United States
Department of
Agriculture

**Forest
Service**

Caribou-Targhee
National
Forest

February, 2003

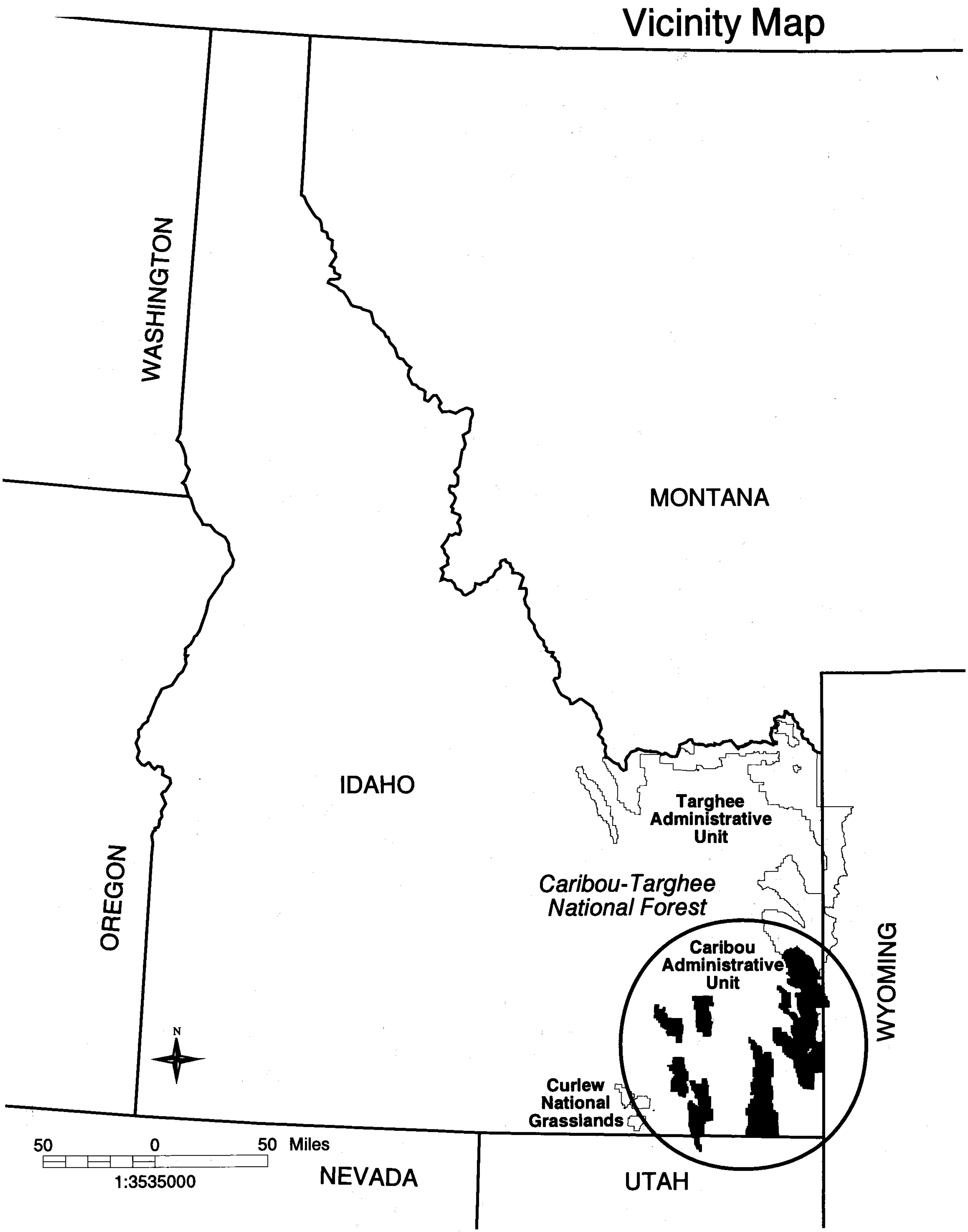
Final Environmental Impact Statement

For the

Caribou National Forest Revised Forest Plan

Volume II: Chapters 4 and 5

Glossary, Literature Cited, Index



Vicinity Map
WASHINGTON
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Targhee Administrative Unit
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Caribou Administrative Unit
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NEVADA
UTAH

Caribou-Targhee NF

Caribou-Targhee NF
1405 Hollipark Dr.
Idaho Falls, ID 83401
(208) 557-5760

Final Environmental Impact Statement

Caribou Revised Forest Plan
Volume II

Contains

Caribou-Targhee NF

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Final Environmental Impact Statement

Caribou Revised Forest Plan
Chapter Four—Environmental Consequences

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Chapter 4 Environmental Consequences

Chapter 4 discusses the environmental consequences and effects of the alternatives. Using Chapter 3 information as the baseline for comparison, each issue is addressed by alternative. The following are major sections described under each issue/resource:

Scope/Scale of Analysis and Analysis Method

This section describes the area in which a specific resource may be affected by the alternatives. Each resource or issue may be discussed at various scales, depending upon the issue. For example, socioeconomic factors may be discussed at the local, county, and state scales. The spatial and temporal scale used to address each issue is identified under each issue or resource. For most issues a brief description of the methods and assumptions used in the analysis are also described. This is done in more detail in Appendix B.

Direct and Indirect Effects

This section describes the **direct effects**, those effects occurring at the same time and place, and **indirect effects**, those effects that occur at a later time or at a different place. These are further categorized by those that are **common to all alternatives** and those which **vary by alternative**.

Cumulative Effects

This section describes the **cumulative effects**, those impacts or effects on the environment that result from incremental impact of an action when added to other past, present and reasonably foreseeable future actions, regardless of what agency or person undertakes the action. Cumulative effects or impacts can result from individually minor, but collectively significant actions taking place over a period of time. The cumulative actions, which are being considered in this effects analysis, are in the next section.

Irretrievable/Irreversible Effects

Irretrievable effects apply to losses of production or commitment of renewable natural resources. For example, some or all of the forage production from an area is irretrievably lost during the time the area is used for a summer recreation event. If the use is changed, forage production can resume. The production loss is irretrievable, but the action is not irreversible.

Irreversible effects apply primarily to the use of non-renewable resources, such as minerals or cultural resources, or to those factors that are renewable over long periods of time, such as soil productivity. Irreversible effects also include the loss of future options.

Cumulative Effects Analysis Process

Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). Cumulative effects must be evaluated along with direct and indirect effects of each alternative. Generally, cumulative effects are considered on a larger scale than the direct and indirect effects. They describe a larger picture across a longer time frame. When analyzing cumulative effects, different temporal and geographic scales are used than for direct and indirect effects. These scales of analysis extend only to where effects can actually be measured (EPA 1997).

Determining the cumulative environmental consequences of an action requires delineating the cause-and-effect relationships between the multiple actions and the resources, ecosystems and human communities of concern. The significance of cumulative effects depends on how they compare with the environmental baseline and relevant resource thresholds. When determining environmental consequences, three principles must be addressed. These are: the additive, countervailing and synergistic effects; a look beyond the life of the action; and addressing the sustainability of resources, ecosystems and human communities (CEQ 1997).

In the case of Forest and planning, the effects analysis "should consider trends and sustainability in the long term while direct impacts are considered less" (EPA Letter, April 6, 2001). In this Final EIS, many of the direct and indirect effects are, in fact, cumulative effects due to the large scale and long time frame. For instance, watershed and riparian effects include impacts and activities across the entire Forest, which encompasses many different watersheds. Those effects and outcomes are disclosed decades into the future. Changes from wildfire, succession, and other activities are described in the previous chapter and are displayed over several temporal scales, up to 100 years in the future. As another example, one of the indicators for the timber program is long-term sustained yield. The current conditions reflect historical treatments and past actions on the Forest. Thus, the effects analysis has generally considered past, present and reasonably foreseeable actions across a very large scale.

In addition, the direct and indirect analysis of effects considers the interactions of many programs on each resource issue indicator. For instance, when determining viability for wildlife species, impacts and risks associated with the timber program are added to livestock grazing, recreation, hunting, etc. Viability is then based on effects of all of those risks together. This is the "incremental effect" included in the definition of cumulative impacts. This integration of resource programs is integral to Forest planning and it makes it difficult to separate cumulative effects from direct and indirect. Whatever the label, the important point is that the effects are disclosed.

Where the previous direct and indirect effects analysis does not adequately disclose cumulative effects, they have been augmented. For instance, if the spatial scale for direct and indirect effects was not adequate for cumulative effects, the cumulative effects discussion identifies the cumulative effects spatial scale. Or, if the integration of resource programs was not considered in direct and indirect, it is addressed in cumulative effects. Cumulative effects are discussed only for those resources impacted by these alternatives.

Much of the information on current activities was obtained from the Caribou Adjacency Analysis (Caribou NF 2001). This analysis details county planning efforts in the Forest's Zone of Influence and identifies specific relationships between federal, state, and county agencies in comprehensive planning efforts. Particular land use management under these various entities is described, including management of scenic byways, wildlife management areas off the Forest, and county zoning plans.

As part of this process, the ID Team identified past, present, and reasonably foreseeable future actions within the analysis area. Chapter 3, Affected Environment and the Caribou Adjacency Analysis (2001) provide more specific information regarding many of the actions shown below.

