed upon their expiration in 2028. At that time, National Environmental Policy Act analysis and public comment would precede a decision to deny future permits for these residences. If the permits are terminated, these properties would be vacated following the appropriate procedures to notify the occupants, and the structures would be removed.

Desired conditions and management approaches specified on page 19 of the revised forest plan encourage the adaptability and resilience of natural resources during ongoing climate change. Along with implementation of strategies for addressing climate change in appendix A of the revised forest plan, they would help to avoid adverse effects of atypical temperature and rainfall patterns on forest soils, water resources, vegetation, plant and wildlife species, and recreational settings (see “Topic 1” under various resource headings for more details about the specific effects of climate change). Thus, special uses that rely upon the integrity of natural resources and settings would remain desirable, and requests for permits for these activities would continue at or above current levels.

Alternative 1

Alternative 1 includes the same components established in the revised forest plan under the proposed action with regard to special use authorizations. Effects on forest resources would likely be of the same nature as those described above for the proposed action. However, because alternative 1 recommends more acreage for wilderness designation than all other alternatives, fewer acres would be

available for special uses, and the potential for adverse effects would be lessened because of restrictions on motorized and mechanized uses in wilderness.

Five additional ecosystem management areas on the Coronado would have acreage recommended for designation as wilderness areas under alternative 1. This would make siting of linear infrastructure across these landscapes more difficult, and would result in fewer and smaller scale projects of this type over the life of the forest plan.

Wilderness restrictions resulting from management under alternative 1 would require that outfitter/guide activities be conducted in the absence of motorized and mechanized vehicles on areas recommended for designation.

Climate change direction under alternative 1 would be the same as that of the proposed action. Therefore, the benefits to natural resources and recreation settings reported under the "Proposed Action" heading above would also be the same. Special uses that rely upon the integrity of natural resources and settings would remain desirable, and requests for permits for these activities would continue at or above current levels.

Alternative 2

Alternative 2 includes the same direction established in the revised forest plan under the proposed action with regard to special use authorizations. Effects on Coronado National Forest resources would likely be the same as those described above for the proposed action. In addition, because of its emphasis on providing greater motorized recreation opportunities than the other alternatives, alternative 2 may encourage an increase in special use authorizations of outfitter/guide services for motorized recreation. This, however, has the potential to increase the intensity of effects of motorized use on natural resources.

Alternative 2 provides no direction regarding management of climate change. However, in appendix A, it includes strategies for addressing the natural disturbances resulting from climate change and their consequent effects. Alternative 2 would be slightly less effective than the proposed action and alternative 1 in maintaining the integrity of natural resources and settings, especially vegetation, water resources, and wildlife habitat. This may decrease the desirability of some areas for recreational uses authorized by special use permit, such as outfitter and guide services.

Cumulative Effects

Special uses are unique to the lands within the Coronado. However, the effects of authorized activities may—in combination with other past, present, and future uses of lands outside the Coronado—result in cumulative effects. The cumulative effects boundary for this analysis is the southwestern portion of Arizona in Pima, Pinal, Cochise, and Graham Counties, and Hidalgo County, New Mexico. Effects on uses of national forest lands over the past 5 years and at present and those from activities proposed by others, are considered to be additive.

Population growth in southern Arizona has increased demand for special uses related to public goods and services, such as utilities, in and around the Coronado. Bureau of Land Management and State lands in the surrounding area have seen an increase in the development of alternative energy facilities and infrastructure. These trends have increased demand for electrical transmission and distribution. Southern Arizona's atmospheric conditions make it an area of high demand for development of astrophysical facilities; however, future demand for locating such facilities is unknown.

Popular recreational uses of the Coronado and adjacent areas are greater in the summer on the sky islands and more popular at lower elevations during the winter. This special use is likely to increase correspondingly with population growth in southeastern Arizona.

Direction under the no-action alternative is unlikely to affect the degree or location of special uses on the Coronado. Therefore, its contribution to cumulative effects with non-forest special uses is unlikely.

Recommendations for designation of wilderness and research natural areas under the proposed action and alternative 1 would prohibit certain uses on the Coronado or constrain where they are allowed to occur. As a consequence, outfitter/guide uses and recreation events and placement of utility infrastructure may be displaced to lands of other ownership. This may increase the cost of doing business to the service provider or utility and affect resources near, but outside the Coronado.

Resource effects from outfitter/guide activities and recreational events are for the most part minimal. Considering the effects of such national forest activities together with those that are displaced outside the national forest, future cumulative effects are also expected to be minimal. This conclusion is based on the recognition that effects from each activity, if any, would be highly localized either within or outside the national forest. Thus, while both may occur within the boundaries of the cumulative effects analysis area, it is unlikely that both would affect the same localized resources at the same time.

Under the three action alternatives, special uses of land for private ingress and egress and for siting of private facilities would occur only in areas where the use is suitable. Therefore, such uses may be denied or displaced to locations outside the Coronado National Forest. Displacement may result in effects of varying degree outside the national forest, but these would offset the same effects that would have occurred on the national forest if these special uses were allowed.

The limited plan direction to manage resources against the effects of climate change under alternative 2 may indirectly decrease the desirability of some areas for recreational uses authorized by special use permit, such as outfitter/guide services, especially if vegetation, water resources, wildlife habitat, or some combination of these things are degraded. Other special uses, such as utility infrastructure, road use and maintenance, and siting and operation of communication sites would not be affected.

Forest Products – Affected Environment

Common forest products available from the Coronado National Forest include sawlogs, fuelwood, cactus, and beargrass. Sawlogs and fuelwood are generally available as byproducts of forest restoration or forest fuels reduction projects. Other less common forest products include manzanita, ferns, and mushrooms.

It is unclear how a changing climate may alter the availability of forest products in the future. Some species that are better adapted to drier climates may be more abundant, while others may become less abundant. An increased need for fuels reduction and restoration projects to restore ecosystem resilience may increase the availability of sawlogs and fuelwood during some periods.

Forest Products – Environmental Consequences

Common to All Alternatives

Each alternative contains plan direction that the Coronado should provide a sustainable supply of forest products with consideration to multiple-use objectives and consistent with desired conditions. Under all alternatives, direction is that a sustainable supply of wood products (e.g., small roundwood, sawlogs, biomass, fuelwood) and other products (e.g., Christmas trees, beargrass, cactus, ferns, and fungi) be made available to the pubic within the capacity of the land to produce these goods. Forest products, especially those derived from wood fiber, would become available as a result of ecosystem restoration, habitat improvement, and fuels treatment projects.

Forest products are expected to continue to be available in the future at the current rate, which is displayed in table 132 for several products. Although the 1986 plan identifies 5,000 acres of suitable timber, sawtimber availability has been low because of accessibility and feasibility of production (see appendix C). Availability is not expected to change under any alternative.

Forest products available under all alternatives provide economic and cultural benefits in local communities and among Native American tribes. All alternatives would also include plan direction to make forest products, such as boughs and herbaceous plants, available to Native Americans for religious and traditional purposes.

Under all alternatives, forest product removal in special areas, such as wilderness areas, wilderness study areas, and recommended wilderness areas, would be permitted only for traditional collection. Collection in research natural areas is never permitted. The locations of forest products could vary by alternative over time depending on ecosystem conditions, ease of access, and restrictions associated with special area designations.

Table 132. Average annual quantities of forest product removal on the Coronado (5-year average)

Forest Product	Current Annual Removal	No Action	Proposed Action	Alternative 1	Alternative 2
Softwood sawtimber (CCF[1])	16	16	16	16	16
Hardwood sawtimber (CCF)	0	0	0	0	0
Posts and poles (CCF)	1,062	1,062	1,062	1,062	1,062
Fuelwood (cords[2])	1,436	1,436	1,436	1,436	1,436
Christmas Trees and other plants (each)	143	143	143	143	143
All other products (lbs.)	4,549	4,549	4,549	4,549	4,549

1. CCF=hundred cubic feet

2. A cord is defined as a stack of wood 8 feet long, 4 feet wide, and 4 feet high.

The sustainable supply of forest products available to surrounding communities and Native Americans would ensure the continuation of commercial, personal, and traditional uses of the Coronado. The removal of wood products would help support the local wood products industry and reduce the risk of uncharacteristic wildfire in the forested communities and high-severity fire in the wildland-urban interface on the Coronado.

No Action

The no-action alternative lacks forest product-specific desired conditions. However, it does encourage forest product availability and removal in conjunction with prescriptive silvicultural practices directed at improving timber and wildlife habitat and reducing hazardous fuel loadings.

The sustainability of forest products (that originate as vegetation) would likely decline under continued management under the 1986 plan, because it lacks management direction to develop resiliency and adaptation in resources to atypical temperature and rainfall patterns. Vegetation is particularly vulnerable to climate change. This could result in a decrease in the quantity of forest products. And, given scientific predictions of a warmer, drier climate in the Southwest, the accumulation of forest product may increase fuel loadings on the Coronado, which may increase the threat of uncharacteristic wildfire occurring.

Proposed Action

The revised forest plan under the proposed action provides specific direction for forest products, including desired conditions. Plan components promote the availability and removal of forest products as secondary to fuel reduction projects and ecosystem restoration activities.

Its inclusion of direction on climate change and a recommendation for designation of four additional wilderness areas and one research natural area have the potential to impact the availability and

sustainability of forest products. Motorized access to and within recommended wilderness areas and the use of mechanized equipment therein, are not allowed, except under special circumstances that must be approved by the regional forester. Because of this, collection of forest products would have to occur on foot or by some other nonmotorized, nonmechanical means. This may affect the availability of forest products to the public, including Native Americans. In addition, in research natural areas, availability of some products may be limited or restricted because of studies ongoing or proposed in the area.

The proposed action includes a desired condition of maintaining forest product sustainability and availability during climate change. Plan direction that guides the management of resources to become resilient and adapt to climate change would help ameliorate adverse effects from atypical temperatures and rainfall patterns on forest products. Progress toward desired conditions, especially with regard to forest products that are vegetative in nature, would be expected.

Alternative 1

The effects of alternative 1 on forest products would, for the most part, be the same as those of the proposed action, except for those that result from its recommendation that much more acreage than the others be designated as wilderness. Motorized access to and within recommended wilderness areas and the use of mechanized equipment therein, are not allowed, except under special circumstances that must be approved by the regional forester. Because of this, collection of forest products would have to occur on foot or by some other nonmotorized, nonmechanical means. This would reduce forest plan collection opportunities on more acres than the other alternatives. However, many newly recommended wilderness areas currently have limited collection opportunities because of terrain and other access limitations. For these, additional restrictions on mechanized and motorized uses may not appreciably affect the availability of forest products. Alternative 1 includes direction on climate change, the effects of which are reported above under the proposed action.

Alternative 2

The type of effects of alternative 2 on forest products would be the same as the proposed action, with two exceptions. First, access for collection of forest products may increase over the other alternatives, because off-road vehicle travel would be permissible in designated Motorized Recreation Land Use Zones. An increase in forest product collection would decrease the quantity of fuels that contribute to uncharacteristic wildfire. Off-road access may also facilitate the collection of forest products by Native Americans for traditional uses. Second, alternative 2 provides only limited direction for management of resources to become resilient and adapt to climate change, including various vegetation communities. Because of this, the type and availability of forest products from vegetation sources may change and decline with corresponding negative effects of atypical temperatures and rainfall patterns. Secondary effects may occur with increased uncharacteristic wildfire and decreasing water available for sustaining plant growth.