PAST ACTIONS

- Elk have increased in the analysis area.
- Severe rain events continue to cause flash flooding and down scouring of stream channels and riparian areas.
- Blow down has occurred in forested stands.
- Natural fires have occurred over time within the analysis area.
- Vegetation succession and wildfire suppression have shaped plant communities.
- Insect and disease activity has persisted in forested stands throughout recorded time.
- Drought cycles, most notably in the 1930s and early 1990s have occurred.
- Timber has been harvested on about 22,000 acres in the past.
- Major arterial roads have been constructed over much of the Forest.
- Past mining has occurred in localized areas. Phosphate mining has disturbed about 6,100 acres.
- Hunting and fishing has and continues to occur in the area.
- Recreation use has increased and use patterns and motorized technology has changed.
- Prescribed fire and chemical treatment have affected vegetation.
- Subdivisions have been developed adjacent to the Forest, some in big game winter range.

- Noxious weed invasion, carried by wind, humans, machinery, and animals has occurred.
- Most of the area has been grazed by domestic livestock.
- Wildfires have been suppressed over the past ninety years.
- Management actions have removed, eroded, and compacted soils, and in localized areas have reduced soil productivity, both short- and long-term.
- Paleontological investigations and research have occurred.

PRESENT ACTIVITIES

- Insect and disease activity persists in forested stands. Outbreaks are increasing throughout the west.
- Severe rain events continue to cause flash flooding and down scouring of stream channels and riparian areas.
- Blow down has occurred in forested stands.
- Drought cycles continue to influence vegetation communities.
- Wildfire occurs.
- Coordination with the Shoshone-Bannock Tribe is continuing to insure land management decisions and activities do not affect treaty rights.
- Timber harvest is continuing on the Forest but at a reduced level when compared with the last 15 years.
- Road construction in association with timber harvest continues on the Forest, but like harvest, it is occurring at reduced levels.
- Livestock grazing continues to occur. A total of 258,913 head months currently are permitted for sheep and cattle combined.
- Mining is occurring on portions of the Forest. Phosphate mining accounts for the majority of the mining activity.
- Recreation, including ATVs, snowmobiles, hunting, camping, and wildlife viewing, is available and will continue to increase as the population grows (Idaho Dept. of Parks and Recreation).
- Hunting and fishing continues to occur in the area.
- Access is being restricted to the National Forest by some private landowners.

- The Snake River adjudication is ongoing and could restrict future diversions or affect in-stream flow needs.

- Water quality limited streams have been identified on the Forest.

- All wildfires are being suppressed because of the risk to resource values, private property, and human safety.

- Several important archeological sites have been discovered, and archeologists and other interested individuals, locally, regionally and nationally, are participating in the Passport-In-Time program to document and protect these sites.

- Water developments and water diversions are in place.

- Declining populations of some species of fish and wildlife in the West continue to receive increased Federal and state agency conservation efforts.

- Subdivision development continues adjacent to the Forest, particularly in the Portneuf and Bear River Range areas.

- Prescribed fire is being used as a vegetation management tool on the Forest.

- Noxious weed invasion continues. Cooperative Weed Management Groups have been established for a five-county area in southeast Idaho.

- Small land exchanges are occurring to consolidate land bases and facilitate management.

- A shift in management emphasis and implementation of Best Management Practices has reduced soil impacts from timber harvest, mining, road construction and livestock grazing. Impacts to soils have increased from recreational activities and noxious weed spread. Short- and long-term soil productivity loss continues to occur in localized areas.

REASONABLY FORESEEABLE ACTIONS

- Insect and disease activity will continue in forested stands (Hoffman 2000).

- Vegetation succession will continue in both rangelands and forest lands.

- Severe rain events will continue to cause flash flooding and down scouring of stream channels and riparian areas.

- Blow down will continue to occur in forested stands.

- Drought cycles will continue to influence vegetation communities.

- Wildfires will continue to occur.

- Coordination with the Shoshone-Bannock Tribe will continue to insure land management decisions and activities do not affect treaty rights.

- Rural communities will continue to grow as the population along the Wasatch front expands north. Many adjacent counties are beginning to deal with increased growth in county development plans and other planning and zoning efforts.

- Timber harvest will continue into the future.

- Mining will continue into the future.

- Livestock grazing will continue into the future.

- Hunting and fishing will continue on the Forest.

- State of Idaho Department of Environmental Quality will establish Total Maximum Daily Loads (TMDLs) for all 303(d) water quality limited streams within the next 5 to 10 years.

- $PM_{2.5}$ standards are likely to be set by EPA under the Clean Air Act.

- Use of prescribed fire and wildland fire is expected to increase.

- More water developments will be installed for livestock management.

- Potential listings under the Endangered Species Act may occur within the 10-year plan period if populations of selected species continue to decline. Species, such as the bald eagle, wolf and grizzly bear, will likely be delisted.

- Recreation use will continue to increase into the future and use patterns will change with changes in the population and technology.

- An increase in the use of developed recreation sites and campgrounds is likely as the population increases.

- OHV use is likely to continue to increase due to changes in the population and technological advances.

- The Wasatch-Cache National Forest will complete its Forest Plan revision in the next year.

- Access to the National Forest is likely to be increasingly restricted by private landowners.

- Subdivision development will continue adjacent to the Forest, particularly along the Bear River Range and outside of the Pocatello area (Caribou Adjacency Analysis).

- More interpretive sites will likely be developed during the ten-year plan period.

- Archeological digs and activities will continue.

- Noxious weed invasion will continue into the future; abatement efforts will increase.

- The impacts on soils from recreational activities will increase. The use of prescribed fire may increase, which impacts soil and water resources.

Incomplete and Unavailable Information

The Council on Environmental Quality (CEQ) established implementing regulations for the National Environmental Policy Act (NEPA, 1969). These provisions [40 CFR 1502.22] require that a Federal agency identify relevant information that may be incomplete or unavailable for an evaluation of reasonably foreseeable significant adverse effects in an EIS. If the information is essential to a reasoned choice among alternatives, it must be included or addressed in an EIS.

Knowledge and information is and will always be incomplete, particularly with infinitely complex ecosystems considered at various scales. Jack Ward Thomas, former Chief of the Forest Service, aptly commented that ecosystem management is not only bigger than we think but "bigger than we *can* think." Many of the components of these ecosystems, such as terrestrial and aquatic species, forestlands, rangelands, local and regional economies, and human use demands and patterns interact in ways that elude definition by even the most complex models, when they exist. Issues of species viability, sustainable and resilient ecosystems and economies remain clouded with uncertainty and risk. The ecology, inventory, and management of such systems are still developing disciplines.

However, fundamental ecological relationships and interactions have been well established in the science and a substantial amount of Caribou National Forest specific data and information have been collected, evaluated and used in this analysis. The alternatives and their effects were evaluated using the best available scientific information. While additional information, data collection and interpretation can add greater precision or resolution to understanding the ecological, social and economic relationships, new information is unlikely to significantly change the basic understanding of these relationships and concepts that form the basis for evaluation of effects.

The Forest's revision team will continue to use new information, consult the scientific community, collect more data, and tap new. The public review and comment period has provided new information and insights that were helpful in achieving an effective final Revised Plan. This Plan is based on the concept of adaptive management. Thus, it has been built to be dynamic enough to account for changed resource conditions (e.g. large scale wildfire), new information and science (e.g. taking a systems approach), and changed regulation and policies (e.g. listing of a new species under the Endangered Species Act). Amendments may happen frequently and revision may be required before requirements dictate in response to new or changed conditions. Though new information is welcomed and will be incorporated as it becomes available, no incomplete or unavailable information was deemed essential to a reasoned choice among the alternatives portrayed in this EIS.

Issue 1

Recreation, Access and Scenery Management

Analysis Scale: Forest-wide

Issue:
Forest Plan Alternatives will affect recreation settings and access.

Indicators:

♦**A.1 Recreation Opportunity Spectrum (ROS) shown in percentage of acres in each class.**
Baseline Indicator:
Primitive = 1%
Semi-primitive Non-motorized = 18%
Semi-primitive Motorized = 46%
Roaded Modified = 15%
Roaded Natural = 20%

♦**A.2 Estimated acres open to cross-country motorized use during the snow-free season.**
Baseline Indicator: Approximately 420,215 acres (~40%) of acres

♦**A.3 Motorized and Non-motorized route opportunities**
Baseline Indicator: Approximately 1, 013, 300 acres or ninety-seven percent open to over-the-snow motorized travel.
Baseline Indicator: Approximately 2,033 miles of open, motorized routes of which 950 are open motorized trails.

Effects Common to All Alternatives

DEVELOPED RECREATION

Numerous laws, regulations, and policies govern the management of recreation facilities and use on the National Forest System lands and are incorporated by reference. Management prescriptions for maintaining recreation settings include 4.1, 4.2 and 4.3. The desired ROS settings will be maintained through forest-wide guidelines, as mapped for the preferred alternative.

Given uncertain budgets and deteriorating recreation infrastructure there would be limited expansion of developed recreation sites for all alternatives. As a general policy, recreation funds will be spent on rehabilitation of existing facilities rather than developing new facilities. New development would likely be driven by the need to mitigate resource impacts from recreation uses. An example would be converting a heavily used dispersed area into a developed site with the minimum facilities needed to protect resources or to provide for public health and safety.

DISPERSED RECREATION

Dispersed uses will continue to increase in intensity levels and resource impacts. In all alternatives, dispersed campsite monitoring will indicate the need to add facilities to mitigate resource impacts from recreation uses, or to close an area to such use.

Most of the Forest's trails are open to non-motorized uses, such as hiking, horseback riding and mountain biking. Some trails and areas are closed to mechanized use, such as bicycles, and some areas are administratively closed for public safety.

Existing trails that are a contributing factor or producing adverse impacts on water, soil, vegetation, or wildlife, as identified through monitoring activities, will be a priority for construction, reconstruction, or closure. Through site-specific analysis, designated uses on existing roads and trails could change, including roads that are converted to trails or single-track trails that are converted to wider two-track trails.

SCENERY MANAGEMENT

In all alternatives, the scenic environment will be maintained through adherence to existing Visual Quality Objectives (VQOs); with the exception of phosphate mining. Phosphate mining activities and reclamation may or may not meet the given VQO. In the case where the VQO is not met, the mine operation and reclamation plan will mitigate visual changes to the degree that reclamation methods and economics allow. See Issue 5 of this FEIS for more discussion on mining and scenery.

Each alternative has a different management emphasis; which in turn will have more or less probability of changes to forest scenery. Management prescription categories 5 (timber emphasis) and 8 (concentrated use areas, including phosphate mining) are likely to change or alter the scenery of forest landscapes. Based on this assumption, Table 4.1, compares the potential changes to forest scenery.

- *Table 4. 1 Potential Changes to Forest Scenery by Alternative*

Alternative	Description of Change	% of Forest acres in MACs 5 & 8
Alternative 1	Changes in forest scenery, notably in areas of phosphate mining	23 %
Alternative 2	Changes in forest scenery, notably in areas of phosphate mining	21%
Alternative 3	Changes in forest scenery, notably in areas of phosphate mining	29%
Alternative 4	Some change in forest scenery, notably in areas of phosphate mining and vegetation restoration	12 %
Alternative 5	Some change in forest scenery, with emphasis on building recreation facilities and in areas of phosphate mining	10 %
Alternative 6	Some change in forest scenery, notably in areas of phosphate mining	10 %
Alternative 7	Some change in forest scenery, notably in areas of phosphate mining	10 %
Alternative 7R	Some change in forest scenery, notably in areas of phosphate mining	17 %

Site-specific NEPA analysis will include effects on forest scenery, and will be managed and assessed using the Handbook for Scenery Management (Agriculture Handbook #701). Existing scenic quality will be maintained using prescribed VQOs, and after travel plan revision, using prescribed Scenic Integrity Objectives, or SIOs. For more discussion on scenery and grazing see the Grazing section of the FEIS, for more discussion on timber management and scenery see the Timber Management section of the FEIS.

Alternatives 4, 5, 6, 7 and 7R propose to manage three travel corridors with a Visual Quality Maintenance prescription. This prescription will help maintain forest scenery as viewed from the forest portions of the Bannock Highway (Mink Creek), State Highway 34 (Tincup Highway) and State Highway 36 (Emigration Canyon).

SPECIAL USE AUTHORIZATIONS

Administration of recreation special use authorizations on the forest does not vary by alternative. Existing recreation residences will remain, but new tracts will not be authorized in all alternatives.

ACCESS

In alternatives that close or restrict motorized routes, the decision regarding which routes to close will be decided on a site-specific basis with public involvement. The method of closure would also be decided in this site-specific process.

The Forest will continue to comply with Section 504 of the Rehabilitation Act of 1973, as amended. Off-road vehicle use restrictions apply to all persons, including persons with disabilities. The Act does not require travel plans to make exceptions for such use because a person has a disability.

Direct and Indirect Effects which vary by alternative

A.1 RECREATION OPPORTUNITY SETTING

Management decisions to allocate areas of the CNF to various management prescriptions will affect recreation use. Effects to recreation opportunities are generally due to changes in the setting and/or changes in types and levels of access.

The degree of change to recreation settings, by alternative, is displayed through changes in summer and winter ROS classifications. (See Chapter 3, Recreation, Access, and Scenery Management for a description of the ROS system.) Appendix B provides additional information on ROS mapping for summer and winter and for complete descriptions of the ROS classes.

SUMMER OR SNOW-FREE RECREATION OPPORTUNITIES

Changes in summer, or snow-free ROS settings vary by alternative. Table 4.2 below shows the Summer Recreation Opportunity Spectrum in Acres by alternative.

- *Table 4. 2 Acres of ROS by Alternative.*

Summer ROS*	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Primitive	9,478	9,478	0	9,478	9,478	9,478	9,478	9,478
Semi-primitive Non-motorized	188,872	188,872	10,038	223,369	223,369	430,463	223,369	223,369
Semi-primitive Motorized	477,318	477,318	632,680	442,821	442,821	235,727	442,821	442,821
Roaded Modified	154,644	154,644	187,594	154,644	154,644	154,644	154,644	154,644
Roaded Natural	211,773	211,773	211,773	211,773	211,773	211,733	211,773	211,773

* ROS (Recreation Opportunity Spectrum)

Alternative 3 provides the most opportunity for Semi-primitive Motorized experiences and the most opportunity to increase motorized routes, with the potential to change some recreation settings from semi-primitive to a roaded natural or a roaded modified experience. The emphasis of increasing many types of recreation in Alternative 5 would increase Semi-primitive Non-motorized opportunities in summer and also increase the number of motorized routes in Semi-primitive Motorized areas. Alternatives 4, 5, 7 and 7R increase Semi-primitive Non-motorized opportunities in the Stump Peak, Dry Ridge and northern Bear River Range areas by restricting cross-country motorized use to designated routes. In Alternative 7R approximately 30,000 acres of the increase in SPNM is due to application of Prescription 3.1(a), Non-motorized Recreation and Wildlife Security in the Caribou Mountain and Webster Ridges Ecological Subsection. Alternative 6 creates large areas for summer SPNM opportunities in the eastern portion of the Forest and in the Elkhorn Range, but this alternative also decreases the ease of vehicle access to some Forest areas.

WINTER OR SNOW SEASON RECREATION OPPORTUNITIES

For winter, changes in ROS opportunities are analyzed by available acres of Semi-primitive Non-motorized and Semi-primitive Motorized categories. Most of the Forest is open to all winter uses, such as snow shoeing, skiing and snowboarding and snowmobiling. The table below shows the Winter Recreation Opportunity Spectrum in acres by alternative. Areas open to snowmobile use are shown in the Semi-primitive Motorized category and vary by alternative.

- *Table 4. 3 Winter ROS in Acres by Alternative.*

Winter ROS	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
S-P Non-motorized Acres (%)	38,200 (4%)	38,200 (4%)	23,400 (2%)	70,600 (7%)	79,000 (8%)	82,100 (8%)	54,500 (5%)	59,300 (6%)
S-P Motorized Acres (%)	1,003,885 (96%)	1,003,885 (96%)	1,018,685 (98%)	971,485 (93%)	963,085 (92%)	959,985 (92%)	987,585 (95%)	982,785 (94%)

Alternatives 1, 2, 3 and 4 manage between two and seven percent of the Forest for winter Semi-primitive Non-motorized opportunities, including the cross-country ski trails in Mink Creek and Trail Canyon, and a portion of Mt. Naomi. Alternatives 5 and 6 manage eight percent of the Forest for winter Semi-primitive Non-motorized opportunities, including the east slope of Mt. Bonneville, cross-country ski trails in Mink Creek and Trail Canyon, and a portion of the Mt. Naomi Roadless Area. Alternative 6 also proposes an area in Bailey Creek for semi-primitive non-motorized opportunities in the winter. Alternative 7 manages five percent of Forest for a winter non-motorized experience, including the east slope of Mt. Bonneville and cross-country ski trails in Mink Creek and Trail Canyon. Alternative 7R proposes to manage six percent of the Forest for a winter non-motorized experience, including the east slope of Mt. Bonneville, cross-country ski trails in Mink Creek and Trail Canyon, in the Toponce area, the Bear Creek Area and a portion of Meade Peak. Alternatives Alternative 7R provides non-motorized experiences in areas that receive high use for backcountry skiing, rather than solely in areas that are closed due to big game winter range concerns.

Some areas are open to snowmobile use, but use is restricted to designated routes in big game winter range or for non-motorized experiences. These restricted areas vary by alternative. For instance, Prescription 2.7.1, Critical Big Game Winter Range allows motorized vehicles on designated routes only. Some of the prescription areas, however, do not have designated route through them and therefore are effectively closed. In some alternatives, snowmobile use in recommended wilderness is only allowed on designated routes. Again, if these areas do not have designated routes through them currently, they are effectively closed.