Cumulative Effects

The cumulative effects boundary is identical to that which is defined in the “Vegetation Communities, Fuels and Fire” section under “Revision Topic 1” of this final environmental impact statement.

Cumulative effects on forest product availability and collection opportunities may result if, for any reason, their availability declines on other lands in the local area or region. If this happens, public demand for forest products may exceed availability on the Coronado. This may result in conflicts among those who collect and use forest products.

When compared to the no-action alternative and the proposed action, alternative 1 has a slightly greater potential than the others to decrease collection opportunities for forest products, because of its restrictions on the use of motorized and mechanized vehicles and equipment during harvest.

Alternative 2 has a slightly higher potential to improve access to their collection because of its emphasis on motorized use.

Overall, the availability of forest products and opportunities for collection would not be affected additively by other actions outside the national forest, and cumulative effects are unlikely to result.

Mineral Resources – Affected Environment

Introduction

Public domain lands on the Coronado National Forest are available for exploration, development, and extraction of mineral resources except where lands have been withdrawn from mineral entry and discovery of a valuable mineral was not made prior to the withdrawal. Mineral exploration and mining activity on the Coronado falls into three federally recognized legal and regulatory mineral categories:

1. **Locatable:** Locatable minerals are those that may be "located" with a mining claim[58] under the General Mining Law of 1872 (Act of May 10, 1872 (17. Stat. 92; 30 U.S.C. 28)), as amended. Locatable minerals include, but are not limited to, gold, silver, copper, lead, zinc, platinum, precious gems, uranium, bentonite, and chemical grade limestone.
2. **Salable:** Also known as mineral materials, salable minerals include common variety mineral materials such as petrified wood, common varieties of sand, rock, stone, cinders, gravel, pumice, clay, most building stone, and other similar materials.
3. **Leasable:** According to the Mineral Leasing Act of 1920, as amended, leasable minerals include coal, phosphate, potassium, oil, oil shale, gas, and sodium resources that occur on public domain lands. The Mineral Leasing Act was amended to include minerals associated with lands acquired by the United States and, by the Geothermal Steam Act of 1970, to include geothermal resources. Additionally, locatable minerals on acquired lands may fall under the Mineral Leasing Act; however, their leasing is at the discretion of the Forest Service and is subject to all standards and guidelines for other resources.

The Forest Service recognizes minerals are fundamental to the Nation's well-being and, as policy, encourages the exploration and development of mineral resources on lands it is authorized to manage. The Agency's role in managing mineral resources is to provide reasonable protection of surface resources while allowing use of the land for operations authorized by U.S. mining laws. To this end, the Secretary of Agriculture has authorized regulations (36 CFR 228) that ensure surface resource protection, while encouraging the orderly development of mineral resources on National Forest System lands.

Management of the Coronado's minerals program supports the goal of environmentally sound energy and minerals development and reclamation; therefore, operations on the Coronado are required to be conducted to minimize adverse environmental impacts to National Forest System surface resources. Minerals-related proposals require site-specific analysis to evaluate compliance with applicable laws, regulations, and with the forest plan. Where there are conflicts with direction in the forest plan regarding locatable and leasable mineral management, specific amendments to the forest plan may be considered on a project-by-project basis.

This environmental impact statement neither evaluates nor provides information in support of a decision to approve any mining-related activity (e.g., leasing) on the Coronado. The Forest Service itself generally does not initiate exploration or development of mineral or energy resources. Rather, proposals for access to, exploration for, and development of mineral resources are driven by external

[58] There are four types of claims: lode, placer, millsite, and tunnel. The Coronado National Forest contains thousands of active claims, primarily lode (hard rock) and placer (sedimentary deposits), that have been filed with the Bureau of Land Management.

parties and market forces. As they are received and determined to be ready for consideration, individual proposals are evaluated on a site-specific basis and mitigated individually under a separate NEPA review that follows Forest Service policy regarding the approval of mineral plans of operation.

Regulatory Framework

Minerals management on National Forest System lands is subject to laws, regulations, and Forest Service policies in the Forest Service Manual 2800, Forest Service Handbook 2800, and 36 CFR Part 228. These include the following.

Locatable Minerals

The Forest Service is obligated to process, administer, and manage mining operations on National Forest System lands that are conducted under the authorities of the following laws and regulations: The U.S. Mining Laws of May 10, 1872 (17 Stat. 91 as amended 30 U.S.C. 31-54), the Organic Administration Act of 1897 (Ch. 2, 30 Stat. 11, as amended; 16 U.S.C. 477-482, 551), and Public Law 91-631, entitled the Mining and Minerals Policy Act of 1970. Regulations promulgated on September 1, 1974, enacted 36 CFR 228 Subpart A, which "sets forth rules and procedures through which use of the surface of National Forest System lands, in connection with operations authorized by the United States mining laws, which confer a statutory right to enter upon public lands to search for minerals, shall be conducted so as to minimize adverse environmental impacts on National Forest System surface resources." Additional direction for locatable mineral management can be found in Forest Service Manual 2810.

All lands on national forests are open to operations under the General Mining Law of 1872, as amended, except those formally withdrawn from mineral entry by Congress or the Secretary of the Interior, or otherwise exempted. The General Mining Law grants every U.S. citizen the right to prospect and explore public domain lands that are open to mineral entry. This right of access is guaranteed; that is, denying access to minerals on public land is not a Forest Service discretionary action. Upon discovering a valuable mineral deposit, citizens have the right to locate a mining claim and remove the mineral resources.

A citizen holding a mining claim (the claimant) is responsible for initiating mining activities and investing the money required to conduct mineral exploration, site development, mine operation, and reclamation of the site. The Forest Service works with mining claimants to provide reasonable access to their claims, minimize adverse environmental effects on surface resources, and ensure reasonable reclamation of lands disturbed by their actions.

The Coronado protects surface resources by reviewing a plan of operations submitted by the claimant; publicly disclosing impacts of the proposed mining operations in a site-specific National Environmental Policy Act document; approving only those activities that are reasonably necessary for the proposed operation; monitoring the claimant's operations to ensure that environmental standards are met; and ensuring prompt and reasonable reclamation of disturbed areas.

Salable Minerals

Common variety mineral materials include deposits that have economic value, but tend to be more widely available than other categories of mineral resources and do not have a distinct and special value. These minerals are most commonly used as building, landscaping, and construction materials. Unlike locatable minerals, the Forest Service has complete discretion on management of salable mineral resources. These minerals are disposed of by either contract sale, issuance of free use permits, or under contracts for in-service needs. Management direction for salable minerals is found in 36 CFR 228, Subpart C, and Forest Service Manual 2850.

Leasable Minerals

The Mineral Leasing Act of 1920 established a comprehensive system for managing oil and gas and other leasable minerals on Federal lands. Since then, numerous modifications have amended this law, including the Mining and Minerals Policy Act of 1970. Forest Service management direction for oil and gas resources is found in 36 CFR 228, Subpart E, and Forest Service Manual 2820.

Leasable minerals under Federal ownership, including oil, gas, potassium, phosphate, sodium, and others, are available for development in accordance with the U.S. Department of the Interior, Bureau of Land Management leasing program. The Forest Service role in managing leasable mineral resources is to consult with the Bureau of Land Management about proposals that involve National Forest System land and, in some cases, provide an opinion on whether leases for these commodities should be issued and specifying any surface resource protections that may be needed.

Current and Future Trends for Mineral Resources

The Coronado has abundant locatable mineral resources, some salable mineral materials, and very little leasable resources. Following is a summary of current minerals activity and the expected future interest for each mineral category.

Locatable Minerals

Past and current locatable minerals activity on the Coronado has produced copper, gold, silver, molybdenum, tungsten, lead, zinc, limestone, marble, agate, turquoise, and opal and the potential exists for future production. Past activities have included, and future activities may include, exploration for locatable minerals, including drilling and underground or surface mining, including open pit mining. Commodities would include precious metals such as gold and silver; strategic and base metal deposits such as copper, lead, zinc, molybdenum, and manganese; gemstones such as opal and turquoise, and uncommon varieties of limestone and marble. Mining and exploration interests are currently strongest for copper, silver, gold, and molybdenum, but interest in these commodities is highly influenced by market conditions. Copper and other locatable deposits potentially exist in different locations on the Coronado, and future development proposals are probable if the demand for these commodities continues to increase.

At present, the Coronado has no approved plans of operations, but several proposed operations are currently in review. Plans of operation under review include proposals for small-scale placer (stream gravel) and lode (bedrock) activities, involving trenching and exploratory drilling, as well as one large-scale plan of operations for construction and operation of an open-pit copper mine (Rosemont Copper Project). In addition to plans of operations, the Coronado annually receives an average of 20 notices of intent for activities such as panning and exploration with hand tools. Current locatable mining activity on the Coronado is moderately high, and the interest in exploration and extraction of locatable minerals is anticipated to increase if market conditions prevail. As market commodity prices increase, private industry would be likely to invest more in exploration and development, making additional areas desirable for potential mineral extraction projects.

Salable Minerals

Common variety mineral materials production on the Coronado includes crushed and pit run aggregate, fill material, landscape rock, and decorative stone. Some of these are used administratively by the Forest Service in constructing or maintaining roads, while other salable resources are under contract for sale to the public. There is currently one commercial limestone quarry in operation on the Nogales Ranger District.

Extraction of salable resources on the Coronado has been variable in recent years. Demand for common variety mineral materials is influenced by industrial and commercial activities and economic conditions. Current salable mining activity on the Coronado is moderate and is expected to remain the same or slightly increase with the local increase in demand. In the near future, the operator of the

limestone quarry is expected to request an extension of operations. As current markets rebound, the Forest Service may experience an increased demand for salable minerals.

Leasable Minerals

Historically, uranium and potassium resources have been explored across the Coronado. Currently, there is some interest in potassium exploration (for potash minerals), but in general, interest in leasable resources on the Coronado is low because of past unsuccessful attempts to locate and develop these resources. Any approved plans for exploration or development of this resource would be the responsibility of the Bureau of Land Management, who has permitting authority. The future potential for exploration of leasable resources will depend on the availability of lands open to leasable exploration and extraction.

A parcel of land near Greaterville, Arizona, on the Nogales Ranger District, which is commonly referred to as the "50/50 land," has a split mineral estate that was established during acquisition by the Forest Service. Mineral ownership is one-half private and one-half acquired minerals status. Interest has been expressed about gold prospecting at this location.[59] However, other interest in minerals at this site has been complicated by issues related to the split mineral estate and the requirement for a prospecting permit from the Bureau of Land Management.

Abandoned Mines

A complete inventory of the abandoned mines lands (AML) on the Coronado has not been compiled; however, there have been reports documenting over 1,500 different sites, with new ones being recorded every year. Some of the abandoned mine sites have significant safety hazards, health hazards, or both (i.e., there are open shafts, emissions of toxic gases, falling debris). To date, over 150 sites have been safely remediated under the Region 3 AML Remediation Program by installing fencing, bat-friendly gates, foam plugs, or back filling. Fifty-one additional sites are scheduled for mitigation in 2018. In addition to the safety hazards, many of the sites have environmental contamination. To date, under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), commonly known as Superfund, the Coronado has remediated seven abandoned mine sites of environmental hazards. Future AML and CERCLA remediation will be, in part, dependent on financial resources and other Forest Service priorities

Mineral Resources – Environmental Consequences

Most direction that protects forest resources from adverse effects associated with access to, exploration for, and extraction of mineral resources originates in the laws, regulations, and policies described above under the "Regulatory Framework" heading. These are independent of forest plan direction and are the same for each alternative evaluated in this environmental impact statement, including the 1986 plan.

On the other hand, the 1986 plan and each of the three action alternatives differ in plan components and direction regarding national forest management, in general, and minerals management, in particular. These include different recommendations of areas for designation as wilderness, research natural areas, or other special areas; different recommendations for specific parcels to be withdrawn from mineral entry; different allocations of national forest land to specific management areas and zones; and different direction regarding management in response to climate change. These differences will be noted below in the discussions of effects of each alternative.

The differences in direction regarding climate change will have no effect on development of mineral resources and the effects of such.

[59] The minerals resource is leasable on this land because of its "acquired lands" status.

Effects Common to All Alternatives

As noted above, both congressional and regulatory agency direction in laws and regulations and Forest Service directives specific to minerals management would be the same for all alternatives. Therefore, the resources potentially at risk of the effects of minerals project activities would be managed similarly. Sources of effects from minerals projects may include, but are not limited to:

- removal of vegetation
- disturbance of soils
- water consumption
- water contamination
- wastes and tailings disposal
- noise
- blasting
- atmospheric emissions
- road and facilities construction
- drilling
- vehicle and equipment operation/traffic
- increased traffic

Eligible wild, scenic, and recreational rivers classified as “wild” are not available for any mineral actions under all alternatives, because Forest Service policy is to protect their eligibility status pending a suitability determination. If and when a stream or segment is established as a wild, scenic, or recreational river by statute, it will be withdrawn from locatable mineral entry. However, valid existing locatable mineral rights are an exception to this policy.

Forest Service policy allows segments of eligible “scenic” and “recreational” rivers to be open to locatable, leasable, and salable mineral disposal for all alternatives. It specifies that they be subject to requirements established to protect the values of the segment that characterizes them as scenic or recreational.

No Action

Direction for minerals resource management in the 1986 plan was based on Forest Service policy and Federal law and regulations applicable to locatable, salable, and leasable mineral resources. Together, the laws, regulations, and policy minimize the adverse effects of minerals projects on the Coronado while concurrently supporting sound energy and mineral exploration and development.

The 1986 plan emphasizes management of minerals operations through the use of operating plans, bonds, and reclamation and also provides for the timely analysis and processing of mineral prospecting, exploration, leasing, and development proposals. Protection of resources in the future under the no-action alternative would be the same as current protection under the 1986 plan.

Specific areas are recommended for withdrawal from locatable and leasable mineral entry in the 1986 plan. These include 2,629 acres in Management Area 2A to protect habitat for threatened and endangered species and to facilitate astronomical research. In Management Area 8, the plan recommends that existing mineral withdrawals be maintained and that three recommended research natural areas be recommended for withdrawal. Since the 1986 plan was signed, however, the forest supervisor decided not to withdraw these areas after other methods of surface resource protection were identified.

The 1986 forest plan acknowledges designation of the Mount Graham, Bunk Robinson, and Whitmire Canyon Wilderness Study Areas by the Arizona Wilderness Act of 1984 (see discussion in chapter 2). Additionally, it recognizes the past designation of eight wilderness areas, all of which were withdrawn from mineral entry. The 1986 plan recommends designation of one new wilderness area (until designation, this is the Mount Graham Recommended Wilderness Area, formerly a wilderness study area). Since the 1986 plan was signed, the Mount Graham Recommended Wilderness Area has been managed to maintain wilderness character. If and when Congress acts on its designation, the Mount Graham Recommended Wilderness Area would be withdrawn from mineral entry.

Overall, the 1986 plan would have less effects on minerals resource management than the proposed action and alternative 1, and effects equal to alternative 2, because it recommends only one new wilderness area (Mount Graham Recommended Wilderness Area), where minerals development

would be constrained by restrictions on motorized and mechanized uses, and because it has no restrictions on “scenic” and “recreational” eligible rivers that have mineral potential.

Locatable Minerals

Management of locatable mineral resources would not change if the 1986 plan continues to be in effect. Mineral proposals would continue to follow the direction of laws, regulations, and policies, and operations would be conducted to minimize adverse environmental impacts to National Forest System surface resources.

The economic effect of withdrawal of the Mount Graham Recommended Wilderness Area on mineral resources would depend on the locatable mineral resource potential of the area. If potential is high, a withdrawal of the area would preclude the opportunity for future mining and development of a valuable economic resource. If potential is low, the economic value of mineral resources would be low and a mineral withdrawal may not be necessary. Other available options for protecting sensitive resources, such as populations of special-status species and their habitat, should be explored before withdrawal is recommended for wilderness, research natural areas, and other areas having special designation. Further discussion of the effects of wilderness designation on minerals resources and development is provided under the proposed action discussion below.

Salable Minerals

Common variety minerals may not be removed for any purpose in Management Area 2A (Mount Graham/Pinaleño Mountains), Management Areas 8 and 8A (existing and proposed research natural areas), and Management Area 14 (South Fork Cave Creek and Guadalupe Canyon). Because of this, these materials would be unavailable to the Forest Service for use in road maintenance and construction, ground cover for parking areas, and landscaping at administrative and developed recreation sites. If supplies of national forest salable minerals from other locations dwindle, the Coronado may have to purchase materials from a commercial vendor to augment its needs for aggregate and rock materials.

Leasable Minerals

The 1986 plan is outdated with respect to leasing authorities and the role of the Bureau of Land Management and Forest Service in managing these resources. The 1986 forest plan has restrictive standards and guidelines for leasable minerals that include no surface occupancy in Management Area 8 and a recommendation for no surface occupancy in Management Area 14 and Management Area 15 (Wild Chile Botanical Area). This means that structures or facilities associated with leasable minerals activity would be constrained to certain areas. The restrictions may be overly conservative if other methods are available to protect natural resources in the restricted parcels. If not, the restrictions would constrain the potential for a leasable mining operation in specific areas of the Coronado.

Abandoned Mines

Access to accomplish closures of abandoned mine features and to mitigate any other potential hazards would continue as guided by the 1986 plan.

Proposed Action

The proposed action establishes desired conditions that support administration of mineral activities under current laws. Consistent with regulations and policy, environmentally sound minerals development is emphasized. Compliance with law and regulation is also emphasized without reiterating specific requirements.

The revised forest plan under the proposed action does not list areas recommended for mineral withdrawal, but rather sets desired conditions to protect resources that are very limited or unique and that are not already protected by law, regulation, and policy for specially designated areas

(wilderness). This management approach contrasts with recommendations for withdrawal made in the 1986 plan, because this approach would protect resources by means other than withdrawal.

Special Areas

Direction under the proposed action differs from the 1986 plan by recommending (1) four additional wilderness areas totaling 108,889 acres (Ku Chish, Chiricahua Addition North, Whetstone, and Mount Graham Wilderness Study Area); and (2) a new proposed research natural area (Finger Rock) in addition to the extension of three research natural areas that were carried forward as proposed in the 1986 plan. With regard to alternative 1, the proposed action recommends much less acreage for wilderness designation, and with regard to alternative 2, the proposed action adds four wilderness areas, a new research natural area, and three research natural area extensions, and direction regarding climate change.

Effects of management of special areas under the proposed action include the following:

Wilderness

Wilderness is typically withdrawn from mineral entry, with recognition of any valid mineral rights existing at the time of withdrawal. Historic mining, abandoned mine features, and active claims filed with the Bureau of Land Management may be present in those areas recommended by the proposed action for wilderness designation. It is possible for mineral activities to occur prior to withdrawal and for valid rights to be established before designation, which would allow continued mineral operations in a designated wilderness area. Mining in wilderness would be prohibited if no valid existing rights have been established at the time of withdrawal.

The proposed action's recommendation for an additional wilderness area would have greater potential to constrain the development of the minerals resource than the no-action alternative and alternative 2, and less potential to constrain it than that of alternative 1, which recommends more areas be designated as wilderness areas than the other three alternatives.

Locatable Minerals: There are producing mines in proximity to designated wilderness boundaries; thus, it is likely that locatable minerals potential extends into designated wilderness areas. Similarly, although none of the four recommended wilderness areas is within a mineral district, there may be mineral deposits extending underground beneath them. If valuable mineral deposits are identified nearby, their exploration, mine development, and extraction in such areas would be constrained by restrictions imposed to maintain wilderness character. If and when recommended wilderness is designated by Congress, access to these mineral resources would be extremely difficult, and their development would be unlikely.

The development of locatable minerals on recommended wilderness would be constrained by restricted access. Potential effects on development of a minerals resource and other natural resources will be reported in future site-specific reviews of individual mineral proposals in areas having special designation. Existing claims with valid existing rights will remain; however, if a determination is made to withdraw one of these areas, no future claims will be allowed, and the exploration for and extraction of locatable minerals would be constrained by restrictions necessary to maintain wilderness character.

Salable Minerals: The proposed action's recommendation for designation of new wilderness would result in a loss of any salable common variety aggregate resources within wilderness. Potential constraints on management affect mining-related roads, mine workings, pits, and other areas of operation.

Leasable Minerals: By regulation (36 CFR 228.102), certain lands are legally unavailable for leasing, including lands withdrawn from mineral leasing, lands recommended for wilderness designation by the Secretary of Agriculture, and lands designated by statute as wilderness study areas (unless oil and gas leasing is specifically allowed by the statute designating the study

area). The consequences of recommending additional wilderness areas would be a loss of potential leasable resources within the wilderness in addition to potential constraints on the development of mining-related roads, mine workings, pits, and other operation areas adjacent to the wilderness area.

Research Natural Areas

Proposed research natural areas would be open to mineral development, but activities would be subject to restrictions on access, exploration, and extraction activities to protect the values that characterize a parcel. Mineral resource exploration and extraction are, in general, incompatible with the desired conditions established by the proposed action for research natural areas.

Locatable Minerals: Locatable mining claims, exploration, and mining may be allowed on research natural area lands if valuable mineral deposits are present and the research natural area has not been withdrawn from mineral entry. The proposed new Finger Rock Canyon Research Natural Area is located within an existing wilderness area that has been previously withdrawn from mineral entry; therefore, mineral resource activities would not be permitted there. The other recommendations for research natural areas carried forth from the 1986 plan are not within withdrawn parcels.

Salable Minerals: Proposed research natural areas would be open to salable mineral disposal. Salable mineral use and development is a Forest Service discretionary action. Because salable mineral activities may conflict with management goals for specific areas, decisions to approve them would likely be made on a case-by-case basis.

Leasable Minerals: Restrictions on surface occupancy and specific requirements for protecting unique or rare resources in research natural areas may discourage leasable mineral exploration and development.

Abandoned Mines

Abandoned mine management and mine reclamation activities are established as objectives in the proposed action. Guidelines for reclamation would provide for restoration of landforms and hydrological features to reduce contrast with the surrounding landscape. As a result, evidence of past mining would be less apparent to visitors and would result in a plant community and ecosystem functions that more closely resemble pre-mining conditions. Abandoned mines would be managed for both the wildlife habitat they provide and for the public safety concerns they present. Balancing these two needs would improve the availability of the resource for bats and other cave-dependent wildlife because it would preserve entrance and exit from the mine shafts while limiting human access where the mines pose a safety risk.

Alternative 1

The type of effects of management under alternative 1 on wilderness and research natural areas are the same as those described under the “Proposed Action” heading. Because 147,018more acres of wilderness are recommended by alternative 1 than the proposed action, its negative impact on mineral resource development would be greatest among the alternatives. On the other hand, protection of natural resources in these areas for their intrinsic values would be greatest under alternative 1.