In Alternatives 1, 2 and 3, about nine to twelve percent of the Forest is available to snowmobiles on designated routes. Alternatives 4, 5 and 7 allow snowmobiles on designated routes on about fifteen to twenty-one percent of the Forest. Alternatives 4 and 7 restrict any human access in areas prescribed as winter range on the southeastern slopes of the Bear River Range (See Alternative 7 map in Chapter 2 for areas with Management Prescription 2.7.1e). In Alternative 6 about 314,000 acres would be open to snowmobiles on designated routes (See Alternative 6 map in Chapter 2 for areas with Management Prescription 1.3). Some of these areas currently do not have designated routes identified, however (See the current Forest Travel Plan Map for designated snowmobile routes).

Alternative 7R allows snowmobiles on designated routes on approximately eighteen percent of the Forest. Some of the areas in Alternative 7R that are mapped for big game winter range emphasis that allow snowmobiles on designated routes do not currently have designated routes identified (See the current Forest Travel Plan Map for designated snowmobile routes). Thus an additional 15,000 acres would be effectively closed to snowmobiles since there are no designated routes through some of the Rx 2.7.1 areas.

Most of the alternatives provide snowmobile access through the lower elevation winter range areas to higher elevation snow play areas, with the exception of Alternatives 6 and 7. For the location of these winter range emphasis areas, see the alternative maps in Chapter 2 for areas with Management Prescriptions 2.7.1 and 2.7.2 (Big game winter range).

EFFECTS ON FUTURE SUPPLY AND DEMAND BY ROS CATEGORY

Developed Sites within Roaded Natural Settings

Currently, some developed sites do not meet capacity demands at peak times of the year, which usually occurs on mid-summer weekends and summer holidays. These developed site opportunities are available during weekdays or during the early spring and late fall. Due to projected budgets and resource concerns, developed site capacity on the Forest will not be greatly expanded under any alternative. The demand to use some developed sites within Roaded Natural settings will not be met at all times of the year. Private enterprises on private land could meet some of this demand in the future.

Dispersed Opportunities within Semi-Primitive Settings

The demand for most dispersed recreation activities are currently being met and will continue to be met during most times of the year for the ten-year planning period in Alternatives 1, 2, 4, 5, 7, and 7R.

The demand for Semi-Primitive Non-Motorized (SPNM) opportunity is high in areas close to the city of Pocatello due to a higher population base. The non-motorized forested areas close to the city could be over-crowded during peak times of the year, such as a cross-country ski trails immediately after a weekend snowfall. Summer SPNM acres vary from some opportunity (1%) in Alternative 3 to greater opportunity (40%) in Alternative 6. Although there are no major differences in SPNM winter acres between alternatives, Alternative 6 and 7R offer more non-motorized opportunity in areas that specifically receive backcountry, non-motorized use in winter, such as the backside of Pebble Creek and the Toponce area with the yurt system. Alternative 3 supplies the least amount of SPNM acres and does not address a growing demand for non-motorized settings during the summer and winter. Alternative 3 would not fully meet demand for future non-motorized recreation settings.

Alternative 6 would probably not meet existing and future Semi-primitive Motorized (SPM) recreation demands, with the loss of 735 miles of motorized routes, and 430,463 acres managed as non-motorized during summer. Existing snowmobile use patterns and activities would change, by putting snowmobiles on designated routes on 30 percent of Forest acres that are recommended for wilderness.

The Forest will meet future demand for most recreation opportunities as identified by ROS categories of Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, and Roaded Natural (or Roaded Modified) with 1, 2, 4, 5, 7 and 7R. Alternative 3 has the potential to not meet some SPNM demand. Alternative 6 has the potential to not meet some SPM demand.

A.2 CROSS-COUNTRY MOTORIZED TRAVEL OPPORTUNITIES

Summer cross-country motorized use can have negative effects to vegetation, soil, water quality, and wildlife habitat and can spread noxious and invasive weeds. All alternatives provide for permittee access to specific sites and facilities as identified in the permit and approved operating plan. The table below shows the acres and percent of the Forest open to summer cross-country motorized travel by alternative.

- *Table 4. 4 Acres Open to Summer Cross-country Motorized Travel by Alternative.*

Alternative	Acres Open to Cross-country Motorized Use	Percent of Forest Acres
1	420,215	40%
2	420,215	40%
3	420,215	40%
4	0	0%
5	25,500	2%
6	0	0%
7	22,900	3%
7R	29,400	3%

Alternatives 1, 2 and 3 propose retaining cross-country motorized use on 40 percent of the Forest. Adverse impacts to fisheries and wildlife from this use could reduce angling, wildlife viewing, and hunting opportunities in these areas. These three alternatives do not increase the opportunities for hiking, horseback riding, wildlife viewing, and hunting in non-motorized settings.

Alternatives 5, 7, and 7R restrict cross-country motorized travel on most acres, but allow this type of use on 3 percent of the Forest. In these three alternatives, summer cross-country motorized use in allowed in the Huckleberry area, which has a high road density at the present time. Restricting motorized use to designated routes on an additional 37 percent of the Forest creates new non-motorized areas between designated motorized routes (See the ROS discussion below for the location of these new areas). Alternatives 4 and 6 place all motorized summer use on designated roads and trails. These two alternatives also create additional non-motorized areas between designated motorized routes. Enforcing additional travel restrictions in these alternatives could require more staff time and funding.

In Alternatives 4, 5, 6, 7, and 7R cross-country motorized use to retrieve big game would not be allowed in most areas of the Forest.

A.3 MOTORIZED AND NON-MOTORIZED ROUTE OPPORTUNITIES

Motorized and non-motorized trails can impact resources by increasing sediment delivery to streams and wetlands, they can fragment habitat and can be points of dispersal for noxious and invasive plants. These effects are described in the other issue sections.

The potential for new trails, summer and winter, varies by alternative. Alternatives1, 2, and 3 emphasize building additional motorized trails to meet public demand. Alternative 5 emphasizes maximizing recreation opportunities, which would mean more non-motorized and motorized trails. In these alternatives, new trail opportunities would increase, particularly motorized trails.

The emphasis in Alternatives 4 and 6 is to not to build additional trails. Alternatives 4, 5, and 6 would convert some motorized routes to non-motorized trails in areas with non-motorized Management Prescriptions. Under Alternatives 7 and 7R new motorized routes, including trails, will meet the prescribed OMRD density identified for these alternatives. Given these parameters, new motorized route construction in Alternatives 7 and 7R would be limited over the next ten years. Management emphasis in Alternatives 4, 5, 6, 7, and 7R would limit the construction of new motorized routes within aquatic influence zones, except for limited stream crossings. Revised Forest Plan guidelines for Alternative 7R limit the construction of new motorized routes within existing Semi-primitive Non-motorized areas, based on the ROS map for Alternative 7R.

SNOW SEASON ROUTE OPPORTUNITIES

The emphasis on building new winter trails, both non-motorized and motorized, varies by alternative. The number of miles cannot be determined, because winter trail marking and grooming is dependent on volunteers and user groups. Any new winter trails, non-motorized and motorized, would be subject to site-specific environmental analysis and public involvement.

Alternatives 1 and 2 would maintain the existing winter trail system, with some potential for new routes. Alternatives 3 and 5 emphasize the development of recreation opportunities, including new motorized and non-motorized routes. Alternative 4 and 6 do not emphasis new motorized winter routes, but these two alternatives could allow new non-motorized routes, as well as new designated motorized routes through big game winter range and recommended wilderness areas. Alternatives 7 and 7R would allow new winter motorized and non-motorized routes within the appropriate management prescription areas. Alternative 7R includes the need to identify new non-motorized areas for backcountry skiing, snowboarding, and snow shoeing during the Travel Plan update, which will be initiated within two years of the signing of the Record of Decision.

SNOW-FREE SEASON ROUTE OPPORTUNITIES

Motorized

Alternative 1, 2 and 3 provide the highest number of miles of motorized trails. These three alternatives also have the greatest potential for more motorized routes. To meet the road density standards, the other alternatives would likely require some motorized route closures. Alternative 4 would likely result in 157 miles of motorized route closures to meet density standards. Alternative 5 would likely reduce motorized routes by 177 miles but has the potential for new motorized routes within areas with a motorized prescription. Alternative 6 would close 735 miles of motorized routes, because more areas in this alternative would be managed as non-motorized. Alternative 7 closes 129 miles of motorized routes to achieve lower open motorized route densities, as prescribed, and new motorized routes would be limited in this alternative. Alternative 7R would likely require closing of about 40 miles of motorized routes to achieve lower open motorized route densities, and new motorized routes would be limited in this alternative, also. Alternatives 5 and 7 propose seasonal route closures in some areas. Seasonal route closures will reduce motorized access in some areas during the fall hunting season.

Non-motorized

Alternatives 1, 2, and 3 have 350 miles of non-motorized trail; most alternatives would not change the current use on these trails. Traditionally it has been difficult to find funds to build new non-motorized trails. The most likely source of new non-motorized trails would come from converting motorized routes that are closed for resource reasons to non-motorized trails. Not all motorized route miles proposed for closures in the alternatives would make appropriate non-motorized trails.

Alternatives 1, 2, 3, and 5 provide the greatest amount of motorized routes or the potential for additional motorized routes. Alternatives 4 and 6 provide the greatest potential for new non-motorized trails. Alternatives 7 and 7R close some motorized routes, but these two alternatives still offer a variety of motorized and non-motorized trail settings.