Locatable Minerals

Among the alternatives, alternative 1 would have the greatest negative effect on development of locatable resources because several recommended wildernesses have mineral resource potential, which would be constrained from development by management for wilderness character. On the other hand, management to retain the character of recommended wilderness and the unique resources in research natural areas would reduce the potential for adverse effects on natural resources that typically occur with locatable mineral exploration and extraction activities.

Salable Minerals

Management under alternative 1 would further reduce the acreage available for salable mineral materials because it precludes development of salable minerals in wilderness. On the other hand, the management of such areas for wilderness character would reduce the potential for adverse effects on natural resources that typically occur with salable minerals extraction.

Leasable Minerals

Alternative 1 would reduce the greatest amount of acreage available for future mineral leases. Lands recommended as wilderness would be closed to new mineral leases, and development of facilities to serve leases in adjacent areas would be allowed only at the discretion of the forest supervisor.

Abandoned Mines

Remediation of abandoned mine features and their health and environmental hazards are expected to continue each year. Plan direction in alternative 1 would restrict motorized access and mechanized uses in wilderness, which may impede progress in completing remediation as compared to the other alternatives.

Alternative 2

The intensity of effects of alternative 2 would be equal to or very similar to the no-action alternative, except that management direction under alternative 2 would be more current than that which appears in the 1986 plan. The lack of direction on climate change under alternative 2 would not have an effect on mineral resources.

Locatable Minerals

Under alternative 2, a larger land base would remain open to mineral entry and would not be subject to a potential mineral withdrawal, thereby allowing for a larger area of potential locatable mineral resources and fewer constraints on resource exploration and development. However, with the increased potential for development, there would be an increased potential for adverse effects on other resources.

Salable Minerals

A larger land base would be available for the development of salable mineral material resources both for internal use on roads and for external commercial use. However, with the increased potential for development, there would be an increased potential for adverse effects on other resources.

Leasable Minerals

A larger land base would remain open for mineral leasing of potential resources with fewer constraints on the resource exploration and development. However, with the increased potential for development, there would be an increased potential for adverse effects on other resources.

Abandoned Mines

Alternative 2 would increase the land base open for motorized vehicle access, which is often needed for abandoned mine site hazard mitigation. Consequently, it may improve access to abandoned mine areas described earlier.

Cumulative Effects

The geographic boundary for actions that may result in cumulative effects on the Coronado is the southeastern portion of Arizona, including Pima, Pinal, Cochise, Santa Cruz, and Graham Counties, and Hidalgo County, New Mexico. The temporal bound for the same is the life of the forest plan, which is estimated to be 10 to 15 years. Ongoing and reasonably foreseeable actions, with emphasis on mining activities on and off-Forest, are potential sources of effects that may additively affect

mineral resource production and disturbances. Existing conditions are used as a proxy for the effects of past actions because they reflect the aggregate impact of all prior actions that have affected access and might contribute to cumulative effects.

Locatable Minerals

Ongoing locatable mineral operations are active in the Santa Catalina, Santa Rita, Huachuca, Dragoon, and Tumacacori Ecosystem Management Areas of the Coronado. Active mineral exploration areas often coincide with those where there has been past historic mining, mineral districts, and similar favorable geologic conditions. The natural progression for minerals resources projects is from exploration to a mining plan of operation; therefore, it is foreseeable that some, but not all, of the current and future mineral exploration prospects will develop into actual mining operations and contribute a positive cumulative effect to minerals production.

The only foreseeable large-scale mining operation on the Coronado is the Rosemont Copper Project in the Santa Rita Ecosystem Management Area. The project is on approximately 3,670 acres of National Forest System land, in addition to 1,085 acres of private land, with connected actions occurring on Bureau of Land Management and State lands. The mine life, including construction, operation, reclamation, and closure, is approximately 25 years (USDA FS 2011b).

Increased values of minerals, such as copper, have led to expanded mineral interest throughout the cumulative effects area. Presently, there are several large active mines, rock quarry operations, and exploratory mining activities on other Federal, State, and private land in the cumulative effects area. Within the cumulative effects area, there are several large producing copper mines including the Mission, Silver Bell, Bisbee, Sierrita, and Tohono mines that are on private, State, tribal, Forest Service and BLM lands. Additionally, the following copper mines are under exploration and development: Safford, Johnson Camp, Rosemont, and Oracle Ridge (Niemuth et al. 2007). The trend is for more copper being mined from open pit methods and to a lesser extent from underground methods. Overall, there is positive trend for mining and production of locatable minerals such as copper, molybdenum, silver, and gold within the cumulative effects area from mining on lands outside the Coronado boundary.

Salable Minerals

The Coronado has a small number of salable minerals resources (pits and quarries) available or being developed in contrast to a large amount of common variety resources on private, State, tribal and other Federal lands within the cumulative area. Administrative use of mineral material sources may be reduced by changes to the Coronado's transportation system, as there may be fewer roads to maintain. However, the external uses for salable resources are expected to be in demand with an increase in pressure to develop the resources in response to population growth and economic recovery that may spawn increased building and road construction. Overall, the cumulative effects of salable mineral materials activities (disturbance and resource contribution effects) would be minor in proportion to the effects of the activities that are ongoing outside the Coronado National Forest within the cumulative effects area.

Leasable Minerals

If potash (potassium) resources were to be developed, cumulative effects and economic benefits would be similar to those of locatable exploration and development of surface resources. However, the proposed areas of recommended wilderness would become closed to new mineral leases, thereby reducing the available acres for mineral development. The restrictions placed on acquired lands for locatable minerals (i.e., hardrock leasable) would have no cumulative effect on the environment because there are only a small number of acres scattered across the Coronado.

Abandoned Mines

Reclamation is anticipated to increase on the Coronado as more mine adits and shafts are identified and prioritized for closure or gating. Similar efforts are underway on other State, tribal and Federal lands. This would be a beneficial cumulative effect in combination with the efforts on other lands in the cumulative effects area.

Cultural Resources – Affected Environment

The Coronado has a long legacy of human presence, which is evidenced by the Coronado having a large and diverse assemblage of archaeological and historic sites. People have used plant, animal, and mineral resources of the Coronado for at least 10,000 years, and their use has often had a major effect on local ecosystems.

To date, inventory surveys for cultural resource sites have covered only about 5 percent of the Coronado, because of the predominance of steep mountain slopes in many areas, which are not conducive to either human occupation or archaeological surveys. Habitations are largely confined to the lower elevations of the Coronado, along the bases of the mountains. Still, more than 2,400 cultural resource sites have been identified and documented on the Coronado. Of these, 141 sites are listed on the National Register of Historic Places, one of the highest among all national forests.

Historical-period sites include a wide variety of structures, features, artifact scatters, roads and trails related to ranching, mining, military defense activities, government programs (e.g., the Civilian Conservation Corps), and forest administrative and recreational uses. The most common Native American sites are artifact scatters that include materials from flaked-stone tool manufacture, ground stone, and ceramics. Other sites are documented to have been food processing camps, roasting pits, rock shelters, petroglyphs, and pictographs.

Several cultural artifacts collected during Forest Service led surveys and projects have been curated and archived at the forest supervisor's office in Tucson. The collection, curation, and archival of diagnostic surface artifacts was the norm from the 1970s through the early 1990s, but this practice has since been virtually discontinued in adherence to an informal noncollection policy for all but extraordinary situations. Today, almost all cultural items collected during excavations by archaeological consultants to the Coronado are currently curated at the State Museum, which is the standard repository in Arizona. The State Museum also houses collections from past research surveys on the Coronado, including those conducted by museum personnel. All relevant items that were archived in pre-1990 collections at the State Museum have been repatriated to tribal governments in accordance with the Native American Graves Protection and Repatriation Act.

Many cultural resource sites on the Coronado have been negatively affected by past and ongoing activities. Cultural resources have been lost or damaged by past land management activities, including those dating from before national forest designation, from visitor use, and as a result of natural events. Many activities were initiated prior to implementation of the National Historic Preservation Act of 1966, as amended. Some roads in use since the turn of the 20th century have had a cumulative long-term adverse effect on cultural sites.

Prior to the passage of the National Historic Preservation Act, many cultural sites were damaged or destroyed by ground-disturbing activities, such as Federal, State, and local road and facility construction. Adverse effects have decreased over time because today, significant sites are typically identified during project planning, allowing for design to avoid and/or mitigate potential effects before implementing an action. Despite this improvement during project planning, many sites, particularly historic-period sites with highly combustible materials, have been damaged or destroyed by uncharacteristic wildfires.

Cultural Resources – Environmental Consequences

Effects Common to All Alternatives

Forest plan direction common to all alternatives is that every proposed Forest Service action must comply with the consultation and other requirements of the National Historic Preservation Act. This direction, if followed properly, will result in the developing of avoidance and/or mitigation strategies to address potential adverse effects on cultural resources before projects are actually implemented.

Also, all alternatives provide direction specific to the identification, evaluation, inspection, stabilization, and maintenance of cultural resources. For this reason, artifact collections and the Coronado's historical documents would continue to be managed and preserved in a beneficial manner to afford opportunities for access to them by other agencies, institutions, and tribes.

No Action

The 1986 plan provides specific direction regarding various facets of cultural resource management, including project clearance procedures, site protection, enhancement and interpretation, research, and curation of collections. Most of these elements are required by various laws, regulations, policies, and agreements, particularly the cultural resource protection compliance and clearance process specified by section 106 of the National Historic Preservation Act. The 1986 plan includes identification of sites through nonproject inventory (section 110 of the Act) and public interpretation of historically significant sites.

The no-action alternative does not include direction regarding issues and mandates for cultural resource preservation and management that have arisen since 1986. It also does not address management of collected artifacts and cultural items nor the need to have them catalogued and curated in accordance with current standards. Specifically, the plan predates the passage of the Native American Graves Protection and Repatriation Act and the 1992 amendment to the National Historic Preservation Act, the latter of which called attention to procedures for the identification of traditional cultural properties.

While the 1986 plan is devoid of direction regarding compliance with many recent laws and regulations that protect cultural resources, Coronado archaeologists are cognizant of the latest regulations and ensure that their requirements are followed. Finally, most of the objectives for cultural resource management in the 1986 forest plan have been accomplished, have become standard operating procedures, or are now irrelevant.

The no-action alternative does not provide direction on managing resources in response to climate change. Because of this, the quality of forest products, availability of forest products, or both for traditional native uses may decline. Cultural sites are typically not vulnerable to the effects of climate change, except for natural features (waterfalls, specific vegetation types) that are considered by tribes as a sacred place or traditional cultural property. Thus, the quality of sacred places and settings and traditional cultural properties may degrade because of climate-induced changes on soils, water resources, vegetation, and habitat.

Proposed Action

Cultural resource management direction in the forest plan, as revised under the proposed action, would have no measurable direct or indirect adverse effects on cultural resources. The revised forest plan's emphasis on treating vegetation with mechanical thinning and prescribed fire to restore historic (desired) conditions, however, would benefit historic properties in the long term, because the probability of uncharacteristic wildfire would decrease with improved and increased vegetation management. This, in turn, would reduce the likelihood that cultural sites would be significantly damaged or destroyed by wildfire.

Like the 1986 plan, the proposed action would continue to require that cultural sites be flagged during pre-project planning, allowing for projects to be designed for avoidance of known sites or mitigation to be developed to minimize impacts. Under the proposed action, goals for restoring historic vegetation conditions and the natural fire cycle would decrease the likelihood of uncharacteristic wildfire, which would correspondingly decrease the likelihood that cultural sites would be adversely affected by fire suppression and related human activity.

The proposed action recommends four areas for wilderness designation on the Coronado. Because of prohibitions and restrictions on the use of mechanized equipment and motorized vehicles in wilderness, this additional acreage would be less vulnerable to physical damage or destruction caused by vehicles and equipment than if it were managed by the 1986 plan or alternative 2.

Few cultural-resource sites have been identified and recorded within the recommended additional wilderness areas. Because no historic structures are known in these areas, wilderness restrictions would not pose any limitation on preservation work at historic sites.

The proposed action provides direction on managing resources in response to climate change. Cultural sites are typically not vulnerable to the effects of climate change, except for natural features (waterfalls, specific vegetation types) that are considered by tribes as a sacred place or traditional cultural property. Therefore, this direction, which would foster adaptation and resiliency in natural resources, would benefit certain cultural resources. Effects of climate change direction on tribal uses of forest products are discussed below under the “Native American Interests” heading.

Alternative 1

Alternative 1 emphasizes additional wilderness on the Coronado, proposing 147,018 more wilderness than the other alternatives. Prohibitions on the use of mechanized equipment and motorized vehicles would apply to the new wilderness areas. Such constraints would decrease the probability of damage or destruction of sites by vehicles and equipment and reduce the potential of vandalism associated with motorized access. Sites would be less prone to defacement, littering, and illegal collection of artifacts.

Under alternative 1, proposed new wilderness areas would be inaccessible by motor vehicle, and the use of mechanical equipment would not be allowed. This would affect the ease of administrative access to the new wilderness areas for repairs, maintenance, and fire suppression of historic structures and for vegetation management to return the Coronado to historic conditions. Because the number of structures within the proposed new wilderness areas is low, effects to cultural resources would be negligible.

Alternative 1 provides the same direction as the proposed action for managing natural resources in response to climate change. Thus, it would maintain the quality and integrity of cultural sites in the same way as described under the “Proposed Action” heading on the previous page.

Alternative 2

Alternative 2 emphasizes increased opportunities on the Coronado for motorized recreation. The proposed expansion of acreage designated for motorized recreation may predispose cultural sites to damage by vehicles and road maintenance equipment and make them more accessible for looting, vandalism, and illegal collection of artifacts. Although the total acreage that would be designated for motorized recreation is small compared to the total area of the Coronado (about 3 percent) and that allocated by each of the other alternatives, the three proposed locations for adding motorized recreation—Redington Pass, Stockton Pass, and the eastern flank of the Santa Rita Mountains—are documented by past surveys to have a relatively high density of prehistoric cultural resource sites.

Alternative 2 does not provide plan components to guide management of resources in response to climate change. It does, however, incorporate strategies for managing natural disturbances resulting from climate change that affect forest resources (see appendix A of the plan). Cultural sites are

typically not vulnerable to the effects of climate change, except for those natural features (waterfalls, specific vegetation types) that are considered by tribes as a sacred place or traditional cultural property. Thus, alternative 2 would be slightly less effective than the proposed action and alternative 1 in maintaining the quality of sacred places and settings and traditional cultural properties during climate change and slightly more effective than no action.

Cumulative Effects

The area of potential effects for cultural resource impacts includes all of southern Arizona and Hidalgo County, New Mexico, over a timeframe including the past 10 years through the next 15 years.

Unlike many resources, cultural resources are nonrenewable; the loss or damage of sites is characteristically permanent. The destruction or damage of archaeological sites means the loss of information important to the understanding of the record of human history, loss of interpretive opportunities, and the incremental loss of the cultural resource base.

The rapid population growth and urbanization in southern Arizona, in general, has resulted in the extensive loss of archaeological sites, often unmitigated, particularly since localities favored for occupation in modern times were also favored in the past. The loss of cultural resources to urban development on private lands is putting greater significance on the cultural resources located in the national forests. The cultural 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 cultural resources as a valued resource.

Without knowledge of what type or how many actions that could affect cultural resources will be proposed by other entities over the effective period of the revised forest plan, it is not possible to identify specific cumulative effects on cultural resources. It is possible, however, to assess the relative increment of effects that would result from each of the four alternatives.

In this regard, all alternatives are similar in their foreseeable contribution to cumulative effects. Each alternative emphasizes compliance with laws and regulations that serve to protect and preserve cultural resources on national forest lands. No increment of adverse effects is expected because of this. Alternative 1 would contribute less to cumulative effects that no action and the proposed action because of its recommendation of additional wilderness acreage, management of which will afford greater protection of cultural resources than the other alternatives. Alternative 2, which proposes an increase in the motorized recreation areas in a location of high cultural resource site density, is more likely than the other alternatives to result in loss of nonrenewable cultural resources, thereby contributing the largest increment to cumulative effects in the analysis area.

Native American Interests – Affected Environment

Traditionally, Native Americans have extensively used a wide variety of resources in the mountains now comprising the sky islands of the Coronado National Forest. Use of resources was greatly curtailed when native peoples were located on reservations, access to traditional lands restricted, and national forests established. However, Native American collection of plants on the Coronado has continued and increased in recent decades as the Forest Service has made the availability of forest products better known and accessible among nearby tribes.

With regard to proposed actions and as an outreach activity, Coronado heritage staff and the forest supervisor frequently consult with 12 tribes having ancestral and ongoing associations to lands now managed by the Coronado. These tribes include the Ak-Chin Indian Community, Fort Sill Apache Tribe, Gila River Indian Community, Hopi, Mescalero Apache Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'odham Nation, White Mountain Apache Tribe, Yavapai-Apache Nation, and Pueblo of Zuni.

Traditional tribal uses of the Coronado include the collection of medicinal plants, wild plant foods, basketry materials, and fuelwood. Tribal members recognize both specific places, such as springs and

shrines, and larger landscapes as places of continuing traditional and cultural significance. Therefore, tribes share an interest in how the Coronado is managed and in protecting important natural and cultural resources.

Two of the prominent mountain ranges of the Coronado have been identified as traditional cultural properties because of their continuing cultural and religious importance to tribes: *Dzil Nchaa Si'an*, the Western Apache[60] name for the Pinaleño Mountains, and *Ce:wi Duag*, the O'odham name for the Santa Rita Mountains. Both of these have been determined to be eligible for the National Register of Historic Places. The Mount Graham Recommended Wilderness Area, which is included under all alternatives, is within the boundary of the *Dzil Nchaa Si'an* Traditional Cultural Property, recognized as an important cultural place for Western Apache people. The Mount Wrightson Wilderness Area (one of eight existing wilderness areas on the Coronado) is within the boundary of the *Ce:wi Duag* Traditional Cultural Property.

In the past decade, the most common organized tribal activity has been the collection of basketry materials. O'odham basket makers collect the leaves of beargrass (*Nolina microcarpa*) and soaptree yucca (*Yucca elata*) and the roots of banana yucca (*Y. baccata*). Western Apache basketmakers use limber branches of skunkbush (*Rhus trilobata*). Primary food items still being collected are acorns, particularly of Emory oak (*Quercus emoryii*), which are collected by both Apache and O'odham groups. Tribal members also collect mesquite fuelwood for traditional uses.

Native American uses occur throughout the country and have effects on different aspects of the Coronado. Within each vegetation community different activities can occur. Many plant species are collected for traditional uses some of which include: willows, which are an important plant for basketry; the light wood from cottonwoods was used for construction, certain tools, and coals for roasting food; mesquite continues to be widely used for fuel and food; and walnuts are a traditional food. Among aquatic plants, cattail (*Typha dominguez*) was used for basketry and food, and yerba mansa (*Anemopsis californica*) has medicinal uses.

Native American Interests – Environmental Consequences

Effects Common to All Alternatives

All alternatives provide direction that requires continued Forest Service dialogue and consultation with tribes about forest management, the effects of proposed undertakings, and the identification of historic places, including traditional cultural properties. Such dialogue encourages native collection and uses of traditionally important plants and minerals, cooperation in making Coronado National Forest facilities available for meetings and educational activities, and facilitation of access to special places.

No Action

The 1986 forest plan provides little direction or narrative about tribes and their interests. The plan indicates that work will be done to "identify areas of Native American religious use during the project scoping portion of the environmental analysis process." Since 1986, several laws, executive orders, and policy direction pertinent to tribal outreach and relations have been established. The 1986 plan is out of date and in need of revision; however, the Coronado has developed an ongoing tribal relations and consultation program not specified by the 1986 plan as part of its heritage program.

The 1986 plan predates the passage of the Native American Graves Protection and Repatriation Act and the 1992 amendment to the National Historic Preservation Act, the latter of which called attention

[60] Western Apache refers to the Apache peoples living today primarily in east-central Arizona. Most live within reservations. The Fort Apache, San Carlos, Yavapai-Apache, Tonto Apache, and Fort McDowell Mohave-Apache Indian reservations are home to the majority of Western Apache and are the bases of their federally recognized tribes.

to procedures for the identification of traditional cultural properties. Hence, the 1986 plan does not address management of collected tribal artifacts and the need to have them properly catalogued according to current curation standards, nor does it require repatriation of certain cultural items under the Native American Graves Protection and Repatriation Act.

With regard to forest uses and products, the lack of direction in the 1986 plan regarding competition- and fire-induced mortality of native desert species and conversion of desert habitat to nonnative grassland could threaten the sustainability and availability of plants collected by Native Americans for traditional uses. In general, however, the degree of negative impacts on forest products collected and used by Native Americans is variable and depends largely on type of product.

The no-action alternative does not provide direction on managing resources to develop adaptation and resiliency in response to climate change. Because of this, the quality and/or availability of forest products for traditional native uses may decline. Likewise, the natural resources that comprise sacred places and settings and traditional cultural properties may degrade because of climate-induced changes.

Proposed Action

The proposed action provides direction regarding the preservation and continued use of resources and landscapes in which tribes have expressed significant interest. Echoing sentiment expressed by native peoples for the restoration of vegetation and the landscape to pre-European settlement conditions, the proposed action emphasizes strategies that target restoration of historic vegetation conditions using mechanical methods and prescribed fire. The Ku Chish Recommended Wilderness Area is within the traditional Chiricahua Apache homeland. Its preservation as wilderness will provide opportunity for quiet recreation and minimize adverse effects from motorized and mechanical uses.

The proposed action calls for continued free access to the Coronado by native peoples for collection of plants and other forest products and the use of special places. Moving riparian vegetation toward desired conditions would enhance the availability of plants that are collected by Native Americans for traditional uses. Additionally, small-scale removal of nonnative buffelgrass in desert communities would conserve the survival of native species important to Native Americans and may improve availability at localized scale. Increased fire presence may also increase the abundance of some forest products collected by Native Americans (Anderson 2004).

The revised forest plan under the proposed action provides direction on managing resources in response to climate change as plan components and management approaches. It also incorporates strategies for managing the effects of natural disturbances resulting from climate change that can adversely affect forest natural resources (appendix A of the plan). Because of this, the quality and/availability of forest products for native uses would be maintained.

Cultural sites are typically not vulnerable to the effects of climate change, except for natural features (waterfalls, specific vegetation types) that are considered by tribes as a sacred place or traditional cultural property and forest products derived from vegetation. Therefore, the direction in the revised forest plan under the proposed action, which would foster adaptation and resiliency in natural resources, would benefit certain cultural resources.