EFFECTS OF OTHER PROGRAMS ON RECREATION, ACCESS, AND SCENERY MANAGEMENT

VEGETATION AND FUELS MANAGEMENT

Vegetation treatments can affect the recreation experience by altering the surrounding vegetation type and structure. These effects are primarily visual, but they can physically affect trails. The trail corridor can be lost with the loss of surrounding vegetation. Mitigation includes relocating trails or installing additional signing in treatment areas.

Vegetation treatments, including timber harvest, thinning, and burning, can temporarily displace recreation use during and following the treatment phase if the area is replanted or re-seeded. Timber harvest, prescribed fire, and other management activities that have the potential to alter recreation settings are required to maintain the desired ROS setting and to meet or exceed the desired VQO. Short-term impacts could be allowed, but the desired recreation setting for the area would be retained in the long-term. Alternatives 1, 2 and 4 have the most potential to alter recreation settings with vegetation changes caused by harvest or fire.

LIVESTOCK GRAZING

Grazing livestock and the evidence of grazing livestock can diminish the recreation experience for many people using trails, roads, and dispersed camping areas. The loss of vegetation from livestock grazing in riparian zones and uplands has the potential to lower scenic quality and adversely affect the recreation setting. Facilities associated with livestock grazing, such as fences, troughs, and corrals can detract or enhance the scenic quality of a landscape, depending on design and condition. Fences, gates, and cattle guards can impede recreation access on roads and trails and for those traveling cross-country on horse, machine, or on foot.

Effects of livestock grazing are similar for all alternatives. Most developed recreation sites are fenced to keep livestock out. Evidence of livestock and livestock facilities can be encountered in most dispersed recreation areas of the Forest. Alternatives 5, 6, 7, and 7R could provide more areas away from livestock grazing, because of reductions in suitable grazing acres and the opportunity to eliminate grazing in some areas in these alternatives. For instance, in alternative 5, all areas in the dispersed camping prescription (Rx 4.3) would be unsuitable for grazing. In Alternative 7R, corridors within those areas are considered unsuitable for grazing. See Issue 4: Livestock Grazing, Chapter 4 and Appendix B for more information.

WILDLIFE, WATERSHED AND THREATENED, ENDANGERED AND SENSITIVE SPECIES MANAGEMENT

Concerns for wildlife and water resources can directly affect recreation opportunities and settings. Facility development can be restricted causing crowding or the unavailability of developed recreation opportunities. Access to some areas could be restricted, especially in riparian areas. Aquatic and watershed concerns could impact dispersed camping sites, since visitors prefer streamside or lakeside camping areas.

Alternatives 1, 2, and 3 would not change the existing recreation facilities or dispersed use. Alternatives 4, 5, 6, 7, and 7R include AIZ standard that could close or alter some dispersed camping areas. Alternative 6 also limits motorized access and recreation development levels with its emphasis on Management Prescription categories 1.3 and 3.1 to provide high quality watershed conditions and improved fish and wildlife habitat.

Road density standards to protect wildlife can concentrate motorized and dispersed recreationists on fewer miles of open travelways, diminishing their sense of solitude, while increasing the sense of solitude for non-motorized, dispersed users. Alternatives 7 and 7R have road density standards that would reduce existing motorized routes

Areas with Management Prescriptions 2.7.1 and 2.7.2 place motorized winter use on designated routes. The realignment of use in these two alternatives has the potential to concentrate use, diminishing the feeling of solitude for snowmobile users. Alternatives 4, 5, 6 and 7 have more 2.7.1 and 2.7.2 areas than the other alternatives.

Recreation benefits from wildlife management could increase hunter, angler, and wildlife viewing satisfaction. This would vary by alternative and by individual expectations. Alternatives 4 through 7R would provide more of a variety of experiences.

Threatened and Endangered species management has the potential to affect recreation management as new guidelines or policies could close habitat areas of concern or limit access or the type of recreation activity. Impacts from could include seasonal or total closures, vegetation treatment to improve habitat, or additional structural improvements. Effects to recreation from TES species management would be the same for all alternatives since law, direction and policy require listed species to be protected.

PHOSPHATE MINING

Mineral activities, especially phosphate mining, can dramatically change the recreation setting and opportunities of and around the affected areas of disturbance. Often, the mining activity displaces all recreation use, because these areas are restricted to public access. Road building can change a Recreation Opportunity Setting from Semi-primitive to Roaded Modified. Effects from active mining include noise and visual impacts. Impacts are long-term and similar for all alternatives. For more detailed information on the effects of phosphate mining on recreation, see Chapter 4, Issue 8—Roadless Area Management and Recommended Wilderness.

Cumulative Effects

In addition to the Caribou National Forest, other outdoor recreation providers in Southeast Idaho include: Wasatch-Cache, Targhee, Bridger-Teton and Sawtooth National Forests, Yellowstone and Teton National Parks, The State of Idaho Department of Parks and Recreation, the Bureau of Land Management, State of Utah Department of Parks and Recreation, US Fish and Wildlife Service and the Bureau of Outdoor Recreation and various private land owners.

These lands and entities provide developed and dispersed recreation opportunities similar to those offered by the Forest. As recreation use increases on the Forest and other public land, both developed sites and dispersed areas will be pushed closer to capacity limits. This increased use of a finite land base will increase user conflict and resource impacts. Use restrictions will have to be implemented to mitigate resource impacts and user conflicts (Executive Order 11644).

The 1998 SCORTP identifies shortages of both motorized and non-motorized recreation opportunities statewide. Over the past decade motorized use on public lands has increased dramatically (See Chapter 3, Issue 1: Recreation, Access and Scenery). A large portion of outdoor recreation occurs on public lands. Motorized and non-motorized opportunities will be affected by future management trends on public lands. Approximately 94 percent of the State of Idaho lies in public ownership (63.7 percent in various federal ownerships and 30.2 percent in State of Idaho lands, 1998 SCORTP).

As use restrictions, especially for motorized users, are being considered in various management plans and as required by public agency policies, the result could be a net loss in motorized opportunities in Southeast Idaho. The USDA-Forest Service manages about 39 percent of the land in Idaho. In 1997, the Targhee National Forest implemented new travel restrictions on 1.8 million acres of that Forest. Almost all of the forest was closed to cross-country motorized travel and motorized roads and trails were closed in order to meet road density standards. In the grizzly bear management units alone, approximately 400 miles of roads or trails were closed and decommissioned. The Sawtooth, Boise, Payette, and Wasatch-Cache National Forests are in the process of revising their Forest Plans. This is likely to result in reduced OHV opportunities on adjacent public lands. All of the alternatives in this FEIS, except Alternative 3, will contribute to this cumulative effect.

The Bureau of Land Management manages about 22 percent of land in Idaho. In 2001 the agency published the National Management Strategy on Motorized Off-Highway Vehicle Use. The strategy does not revise existing Off Highway Vehicle regulations; it is intended to provide consistency of motorized decision-making and management within the agency (BLM, 2001). BLM Resource Management Plans currently being updated within the State of Idaho include the Bruneau, Pocatello/Malad and Craters of the Moon areas (BLM Major Land Use Planning Projects: 2001-2003). These management plans will address several issues, including recreation. How these planning efforts will affect motorized and non-motorized recreation opportunities is unknown at this time.

If the future planning efforts (for BLM and FS) reduce the acres currently open to OHV use, demand for more motorized areas may not be met. Concurrently, if these future planning efforts (for BLM and FS) reduce the acres currently closed to OHV use, demand for more non-motorized areas may not be met. The land base is a finite resource, and forest users will encounter more users and more evidence of use in all areas of the forest as the state population increases.

State and local planners and members of the private sector recognize the importance of outdoor recreation to the tourist industry and to the local economy. As some extractive industries, such as timber and phosphate, enter periods of decline, local communities are turning toward promoting outdoor recreation and tourism. As a result, outdoor recreation becomes more important as a means to diversify the local economy. All alternatives will supply a variety of recreation opportunities. Not all preferences will be accommodated on every acre of the Forest, however.

As tourism grows and the nation's population ages, the demand for more developed recreation settings may increase. Demand could increase sharply for interpretive sites, highly developed campgrounds, expanded cross-country ski facilities and additional trails and trailheads. If more developed sites and facilities are provided to meet demand, natural landscape settings would change from Semi-primitive to Roaded Natural or Rural Recreation Opportunity Spectrum classes. This would decrease the availability of more primitive and secluded experiences.

Irreversible and Irretrievable Effects

No irretrievable or irreversible effects have been identified.

Issue 2

Social and Economic Environment

Analysis Scale: Forest's Zone of Influence

Issue:
Decisions made in the Forest planning process may result in changes to the economic condition of local communities and may influence regional and national markets.
Indicators:

- ♦**EC 1 Changes in jobs**
- ♦**EC 2 Changes in incomes**
- ♦**EC 3 Present Net Value (Financial and Economic Efficiency))**

Economic Environment

The impacts of the alternatives are projected based on Forest Service expenditures and the estimated outputs in five program areas of forest management: recreation/tourism, range, wildlife and fish, timber, and minerals. The output levels used for this analysis represent the projected ten-year average for the planning period. Resource specialists have provided estimates based on the best available information and professional judgment. Additionally, because complete information about the area economies was not available, it was necessary to make a number of assumptions in order to conduct the analysis. Where pertinent to the discussion of effects, some of these assumptions are explained below. More information about the assumptions and processes used to conduct the analysis is provided in Appendix B.

The nine-county scale of analysis represents the region of economic and social relationship and interaction with the Caribou National Forest and its management policies. The analysis model incorporates county level data into the regional scale and generates results at the regional level. Because of this, economic effects at the any smaller combination of counties, or an individual county, or an individual county, were not generated and cannot be inferred from the analysis results.

Because of limited data, the need for modeling assumptions, limits to the model itself, and other factors, the most important use of the results is to *compare relative economic effects among the eight alternatives* analyzed in detail. The results should not be viewed as absolute economic values that accurately portray the infinitely complex economic interactions of the regional economy, but as an estimate of potential effects.

The economic sections of the analysis consider the potential effects to market-related goods and services that are traditionally related to national forests, for which monetary values are available, and for which analysis tools are generally accepted. Passive use values have not been quantified. Therefore, the analysis considers the possible economic impacts of alternatives to timber, livestock grazing, mining, and recreation. It does not consider many other "amenity" values for which monetary values and analysis techniques are less clear. These are mainly comprised of existence, bequest, option and quasi-option values.

"Existence value" refers to the amount an individual would be willing to pay to preserve an old-growth forest stand, for example, even if they had no intention of ever visiting it. "Bequest value" refers to the amount individuals would be willing to pay to preserve the stand for the enjoyment of their children or future generations. "Option value" refers to the premium risk-adverse individuals would be willing to pay in excess of their expected surplus to ensure the future availability of the stand in an environment of uncertainty. "Quasi-option value" arises because there is uncertainty about the future value of a natural resource. Information about the value of the resource is revealed only with the passage of time.

While the passive values associated with the Forest as a whole are no doubt considerable, and the Forest Service recognizes the tremendous value of these kinds of times, they are extremely difficult to accurately measure, particularly on a "per acre" basis, which would be needed in order to make a comparison between alternatives. Analysis methods to quantify them in an economic analysis are not readily available or agreed upon. Such values are described and considered qualitatively within the Social section of this analysis. Additional assumptions and the derivation of value estimates by alternative are included in Appendix B.

Direct and Indirect Effects

EC 3 FINANCIAL AND ECONOMIC EFFICIENCY

Financial and economic efficiency are analyzed in this section. Financial efficiency examines revenue and cost implications from the perspective of the Forest Service. IT could also be said that this is the perspective of the taxpayer. Only those revenues and costs that are recorded in financial records are included in this analysis.

When considering quantitative issues, financial efficiency analysis offers a consistent measure in dollars for comparison of alternatives. This type of analysis does not account for non-market benefits, opportunity costs, individual values, or other values, benefits, and costs that are not easily quantifiable. This is not to imply that such values are not significant or important – but to recognize that non-market values are difficult to represent with appropriate dollar figures. The values not included in this part of the analysis are often at the center of disagreements and the interest people have in forest resource projects. Therefore, financial efficiency should not be viewed as a complete answer but as one tool decision makers use to gain information about resources, alternatives, and trade-offs between costs and benefits.

Economic efficiency examines a broader definition of benefits by including values for national forest uses that are not captured in the marketplace. Many non-market and passive use values are excluded from the economic efficiency analysis discussed here. Some outcomes of effects, such as biological diversity, visual amenities, and some social impacts have no monetary values or costs that have been established by the U.S. Department of Agriculture (USDA) or the Forest Service. While some research studies have explored the development of such values, this analysis has considered these items in a non-monetary fashion in the other resource sections of this EIS. "Willingness-to-pay" values for recreation use are the primary additions over a financial analysis. Estimated market value for meat gained by grazing livestock on public lands is also included. See Appendix B for a description of values used in the economic analysis.

Net public benefit is an important concept in the current regulations for carrying out a Forest Plan revision. Net public benefit is defined as the overall value to the nation of all outputs and positive effects (benefits) minus all the associated Forest Service inputs and negative effects (costs) for producing those primary benefits, whether they can be quantitatively valued or not. Thus, net public benefits conceptually are the sum of this economic analysis plus the net value of non-priced outputs and costs. It is not the result of an economic analysis alone. This concept is the basis upon which the Regional Forester selects an alternative for implementation. Net public benefits are discussed in the Record of Decision for this EIS.

The main criterion used in assessing financial and economic efficiency is present net value (PNV), which is defined as the value of discounted benefits (or revenues) minus discounted costs. A PNV analysis includes all outputs, including timber, grazing, mining, and recreation to which monetary values are assigned. As noted above, the monetary values include both market and non-market values received by the public. In deriving PNV figures, costs are subtracted from benefits to yield a net value. "Future values" (i.e., benefits received in the future) are discounted using an appropriate discount rate to obtain a "present value." The PNV of a given alternative is the discounted sum of all benefits minus the sum of all costs associated with that alternative. PNV, as required by NFMA (36 CFR 219), estimates attempts to condense a large amount of information into a single value. They must be used with caution.

Table 4.5 displays the economic and financial PNV for each alternative. All dollars are in constant dollars with no allowance for inflation. A four percent (4%) discount rate was used over the planning horizon, fifty years (2002-2051). While the planning horizon for the Forest Plan is ten to fifteen years, the PNV analysis considers costs and benefits into the future to account for long-term benefits and discount costs. While the question of the appropriate discount rate to use is debatable, the four percent level is consistent with what is commonly used in the evaluation of public policy. Revenues are not reduced for payments made to states and counties. The reduction of PNV in any alternative as compared to the most financially or economically efficient solution is the economic trade-off, or opportunity cost, of achieving that alternative.

Forest Service budgets have been held constant over the planning horizon. Specific allocation differences between resource programs were made based on each alternative's emphasis. Based on estimated resource outputs by alternative, the level of revenues to the Forest Service changes by alternative.

- *Table 4. 5 Economic and Financial Efficiency (PNV) Estimated by Alternative for 50-Year Planning Horizon, in Millions of Dollars.*

	Alternative Present Value, Million of Dollars								
Value	**Current**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 7**	**Alt 7R**
Forest Service Revenues	277	278	276	280	265	264	262	265	268
Public Benefits	10,273	10,335	10,304	10,382	10,054	10,054	9,992	10,065	10,125
Costs	-441	-441	-441	-441	-441	-441	-441	-441	-441
Financial Net Revenues	-164	-163	-164	-161	-176	-176	-178	-176	-173
Economic Net Benefits	9,832	9,894	9,864	9,941	9,613	9,613	9,552	9,624	9,684

Source: QuickSilver, 2001.

As shown in the table above, the financial PNV (Forest Service revenues minus costs) for the budget level varies little between the alternatives, with Alternative 6 being the most negative at -$178 million to Alternative 3 with a total of -$161 million. All alternatives show negative financial net revenue, indicating that the costs of Forest Service management are estimated to be greater than the revenues taken in over the next fifty years. What appears to make Alternative 3's financial PNV the highest among the alternatives is the higher levels of timber harvest associated with the alternative. Alternatives with preservation emphases, such as Alternative 4 and Alternative 6, show the highest net cost to the taxpayer, because there are fewer agency revenues associated with these emphases while expenses remain the same.

The economic PNV (public benefits minus costs) is positive for all alternatives. The net value ranges from a low $9,552 million for Alternative 6 to a high of $9,941 million for Alternative 3. There is only a four percent difference between the lowest and highest PNV – a difference that may be indistinguishable given estimated accuracies for value and output estimates. The net economic benefits are orders of magnitude larger than the financial gross revenues. This suggests that even with the limited monetary values available for the analysis, society benefits greatly from implementing any alternative fully considered in this document.

DISTRIBUTION ANALYSIS

Distribution analysis is not concerned with costs and benefits directly, or with direct values of resources, but with the equity in which resources are distributed. In this analysis the distribution of potential impacts within the analysis area is considered from several perspectives, including impacts of employment and labor income by alternative and environmental justice. The following analysis is one of the many tools decision makers use to compare the relative difference between alternatives.

EC 1 Changes in Jobs

Direct and indirect effects on planning area jobs and income are generated by changes in recreational uses or the Forest, grazing uses, wood production, mining and manufacturing of phosphate, and agency expenditures (salaries, equipment, contracts). An increase in recreation or timber production may mean an increase in jobs and income to local counties. In addition, if production is decreased in one resource and increased in another, there may be a shifting of jobs from one industry to another.

The following analysis and discussion examines the potential effects of alternatives on employment and labor income opportunities within the analysis area. Although in many cases the differences between the alternatives are relatively small, the impact may be considerable to individual communities, persons, families, or businesses. Within small communities, the loss of a single job can be very important, even though the impact across the analysis area is negligible.

The IMPLAN model was used to estimate complex economic relations in order to approximate the effects of each alternative on the economy as a whole. The IMPLAN model is an input output model that estimates and uses multipliers as a means to estimate the change in direct, indirect, and induced effects as a result of an adjustment in the level of final demand for the goods or services provided by a given sector of the economy. These multipliers also take into account the effects of leakage and imports. (See Appendix B – Economics for additional details and discussion of the model and the analysis.)