Alternative 1

Restrictions on motorized access and mechanized uses in the additional acres of wilderness recommended under alternative 1 would facilitate the movement of vegetation and the landscape toward desired conditions expressed by the tribes with regard to a return to pre-European settlement conditions. Free access to the Coronado would be offered to native peoples for collection of plants and other forest products and the use of special places. The effects on forest products available for Native American traditional uses would be the same as those reported for the proposed action.

Alternative 1 provides the same direction as the proposed action for managing natural resources in response to climate change. Thus, it would maintain the quality and integrity of cultural sites and the quality and availability of forest products in the same way as described under the "Proposed Action" heading on the previous page.

Alternative 2

The designation of specific areas for motorized recreation use under alternative 2 has the potential to impede the return of pre-European settlement conditions in landscapes of tribal interest and the damage of cultural sites, including ancestral homes and spiritual places. However, this would likely not occur, because the areas specified for motorized use under this alternative were carefully selected to avoid such landscapes as well as locations to which tribes have traditional ties, where forest products are available, and/or where other cultural resources may be present.

Alternative 2 does not provide plan components to guide management of resources in response to climate change. It does, however, incorporate strategies for managing natural disturbances resulting from climate change that affect forest resources (see appendix A of the plan). Thus, with regard to the effects of climate change on natural resources (see effects under "Topic 1" for vegetation, soils, water, and air quality), alternative 2 would be slightly less effective than the proposed action and alternative 1 in maintaining the quality and availability of forest products for native uses and the quality of sacred places, settings, and traditional cultural properties, and slightly more effective than no action.

Cumulative Effects

The area of potential effect with regard to tribal relations includes all of southern Arizona and Hidalgo County, New Mexico, over a timeframe including the past 10 years through the next 15 years. The tribes that have historically occupied this region view its entirety as a landscape of continuing traditional and cultural importance.

Without knowledge of what type or how many actions that could impact tribal relations and resources will be proposed by other entities over the effective period of the revised forest plan, it is not possible to identify specific cumulative effects on them. It is possible, however, to assess the relative increment of effects that would result from each of the four alternatives.

Tribal members are concerned about the cumulative degradation of open spaces and the modification of cultural landscapes. Places of historical, traditional, and cultural significance to the tribes, whether or not they are identified as traditional cultural properties, and traditional forest product collection areas are located across these landscapes. Many of these important areas are located on nontribal lands, and in particular, on the mountains managed by the Coronado. Across this overall cultural landscape, there has been a trend toward the degradation of places of traditional cultural importance. As with cultural resource sites, many of which are considered ancestral homes of tribal members, losses of traditional use areas and places of traditional importance has been high in urbanized areas and on developed private lands.

Tribal relations would be enhanced under the revised forest plan direction contained in the proposed action, alternative 1, and alternative 2. And, all would protect traditional cultural properties, important resources, and traditional use areas on the Coronado. No action would not change the way that tribal relations are managed.

Alternative 2, more than the other three, has the greatest potential to adversely alter the landscape and result in negative impacts, because of its emphasis on motorized recreation. Alternative 1 has the greatest potential to benefit landscapes and access to traditional places because of its proposed addition of about 255,908 acres of new wilderness, which will exclude motorized and mechanized uses and emphasis on quiet recreation. The proposed action, alternative 1, and alternative 2 would all provide free access to native peoples for use of forest resources. Even though the 1986 plan states no

direction about native access, it is freely allowed in the same way that it is proposed by the other alternatives.

International Relations – Affected Environment

Activities at and beyond the Coronado's international border with the Republic of Mexico have varying degrees of influence on the management and sustainability of its resources and uses. Portions of three ranger districts (Sierra Vista, Nogales, and Douglas) are contiguous with the border. Ports of entry on the border accommodate thousands of Mexican citizens and American citizens who travel to and from the U.S. for business, work, or pleasure. Many Mexican citizens avail themselves of the recreational amenities of the Coronado. Since the 1990s, cross-border sharing of resource management knowledge and experience—especially in the fields of fire ecology, wildlife research, range management, archaeology, and historic preservation—has been facilitated by the Forest Service International Forestry Program

Over the past few decades, illegal uses of the border for trafficking in people, drugs, and weapons have complicated management of the Coronado, presenting public health and safety hazards, degrading natural resource conditions, and greatly increasing the occurrence of wildfires. As a consequence, the role of the U.S. Department of Homeland Security and other Federal, State, and local law enforcement agencies has escalated on both sides of the border. Hence, cooperative interrelationships between the Forest Service, agencies, and local governments are essential.

Management of forest resources in border areas is challenging because it must balance conservation efforts with the potential negative effects of enforcement vehicles traveling on and off National Forest System roads, such as damage or loss of vegetation; degradation of soils and related sedimentation of surface waters; fugitive dust emissions; disturbance of wildlife and habitat; disturbance of historic and/or archaeological sites; and disruption of recreational use. The Coronado must also accommodate infrastructure associated with border surveillance, including observation towers and communication facilities and equipment, which degrade the scenic quality of natural settings and viewsheds.

International Relations – Environmental Consequences

No Action

The 1986 plan provides no direction or management emphasis or guidance for recognizing and/or enhancing the Coronado's relationship with the Republic of Mexico, which would continue to be important to resource management. However, the relationship between the Coronado and Mexico that has developed over recent years because of border issues would continue to be fostered.

Proposed Action, Alternative 1, and Alternative 2

Under the action alternatives, specific goals are established for managing values and resources that are shared with the citizens of Mexico. Every action alternative sets desired conditions for clean and safe recreation sites in the three ranger districts contiguous with the border; for high scenic quality in viewsheds that include Mexico; and for unimpeded movement of wildlife dependent on unfragmented habitats both in Mexico and on the Coronado.

Partnerships – Affected Environment

In addition to traditional economic values defined by commodity production, the Coronado National Forest has a high amenity value to communities of place and interest. One measure of that value is the contributions to the Coronado in time, money, and energy that are expended in the form of formal partnerships or informal volunteer projects.

In 2010, a conservative estimate for the number of volunteer hours on the Coronado was 53,349 with an estimated value of $1,112,327. Fundraising efforts by partners are significant, yielding about $20,000 per year in cash contributions and usually more from in-kind contributions, such as materials

donated in group volunteer projects. In 2007, concerned Tucson donors raised $800,000 in private funds to help restore the Sabino Canyon Recreation Area, which was badly damaged by flooding and debris flows during 2006 summer rainstorms.

In the past 25 years, partnerships with the public, organizations, and other agencies have become increasingly important in the preservation, restoration, rehabilitation, and interpretation of cultural resources. At Kentucky Camp and Brown Canyon Ranch, "friends" groups have contributed thousands of hours each year, and Passport in Time volunteers serve as caretakers at those and other historic sites. Site stewards not only monitor the condition of many significant archaeological sites on the Coronado, but have also instituted site recording. Cochise College has sponsored several volunteer rock art recording projects.

In cooperative partnerships with conservators, architects, masons, and resource specialists from the National Park Service and Mexico's Instituto Nacional de Antropología e Historia, historic adobe buildings have been preserved on the Coronado. Under "Service-First" interagency agreements, the Coronado National Forest, Bureau of Land Management, and U.S. Fish and Wildlife Service (Buenos Aires National Wildlife Refuge) share personnel and expertise to reduce staffing costs.

Other partners known as "cooperators" contribute significantly to funding projects that are of mutual benefit to the Forest Service and the cooperator. Examples include the Natural Resource Conservation Service, Quail Unlimited, the National Wild Turkey Federation, Fort Huachuca (U.S. Department of Defense), U.S. Department of the Interior, National Park Service, and Bureau of Land Management.

Partnerships – Environmental Consequences

No Action

The 1986 plan provides no direction or management emphasis or guidance for recognizing and/or enhancing the Coronado's relationship with various partners, who would continue to be important to resource management. However, the relationships between its partners that have developed over recent years would continue to be fostered by the Forest Service in the best interest of conserving and preserving resources. Only positive effects on resource management are expected.

Proposed Action

The revised forest plan under the proposed action explicitly recognizes partnerships and emphasizes collaboration with partners in the desired conditions, objectives, guidelines, and management approaches it establishes for various resources and geographic areas. The incorporation of this direction in the revised forest plan will encourage continued partnerships that serve to improve and maintain the integrity and condition of each resource. Only positive effects on resource management are expected.

Alternative 1

The environmental consequences of direction under alternative 1 would be the same as those reported for the proposed action. However, because of its emphasis on adding wilderness to the national forest in response to the public sentiment, alternative 1 may encourage new partnerships with wilderness advocacy, quiet recreation, and other environmental organizations. If these are realized, improvements and protection of forest resources would be greater than those expected under the proposed action, no action, and alternative 2.

Alternative 2

The environmental consequences of direction under alternative 2 would be the same as those reported for the proposed action. However, because of its emphasis on adding motorized recreational acreage to the Coronado, alternative 2 may encourage new partnerships with groups who champion motorized recreation and related activities. If these are realized, new opportunities for recreational use of the

Coronado may result. If motorized recreation zones are added to the national forest in previously disturbed areas, as proposed, effects on sensitive and vulnerable resource areas would decrease over those that occur under management by the 1986 plan. Partnerships developed as a result of alternative 2 may result in cooperative efforts to remediate damaged resources in exchange for increased opportunities for motorized recreation.

Short-Term Uses and Long-Term Productivity

The National Environmental Policy Act requires that decision makers examine the potential consequences of proposed actions as they affect "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). In Section 101 of the Act, Congress explained that 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.

Implementation of national forest management in accordance with the direction provided by any of the alternatives evaluated in this environmental impact statement would not result in adverse impacts to the long-term productivity of the affected environment because of the short-term uses of natural and human resources on the Coronado. This is because the direction in the forest plan was carefully developed to guide the use of these resources in a manner that achieves short-term conservation objectives and long-term sustainability.

As an example, achievement of the desired condition of vegetation communities, as envisioned in the revised forest plan, would require a dramatic increase in treatments, such as mechanical thinning or prescribed fire. Treatments also benefit other forest resources (e.g., soils, wildlife, and water) that depend on healthy and sustainable vegetation communities. Widescale disturbance on the Coronado to move rapidly toward desired conditions would have adverse effects on these other resources in the short term. 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

Implementation of national forest management in accordance with direction provided by any of the alternatives evaluated in this environmental impact statement would not result in unavoidable adverse environmental effects.

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.

None of the alternatives evaluated in this environmental impact statement would cause either an irreversible or an irretrievable commitment of resources.

Other Required Disclosures

The regulations for implementing the National Environmental Policy Act at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." As a proposed Federal project, the proposed plan decisions are subject to compliance with other Federal and State laws. Determinations and decisions made in the proposed plan have been evaluated in the

context of relevant laws and executive orders. Throughout the development of the proposed plan, there has been collaboration with various State and Federal agencies. The following actions have been taken to document and ensure compliance with laws that require consultation and/or concurrence with other Federal agencies.

- **Endangered Species Act, Section 7:** Consultation with the U.S. Department of the Interior, Fish and Wildlife Service, regarding federally listed threatened, endangered, and proposed species and designated and proposed critical habitat, has been completed.
- **National Historic Preservation Act:** Consultation with the Arizona State Historic Preservation Officer is mandated by Section 106 of the National Historic Preservation Act. The Southwestern Region also subscribes to a programmatic agreement with the Arizona and New Mexico State Historic Preservation Officers for ways in which consultation can be conducted. The various appendices of the programmatic agreement are particularly directed to Southwestern Region projects and issues.

Government-to-government consultation was completed with Native American tribes who have aboriginal territory within the lands now part of the Coronado National Forest, as required by the National Historic Preservation Act; Executive Orders 13007 and 13175; and the 2003 "First Amended Programmatic Agreement between the Forest Service and State Historic Preservation Officers in Arizona, New Mexico, Texas, and Oklahoma."

Chapter 4. Consultation and Coordination

The following is a list of the Federal, State, and local agencies, tribes, and individuals who were consulted or involved in the preparation of the environmental impact statement during this National Environmental Policy Act review. Lists of all persons, groups, officials, and others who were contacted during the forest plan revision and National Environmental Policy Act review processes are filed in the project record.

State Agencies and Officials

- State Historic Preservation Offices of Arizona and New Mexico
- Arizona Game and Fish Department

Local Agencies and Officials

- Cochise, Graham, Pima, Pinal and Santa Cruz Counties

Tribes

O'odham

- Tohono O'odham Nation
- Gila River Indian Community
- Ak-Chin Indian Community
- Salt River Pima-Maricopa Indian Community

Western Apache

- San Carlos Apache Tribe
- White Mountain Apache Tribe
- Yavapai-Apache Nation

Chiricahua Apache

- Fort Sill Apache Tribe (Oklahoma)
- Mescalero Apache Tribe (New Mexico)

Pueblo People

- Hopi Tribe
- Pueblo of Zuni

Yaqui People

- Pascua Yaqui Tribe

List of Preparers

Following are the credentials of Forest Service resource specialists who contributed to the content of this environmental impact statement.

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M.S., Hydrology, University of Arizona
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Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to, or made electronically available to, over 4,000 individuals and groups who specifically requested a copy of the document or commented during public involvement opportunities. In addition, copies have been sent (or in some cases made electronically available) to Federal agencies, federally recognized tribes, State and local governments, and organizations that have requested to be involved in the development of this analysis. These entities include the U.S. Environmental Protection Agency; U.S. Army Corps of Engineers; U.S. Department of the Interior; Federal Highway Administration; Advisory Council on Historic Preservation; USDA National Agricultural Library; State wildlife and fisheries management agencies; county commissions; and local community governments. Due to the number of people, agencies, and organizations, a complete listing has been omitted from this environmental impact statement but is available upon request or on the Coronado Web site at:
http://www.fs.usda.gov/detail/coronado/landmanagement/planning/?cid=fswdev7_018702

Glossary

Alternatives: The different means by which objectives or goals can be attained. One of several policies, plans, or projects proposed for decision making.

Access: In this document, it primarily refers to vehicular access on National Forest Road Systems, but can also refer to the ability to get to a certain area whether on foot or by other means.

Airshed. Subset of air basin, the term denotes a geographical area that shares the same air because of topography, meteorology, and climate.

Ambient: A term used to describe the environment as it exists at the point of measurement and against which changes (impacts) are measured.

Ambient air quality standard: Air pollutant concentrations of the surrounding outside environment that cannot legally be exceeded during fixed time intervals within a specific geographic area.

Aquatic: Growing, living in, frequenting, or taking place in water; in this environmental impact statement, used to indicate habitat, vegetation, and wildlife in freshwater.

Archaeological resource: Place(s) where the remnants (e.g., artifacts) of a past culture survive in a physical context that allows for the interpretation of these remains. Archaeological resources can be districts, sites, buildings, structures, or objects and can be prehistoric or historic in nature.

Biological assessment: A document prepared by or under the direction of a Federal agency; addresses listed and proposed species and designated and proposed critical habitat that may be present in the action area, and evaluates the potential effects of the action on such species and habitat.

Candidate species: Plant and animal species that, in the opinion of the U.S. Fish and Wildlife Service, may become endangered or threatened (FSM 2670 09/23/2005). These are documented in the Fish and Wildlife Service's program advice to its regional directors for preparation of listing packages or documented in a current Federal Register Notice of Review (categories 1 and 2) for threatened or endangered listing.

Carbon monoxide (CO): Colorless, odorless gas that forms when carbon in fuel does not burn completely. Carbon monoxide is a component of exhaust from motor vehicles and engines.

Class I air quality area: One of 156 protected areas such as national parks, wilderness areas, national memorial parks, and international parks that were in existence as of August 1977, where air quality should be given special protection. Federal Class I areas are subject to maximum limits on air quality degradation called air quality increments (often referred to as prevention of significant deterioration (PSD) increments). All areas of the United States not designated as Class I areas are Class II areas. The air quality standards in Class I areas are more stringent than national ambient air quality standards.

Coarse woody debris: Woody material on the ground greater than 3 inches in diameter, including logs.

Code of Federal Regulations (CFR): A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

Concern: A point, matter, or question raised by management or the public that must be addressed in the planning process.

Consultation: Exchange of information and interactive discussion; it refers to consultation mandated by statute or regulation that has prescribed parties, procedures, and timelines (e.g., Consultation under NEPA or section 7 of the Endangered Species Act).

Council on Environmental Quality (CEQ): An advisory council to the President of the United States; established by the National Environmental Policy Act of 1969. It reviews Federal programs for

their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Criteria air pollutants: The six most common air pollutants in the U.S.: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (both PM_{10} and $PM_{2.5}$ – inhalable and respirable particulates), and sulfur dioxide (SO_2). Congress has focused regulatory attention on these six pollutants because they endanger public health and the environment, are widespread throughout the U.S., and come from a variety of sources. Criteria air pollutants are typically emitted from many sources in industry, mining, transportation, electricity generation, energy production, and agriculture.

Critical habitat: Areas designated as critical by the Secretary of the Departments of the Interior or Commerce for the survival and recovery of listed species (50 CFR Parts 17 and 226). Because use of the term has legal implications, the Forest Service limits its use to only those habitats officially determined as critical by the Secretary.

Cultural resources: The remains of sites, structures, or objects used by humans in the past, historic or prehistoric. More recently referred to as heritage resources.

Cumulative effects or impacts: The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant actions, taken place over a period of time.

Desired conditions: Aspirations that set forth desired social, economic, and ecological attributes for the management of National Forest System lands.

Diversity: An expression of community structure; high if there are many equally abundant species; low if there are only a few equally abundant species. The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Draft environmental impact statement (DEIS): The draft statement of the environmental effects of a major Federal action, which is required under section 102 of the National Environmental Policy Act, and released to the public and other agencies for comment and review.

Ecosystem: Spatially explicit, relatively homogeneous units of the Earth that include all interacting organisms and elements of the abiotic environment within its boundaries.

Ecosystem management area: Geographically defined areas that include one or more mountain ranges. These mountain ranges are used to distinguish the ecosystem management area's unique social and ecological issues with appropriate plan components. Also known as "geographic areas."

Effect: Environmental change resulting from a proposed action. Direct effects are caused by the action and occur at the same time and place, while indirect effects are caused by the action, but are later in time or further removed in distance, although still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effect and impact are synonymous as used in this document.

Emissions: Releases of pollutants into the air from a source, such as a motor vehicle or a factory.

Endangered species: Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range; plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

Environmental justice: According to USDA DR5600-002 (USDA 1997), Environmental Justice, minority, minority population, low-income, and human health and environmental effects, are defined as follows:

> "Environmental Justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are

allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment.

Minority means a person who is a member of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

Minority Population means any readily identifiable group of minority persons who live in geographic proximity to, and, if circumstances warrant, migrant farm workers and other geographically dispersed/transient persons who will be similarly affected by USDA programs or activities.

Low-Income Population means any readily identifiable group of low-income persons who live in geographic proximity to, and, if circumstances warrant, migrant farm workers and other geographically dispersed/transient persons who will be similarly affected by USDA programs or activities. Low-income populations may be identified using data collected, maintained, and analyzed by an agency or from analytical tools such as the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty.

Human Health and/or Environmental Effects as used in this Departmental Regulation includes interrelated social and economic effects."

Environmental impact statement (EIS): An analytical document prepared under the National Environmental Policy Act (NEPA) that portrays the potential impacts to the environment of a preferred action and its possible alternatives. An ElS is developed for use by decision makers to weigh the environmental consequences of a potential decision.

Erosion: The wearing away of the land surface by running water, wind, ice, or other geologic agents, including gravitation creep.

Final environmental impact statement (Final EIS): A revision of the draft environmental impact statement that includes public and agency comments on the draft.

Fire regime: Patterns of fire that occur over a long period of time across an appropriately scaled area and its immediate effects on the ecosystem in which it occurs. An ecosystem's natural fire regime is the one that existed prior to human-facilitated interruption of fire frequency, extent, or severity.

Forest plan: see *land and resource management plan*.

Functioning at risk: Watershed condition that exhibits moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

Geology: The scientific study of the origin, history, and structure of the Earth; the structure of a specific region of the Earth's surface.

Greenhouse gas: A gas that absorbs and emits thermal radiation within the lowest layers of the atmosphere. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases that are considered air pollutants are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and chlorofluorocarbons (CFCs).

Groundwater: Water found beneath the land surface in the zone of saturation below the water table.

Guidelines: Components with which a project or activity must be consistent, in either of two ways:

1. The project or activity is designed exactly in accord with the guideline; or
2. The project or activity design varies from the exact words of the guideline, but is as effective in meeting the purpose of the guideline to contribute to the maintenance or attainment of the relevant desired conditions and objectives.

Habitat: The natural environment of a plant or animal, including all biotic, climatic, and soil conditions, or other environmental influences affecting living conditions. The place where an organism lives.

Impaired watershed function: A watershed has impaired function because some physical, hydrological, or biological threshold has been exceeded. Substantial changes to the factors that caused the degraded state are commonly needed to set them on a trend or trajectory of improving conditions that sustain physical, hydrological, and biological integrity.

Impaired water quality: A water body is listed as impaired by the state environmental quality department when it does not support one or more of its designated uses. Examples of designated uses include: recreation, water supply, aquatic life, and agriculture. A water body whose designated use is a water supply must meet higher water quality standards than one designated for agriculture.

Indirect impacts: Impacts that are caused by an action, but are later in time or farther removed in distance, although still reasonably foreseeable.

Irretrievable: A term that applies to losses of production, harvest, or commitment of renewable natural resources.

Irreversible: A term that applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Land and resource management plan: Also referred to as a forest plan, a comprehensive land management planning document prepared by and for the Forest Service under requirements of the National Forest Management Act.

Land management: The intentional process of planning, organizing, programming, coordinating, directing, and controlling land use actions.

Land use zones: Areas defined by the types of uses and desired settings that would occur in them under the revised forest plan. They occur across districts, mountain ranges, and ecosystems but have commonalities that make their overarching land uses similar.

Landscape: The sum total of the characteristics that distinguish a certain area on the Earth's surface from other areas; these characteristics are a result not only of natural forces, but also of human occupancy and use of the land. An area composed of interacting and interconnected patterns of habitats (ecosystems) which are repeated because of geology, landforms, soils, climate, biota, and human influences throughout the area.

Leasable minerals. Oil, gas, coal, phosphate, potassium, sodium, sulphur, gilsonite, oil shale, geothermal resources, and hardrock minerals. A lease grants the exclusive right to explore for, develop, and produce the mineral commodity identified in the lease. Lease stipulations are used to limit or constrain those rights. Lease regulations for the Forest Service are found in 36 CFR 228 Subpart E.