The employment and income estimated should be viewed as resource opportunities, not as actual jobs the alternatives will provide. The impacts estimated are based on the assumption of full implementation of each alternative. The actual changes in the economy will depend on individuals taking advantage of resource-related opportunities supported by each Forest Plan alternative. If market conditions or trends in resource use are not conducive to developing some opportunities, the impact on the economy will be different than estimated here.

Leakage occurs when money must be spent outside the analysis area in order to fulfill production needs – if a local restaurant requires seafood for production of dinner, the money spent in Washington or Oregon for fresh salmon is considered a leakage. The money has left the area and is no longer available for circulation within the local area. Imports to the local area are basically someone else's leakage--when non-residents enter the area for a weekend of skiing, all the money spent is considered new money, or an import to the economy.

The following tables estimate the potential impact of each alternative on the employment and labor income in the analysis area. The model estimates how many jobs and associated income would be necessary in each sector to fulfill the resource demand of each alternative within the analysis area. The jobs estimated are not necessary new employment – the tables display the total employment (direct, indirect and induced) needed to produce each alternative's resource output. The current situation highlights the level of employment and income that is currently associated with Forest activities, so the difference between alternatives can be compared to current operations.

It is also important to note that in the IMPLAN model, jobs can be part-time, full-time or seasonal. In this analysis, jobs are not the same as a Full Time Equivalent (FTE). This is important to consider when looking at these job figures that only a portion of an industry related to Forest outputs will be accounted for in the analysis. For example, there are about 350 grazing permittees within the analysis area, but because these operations do not graze solely on Forest Service lands, the analysis only accounts for that grazing output on the Forest and then adds all jobs together. So, the seventy-five jobs represent the employment of the 350 permittes while operating on the Caribou National Forest.

Table 4.6 displays the estimated annual average employment within the analysis area. All alternatives show similar results with a change of 150 potential jobs between the highest and lowest alternatives. Alternative 3 estimates the largest increase from the current situation, and Alternative 6 estimates the only decrease. A portion of the potential increase in the alternatives is due to the assumption of full implementation of all alternatives, while the current situation is reflective of budget and personnel limitations encountered annually by all Forest Service offices.

- *Table 4. 6 Average Annual Employment by Program by Alternative (Decade 1).*

Resource	Alternatives Average Annual Employment, Jobs								
	Current	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Recreation/Tourism	744	869	869	874	844	864	821	865	869
Wildlife and Fish	116	116	116	116	116	116	116	116	116
Grazing	140	110	111	112	95	90	43	100	102
Timber	40	40	37	45	18	18	16	19	44
Minerals	408	408	408	408	408	408	408	408	408
Forest Service Expenditures	470	470	470	470	470	470	470	470	470
Total Forest Management	1,918	2,013	2,011	2,025	1,951	1,968	1,875	1,978	2,009
Percent Change from Current	--	5%	5%	6%	2%	3%	-2%	3%	5%

Source: MIG 2001.

Recreation/tourism outputs associated with mechanized travel tend to elevate job opportunities due to associated rentals, repairs, and outfitter/guide expenditures. Wood products include the logging and initial sawmill activity associated with Forest Service timber. Impacts appear to be fairly small, because the planning area lacks sizable milling or processing capabilities. Economic impacts associated with timber that is transported to mills outside the analysis area for processing is not included in the employment number beyond associated logging. Potential grazing outputs, as shown in the Livestock Grazing section of this FEIS, were measured in AUMs and were estimated based on current livestock management efforts that show a "worst case scenario." So the AUMs used in total are likely lower than would be seen permitted in each allotment. Minerals and Wildlife and Fish are not expected to change in any alternative and remain constant throughout the alternatives. Forest Service budgets are held constant throughout the analysis, but the emphasis on program spending changes depending on the theme of each alternative, so employment changes depends on management differences. For a complete discussion of outputs associated with each alternative, refer to individual resource sections in this FEIS.

Outputs used for Alternative 3 increase mechanized travel opportunities, limit the decline in grazing, and has the highest ASQ for timber harvest. These three outputs when converted to employment create the highest level of job opportunities. Alternative 6 would produce the lowest level of resource outputs under full implementation as it has the lowest level of mechanized recreation, lowest commercial timber outputs, and the fewest AUMs. Alternative 7R falls in the middle with a potential moderate decline in AUMs, a decline in timber output, and moderate increase in recreation and tourism opportunities. The emphasis in restoration without limitation due to Roadless increases the logging potential for both commercial and non-commercial activities.

EC 2 Changes in Income

Table 4.7 displays the estimated annual average labor income within the analysis area by resource program. The labor income differences by alternative show similar trends as the employment figures with limited variability between alternatives. The largest increase is within the recreation/tourism program and the minerals program is stable. Alternative 3 estimates the largest change, three percent, from the current level of labor income associated with the higher outputs and activities. Alternative 6 estimates the only decline in labor income from current with the lowest levels of outputs in grazing, timber, and recreation/tourism. Alternative 7R shows a two percent increase in labor income from the current situation with increases in recreation/tourism opportunities.

- *Table 4. 7 Labor Income Estimated by Program by Alternative (Decade 1)*

	Alternatives Average Annual, in Millions of Dollars								
Resource	**Current**	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 7**	**Alt 7R**
Recreation	11.6	13.3	13.3	13.4	13.0	13.3	12.5	13.3	13.3
Wildlife and Fish	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Grazing	2.3	1.9	1.9	1.9	1.6	1.5	0.7	1.7	1.7
Timber	1.1	1.1	1.0	1.2	0.4	0.4	0.4	0.5	1.0
Minerals	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6
Forest Service Expenditures	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4
Total Forest Management	52.9	54.2	54.1	54.4	52.9	53.1	51.5	53.4	53.9
% Change from Current	--	2%	2%	3%	0%	0.4%	-3%	1%	2%

Source: MIG 2001.

PAYMENTS TO THE STATE

25% Fund Payments

All counties within the Caribou National Forest analysis area have selected stable payments under the secure payments legislation. Because of this, there will be no changes in payments to states as a result of any of the alternatives.

PILT (Payment in Lieu of Taxes) Payments

PILT is a federal revenue-sharing program designed to compensate local governments for the presence of tax-exempt federal lands within their jurisdictions. The formula takes into account such factors as other forms of revenue sharing, acreage, and population. These payments are made directly to counties and may be used for any purpose. PILT payments can be and recently have been limited by Congress through the appropriation process. Congress has not appropriated sufficient funds to fully pay counties since 1994. PILT payments will not change significantly between alternatives.

Social Impact Analysis

The social impact analysis is a systematic effort to identify, analyze and evaluate social impacts of the planning alternatives on the individuals and social groups both inside and outside the analysis area. This analysis is another tool used to describe the potential impacts of alternatives to decision makers and the public. Estimating potential impacts to social groups is a difficult task as people and their relationship to the Forest can and do change. The social component of this analysis also includes impacts of social groups outside the analysis area, people who are interested in specific issues of National Forest management, or may visit the Forest in the future. The values and interests of these groups are considered, as well as the values and needs of communities surrounding the Forest.

The following analysis describes potential impacts on social values and interests as they related to the significant issues and each alternative. Potential impacts related to other concerns were also raised by individual counties (Rine, 2001). A narrative is provided which describes effects to concerns raised by individual counties that were voiced during information gathering for this analysis. Affects to American Indians in the vicinity are also discussed.

RESOURCE USES, ECONOMICS

Throughout the scoping and the planning process grazing, minerals, timber harvest, and recreation access were issues people, local and non-local, were concerned about. In most cases, there are concerns on both sides of these issues. The alternatives, as highlighted in the economic analysis, show little difference between them at the analysis area scale, but often the social impacts can be more significant, especially for specific areas or projects.

People who depend on a supply of outputs from the Forest will likely be interested in alternatives that maintain or increase their opportunities. The lifestyle and social linkages related to timber and grazing dependent enterprises and communities would likely be negatively impacts by Alternatives 4, 5, 6, and 7. Such commodity reductions would not likely have any measurable effect on the larger, more economically diversified counties, such as Bannock, Bonneville, and Bingham counties.

On the other side, many people are interested in curtailing resource extraction and access to the Forest in order to protect resources and provide more primitive, non-motorized opportunities. Because Alternative 6 was developed to manage the Forest with emphasis on preservation and less active restoration, there is likely national support among individuals and groups interested in larger ecological issues and preservation. At a more local level, individuals and groups may support different alternatives that offer protection for or access to their special places or "backyards" at various levels. Depending on where people have an interest, each alternative addresses needs and values differently. For specific outputs or activities associated with each alternative, see the individual resource sections in this FEIS.

ENVIRONMENTAL JUSTICE – CIVIL RIGHTS

A specific consideration of equity and fairness in resource decision-making is encompassed in the issue of environmental justice and civil rights. As required by law and Title XI, all federal actions will consider potentially disproportionate effects on minority or low-income communities. Potential impacts or changes to low-income or minority communities within the study area due to the proposed action should be considered. Where possible, measures should be taken to avoid negative impacts to these communities or mitigate the adverse affects.