Listed species: Species that are listed as threatened or endangered under the Endangered Species Act of 1973 (as amended).

Locatable minerals: Minerals that may be located and removed from Federal lands under the General Mining Law of 1872 as amended and were not excepted in later legislation. Locatable minerals include, but are not limited to, gold, silver, copper, lead, zinc, platinum, precious gems, uranium, bentonite, and chemical grade limestone.

Maintenance level: The service level of a road is determined by its maintenance level (ML).

ML 2 roads are suitable for high-clearance vehicles, but not passenger sedans.

ML 3 roads are open and maintained for travel by prudent drivers in standard passenger cars. Roads are typically low speed, single lane with turnouts, and spot surfacing.

ML 4 roads provide a moderate degree of user comfort and convenience at moderate travel speeds. Most are double lane and aggregate surfaced, but some roads may be single lane.

ML 5 roads provide a high degree of user comfort and convenience. These roads are typically double lane, paved facilities.

Management approaches: Forest plan content which briefly describes the principal approaches to management that a responsible official is inclined to take. Management approaches do not make commitments of resources. They may illustrate suggestions as to how desired conditions and/or objectives could be met, convey a sense of priority among objectives, or indicate a possible future course of change to a program; partnership opportunities and collaborative arrangements may be discussed, as well as potential processes such as further analysis or inventory.

Management area: The assignment of a management emphasis to particular land areas with the purpose of achieving the goals and objectives of some specified use(s) (e.g., campgrounds, wilderness, logging, and mining).

Migratory: Moving from place to place, daily or seasonally.

Minority: A person who is a member of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.

Minority population: Any readily identifiable group of minority persons who live in geographic proximity to, and if circumstances warrant, migrant farm workers and other geographically dispersed/transient persons who would be similarly affected by USDA programs or activities.

Mitigation: Steps taken to: (1) avoid an impact altogether by not taking a certain action or parts of an action; (2) minimize an impact by limiting the degree or magnitude of the action and its implementation; (3) rectify an impact by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate an impact over time by preserving and maintaining operations during the life of the action; and, (5) compensate for an impact by replacing or providing substitute resources or environments (40 CFR Part 1508.20).

Memorandum of understanding (MOU): Usually documents an agreement reached among Federal agencies.

National Environmental Policy Act (NEPA): An act declaring a national policy to encourage productive and enjoyable harmony between humankind and the environment; promote efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity; enrich the understanding of the ecological systems and natural resources important to the Nation; and establish a Council on Environmental Quality.

National Forest System road (NFS road): A road wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

National Visitor Use Monitoring (NVUM): Systematic process to estimate annual recreation and other uses of National Forest System lands through user surveys. The National Visitor Use Monitoring process includes a survey to develop statistically accurate estimates of national forest visitor use; the survey began in 2000, and will continue indefinitely, during which 20 percent of all national forests will participate in a given year. Use information is gathered in five categories: day use developed sites, overnight use developed sites, general forest areas, wilderness, and viewing corridors.

NO_x: Mono-nitrogen oxides, including nitric oxide (NO) and nitrogen dioxide (NO_2). It is formed when naturally occurring atmospheric nitrogen and oxygen are combusted with fuels in automobiles, power plants, industrial processes, and home and office heating units.

Nonattainment area: A geographic area that does not meet one or more of the Federal air quality standards. Class I areas include international parks, national wilderness areas exceeding 5,000 acres in

size, national memorial parks exceeding 5,000 acres in size, and national parks exceeding 6,000 acres. Class II areas comprise all the remaining areas that are not class I.

Noxious weed: A legal term applied to plants regulated by Federal and state laws, such as plants designated as noxious weeds by the Secretary of Agriculture or by the responsible state official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insect or disease, and being not native or new or not common to the United States or parts thereof.

Objectives: Concise, time-specific statements of measurable planned results that make progress toward or maintain desired conditions.

Old growth: Old growth in southwestern forested ecosystems is different than the traditional definition based on northwestern infrequent fire forests. Due to large differences among Southwest forest types and natural disturbances, old-growth forests vary extensively in tree size, age classes, presence, and abundance of structural elements, stability, and presence of understory. Old growth refers to specific habitat components that occur in forests and woodlands—old trees, dead trees (snags), downed wood (coarse woody debris), and structure diversity. These important habitat features may occur in small areas with only a few components, or over larger areas as stands or forests where old growth is concentrated. In the Southwest, old growth is considered "transitional," given that the location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). Some species, notably certain plants, require "old forest" communities that may or may not have old-growth components but have escaped significant disturbance for lengths of time necessary to provide the suitable stability and environment.

Particulates: Small particles suspended in the air, generally considered pollutants.

Particulate matter: Tiny particles or liquid droplets suspended in the air that can contain a variety of chemical components. Larger particles are visible as smoke or dust and settle out relatively rapidly. The tiniest particles can be suspended in the air for long periods of time and are the most harmful to human health because they can penetrate deep into the lungs. Some particles are directly emitted into the air.

Per capita income: Total income divided by the total population.

Prevention of significant deterioration (PSD): A special permit procedure established in the Clean Air Act, as amended, used to ensure that economic growth occurs in a manner consistent with the protection of public health and preservation of air quality related values in national special interest areas.

Properly functioning condition: Watershed condition that exhibits high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and are functioning properly.

Public scoping: A process whereby the public is given the opportunity to provide oral or written comments about the influence of a project on an individual, the community, and/or the environment.

Record of decision (ROD): A document separate from, but associated with, an environmental impact statement, which states the decision, identifies alternatives (specifying which were environmentally preferable), and states whether all practicable means to avoid environmental harm from the alternative have been adopted and, if not, why not (40 CFR § 1505.2).

Recreation opportunity spectrum (ROS): A framework for defining the types of outdoor recreation opportunities the public might desire, and identifies that portion of the spectrum a given national forest area might be able to provide. The broad classes are:

> **Primitive:** Characterized by essentially unmodified natural environment. Interaction between users is very low and evidence of other users is minimal. Essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is generally not permitted. Very high probability of experiencing solitude, closeness to nature, tranquility, self-reliance, and risk.

Semiprimitive Nonmotorized (SPNM): Characterized by a predominantly natural or natural-appearing environment. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but are subtle. Motorized use is generally not permitted. High probability of experiencing solitude, closeness to nature, tranquility, self-reliance, and risk.

Semiprimitive Motorized (SPM): Characterized by a predominantly natural or natural-appearing environment. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but are subtle. Motorized use is generally permitted; roads are usually unpaved and often primitive. Moderate probability of experiencing solitude, closeness to nature, tranquility, self-reliance, and risk.

Roaded Modified (RM): Characterized by a predominately natural or natural-appearing environment. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but are subtle. Roads are well maintained and provide easy access. Moderate probability of experiencing solitude, closeness to nature, self-reliance, and risk.

Roaded Natural (RN): Characterized by a predominantly natural-appearing environment with moderate evidence of the sights and sounds of other humans. Areas are usually road corridors where people drive to enjoy the scenery and are often on their way to a developed site (such as campgrounds, picnic area, or visitor center). Facilities harmonize with the natural environment, though interaction between users may be moderate to high. Roads are passable by low-clearance vehicles. Roaded natural areas often have rural and urban recreation opportunity settings along them, where there are opportunities to affiliate with other users in developed sites.

Rural (R): Characterized by a modified natural environment. The natural setting is the attraction, but there are many facilities such as buildings, roads, and signs. The sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. Facilities are often provided for special activities (such as campgrounds, organization camps, and summer homes). Opportunity to observe and affiliate with other users is important, as is convenience of facilities.

Urban (U): Characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Characteristics include intensive use, clustered facilities, large numbers of people, and specialized activities. Examples include major recreation sites (such as large visitor centers) and other human needs (such as astrophysical structures and electronic sites). The opportunity to observe and affiliate with other users is very important, as is convenience of facilities.

Riparian: Occurring adjacent to streams and rivers and directly influenced by water. A riparian community is characterized by certain types of vegetation, soils, hydrology, and fauna and requires free or unbound water or conditions more moist than that normally found in the area.

Resiliency: The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

Restoration: The process of assisting in the recovery of an ecosystem that has been degraded, damaged, or destroyed. Ecological restoration focuses on establishing the composition, structure, pattern, and ecological processes necessary to facilitate terrestrial and aquatic ecosystem sustainability, resilience, and health under current and future conditions.

Salable minerals: Also known as mineral materials, salable minerals include common variety mineral materials such as petrified wood, common varieties of sand, rock, stone, cinders, gravel, pumice, clay, most building stone, and other similar materials.

Scoping process: A part of the National Environmental Policy Act process; early and open activities used to determine the scope and significance of the issues, and the range of actions, alternatives, and impacts to be considered in an environmental impact statement (40 CFR § 1501.7).

Sensitive species: Those plant and animal species identified by a regional forester for which population viability is a concern.

Significant: The description of an impact that exceeds a certain threshold level and requires consideration of both context and intensity. The significance of an action must be analyzed in several contexts, such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of impacts, which should be weighed along with the likelihood of its occurrence.

Sky islands: Widely scattered mountain ranges that rise dramatically from the desert floor and contain unique and geographically isolated ecosystems.

Socioeconomic: Pertaining to or signifying the combination or interaction of social and economic factors.

Special areas: Lands that have designations by Congress or another delegated authority. Special areas are designated because of their unique or special characteristics.

Special use permit: A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of Federal or state lands for some special purpose.

Standards: Constraints upon project and activity decision making. A standard is an absolute requirement to be met in the design of projects and activities.

Suitability: The appropriateness of applying certain resource management practices (uses) to a particular area of land. A unit of land may be suitable for a variety of individual or combined uses.

Terrestrial: Of or relating to the Earth, soil, or land; inhabiting the Earth or land.

Threatened species: A plant or animal species likely to become an endangered species throughout all or a significant portion of its range within the foreseeable future.

Unauthorized road: Road that is not a National Forest System road or a temporary road and is not included in a forest transportation atlas.

Vegetation community: A vegetation complex, unique in its combination of plants, which occurs in particular locations under particular influences. A vegetation community is a reflection of integrated environmental influences on the site, such as soils, temperature, elevation, solar radiation, slope aspect, and precipitation.

Viable population: A population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range (or range required to meet recovery for listed species) within the planning area.

Water quality: The interaction between various parameters that determines the usability or non-usability of water for onsite and downstream uses. Major parameters that affect water quality include: temperature, turbidity, suspended sediment, conductivity, dissolved oxygen, pH, specific ions, discharge, and fecal coliform.

Wetlands: Those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include habitats such as swamps, marshes, and bogs.

Wild and scenic river. A river selected for nomination and/or designation through the Wild and Scenic Rivers Act of 1968 for possessing outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values.

Wilderness: Land designated by Congress as a component of the National Wilderness Preservation System. For an area to be considered for wilderness designation it must be roadless and possess the characteristics required by section 2(c) of the Wilderness Act of 1964. These characteristics are: (1) naturalness—lands that are natural and primarily affected by the forces of nature; (2) roadless and having at least 5,000 acres of contiguous public lands; and (3) outstanding opportunities for solitude or primitive and unconfined types of recreation. In addition, areas may contain "supplemental values" consisting of ecological, geological, or other features of scientific, educational, scenic, or historical importance.

Wildland-urban interface: The zone of transition between unoccupied land and human development. The area where houses and private structures meet or intermingle with undeveloped wildland vegetation.

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