As highlighted in this section of the FEIS, few minorities reside within the study area, and no communities are considered low-income. While there are individual households that are either minority or low-income, the communities as a whole are not.

The Shoshone Bannock tribe is within or surrounding the analysis area. Throughout the planning process, consultation between the Tribe and the Caribou NF has occurred. Further consultation has occurred during the preparation of the Final EIS and Revised Forest Plan. The Tribe was also interviewed during development of the Caribou Adjacency Analysis (Rine, 2001). Based on information received during tribal consultation, changes to alternatives and to the Forest Plan have been made. Continued consultation and consideration of communities and the Tribe will be conducted as project level analyses are completed under this Forest Plan.

RESOURCE MANAGEMENT

People have also expressed varied points of view and preferences for different styles of resource management. Those who would like to see ecosystems actively managed for continued resource use would favor Alternatives 1, 2, and 3. Those who prefer alternatives that strike more of balance between restoration and traditional commodity production may prefer Alternatives 4 and 7R. People who prefer resources to be allowed to function naturally with little interference from humans would want to see Alternative 6 implemented. All alternatives offer a mix of active management with some resource outputs and continued use by humans. Depending on an individual or group's interest or value of the Forest, each alternative reflects different social values.

Cumulative Effects

Continued population growth will further reduce the available open space in urban areas adjoining the Forest. The demand for opportunities to recreate and escape urban environments will increase. As urban areas expand, more and more people will experience lifestyle changes as rural environments recede. With expanding urban influences, residents are likely to experience higher levels of government influence in their lives, possibly exacerbating currently existing resentments about governmental restrictions and their impacts. The growing list of management actions and restrictions on activities and uses within the Forest required by the Endangered Species Act, the Clean Water Act, and other Federal legislation may also serve to frustrate local governments who believe that too much local control has been lost.

The Wasatch-Cache National Forest is concurrently revising its Forest Plan. Changes in management direction that impose limits on historical activities, goods, or services could cumulatively affect these types of uses throughout the region from southeast Idaho south through the Wasatch Front. Examples include motorized opportunity, grazing, and timber harvest. This could affect local communities that have traditionally depended on these uses for enjoyment and as part of their rural culture and values.

Additionally, the Roadless Area Conservation Rule affects the management of roadless areas on all National Forests. The combined effect is the likely implementation of additional use and management constraints on thousands of additional acres of public land. For many people who seek to preserve the resource values they most treasure, these protective designations and rules are a welcome change to current forest management policies. Cumulatively, however, many of these changes may limit the region's capacity to satisfy the public's desire for some types of recreation opportunities and other uses. Individuals who prefer motorized recreation opportunities may become frustrated as the opportunities they seek become more limited throughout the region. This would be more likely under alternatives 7, 5 and 4, in order of likely effect, with restriction or elimination of summer cross-country motorized use. It would be most pronounced in Alternative 6, which eliminates summer motorized use, and restricts winter snowmobile use to designated routes only on approximately one third of the Forest, including recommended wilderness.

It will become increasingly difficult to provide the same wide range of recreation opportunities that have been available in the past as the number of users increase, and uses on the already limited space available are further constrained. Those with economic ties to forest resources will likely find it increasingly difficult to locate alternative sources on neighboring public lands. Growing numbers of forest users, conflicting objectives, and the need to ensure ecosystem health and sustainability will require compromise on the part of all involved to resolve differences. Increased strain between user groups in many cases may be unavoidable.

The total or partial loss or reduction of National Forest grazing privileges and/or permitted livestock numbers or seasons of use, can cumulatively affect the stability of traditional values and income opportunities of the local rural areas and individual ranches. For example, if a local permittee loses a grazing privilege that accounts for 35 percent of the time needed to sustain livestock production for the overall ranching operation, then the loss of AUMs needs to be made up elsewhere. The purchase of additional hay or feed, reducing the base livestock herd, and acquiring pasture elsewhere are possible mitigations. If the 35 percent cannot be made up, and the base herd is reduced to a level where it is no longer profitable, or the costs for additional hay or pasture are too expensive or not available, then the ranch or portions of the ranch could be sold. Ranches and farms sold in this region have typically been sold for housing units, seasonal home sites, or subdivisions.

Because ranching operations and allotment conditions vary across the Forest, it is difficult to determine how each individual allotment or permittee will respond to implementation of the standards, guidelines, and prescriptions associated with each alternative. For example, a change in AUMs can be the result of changes in the numbers of livestock, the permitted season, or a combination of both. As demonstrated by actual past situations on the Forest, the loss of AUMS can sometimes be mitigated while improvements in other non-commodity resources, such as fish and wildlife resources, and values occur.

Irreversible and Irretrievable Effects

In general, because none of the alternatives vary significantly from the current situation, it is unlikely that any alternative would result in irreversible or irretrievable impacts within the analysis area. At a smaller scale, however, in local rural counties and communities, and to individuals involved directly with possible changes in Forest resource management, some impacts may be irretrievable. Some dependent enterprises could be adversely impacted by loss of traditional goods and services. For example, timber mill closures in southeast Idaho were a trend of the late 1980s and 1990s as timber supply decreased, particularly on the adjacent Targhee National Forest with the end of the accelerated lodgepole salvage program in early 1990s.

Irretrievable impacts may result from estimated reductions in livestock grazing opportunity from changed utilization standards. These relative reductions are displayed elsewhere in Chapter 4. The relative impact would be expected to correspond to the relative change in available forage. Again, impacts would mostly be observed at the local level or even the enterprise or individual permittee scale. At the Forest Plan scale, it is difficult to consider these specific localized effects, because the scope of the analysis looks no closer than the analysis area economy. General outputs can be estimated, but this analysis cannot attempt to predict which individuals will have use of grazing permits, which companies will bid successfully on timber sales, or which outfitter-guides will receive permits to operate.

Ecosystem Disturbances

- ♦EM.1 Insect Hazard Rating: A relative rating with a range of: Low; Low-Moderate; Moderate; Moderate-High; and High
- ♦EM.2 Wildfire Hazard Rating - A relative rating with a range of: Low; Low-Moderate; Moderate; Moderate-High; and High for forested and non-forested vegetation
- ♦EM.3 Fire Condition Class – a relative rating of the potential for uncharacteristically large wildfires with a range of: Low; Low-Moderate; Moderate: Moderate-High; and High.

Analysis Methods

EM 1, 2 INSECT AND WILDFIRE HAZARD RATINGS

HUMAN INDUCED DISTURBANCES

For the purpose of comparing alternatives, this analysis assumed that all acres affected by fire would be prescribed fire. Since it is difficult to predict where and when wildfire events will occur, these were not factored into Alternatives 1 through 7. In these alternatives, when wildfire events occur, site-specific analyses would likely scale back or abandon proposals for prescribed fire. In Alternative 7R, however, wildfire events would not be compensatory, they would be additive. Thus, this analysis considers only the probable human-induced treatments. In Alternative 7R, it is likely that additional acres will be affected by wildfire.

Forest Plan alternatives that propose lower human-induced disturbance levels result in higher amounts of vegetation in mature and old age-classes, which, in turn, produce higher insect hazard and wildfire hazard ratings. The amounts of human-induced disturbance proposed by the alternatives for the first decade are shown in Table 4.8.

The number of acres to be treated over time, particularly for prescribed fire, generally is constant on a decadal basis for the alternatives. The effects described for those treatments will apply to all decades, although the amount of acres may vary slightly.

- *Table 4. 8 Estimated Acres Affected by Human-Induced Disturbance Annually Short-Term (10 Years).*

Disturbance	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt7R
Forested Vegetation								
Regeneration Harvest	1,680	1,670	2,190	710	650	490	730	1,030
Prescribed Fire	0	1,740	1,990	4,990	1,920	2,080	2,680	3,500[1]
Non-Forested Vegetation								
Prescribed Fire	13,000	7,750	10,000	7,750	7,080	6,000	7,980	4,000
Total Acres	**14,680**	**11,160**	**14,180**	**13,450**	**9,650**	**8,570**	**11,390**	**8,530**

[1]In alternative 7R, this includes mechanical treatments also.

A Vegetation Dynamics Development Tool (VDDT) model was used to estimate the long-term (100 years) acreage of regeneration harvest and prescribed fire for forested vegetation. The acres affected by human induced disturbance were derived from the model. For a comprehensive explanation of the assumptions and inputs of the model, see Appendix B, Issue 3, Forested Vegetation. For this comparison of alternatives the acreage provided by VDDT modeling, for both wildfire and prescribed fire acreage figures, was combined for Alternatives 2 through 7, because, as previously stated, it is not possible to predict when a wildfire might occur. No prescribed fire treatments were scheduled to occur in forested vegetation in Alternative 1. Prescribed fire treatments in non-forested vegetation in all decades were assumed to be constant. The amounts of human-induced disturbance predicted to occur in each alternative over the long-term are shown in Table 4.9.

- *Table 4. 9 Estimated Acres Affected by Human-Induced Disturbance Annually Long-Term (100 Years).*

Disturbance	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Forested Vegetation								
Regeneration Harvest	770	720	850	410	390	250	290	640
Prescribed Fire	0	1,690	2,060	3,770	2,250	1,640	2,410	3,100
Non-Forested Vegetation								
Prescribed Fire	13,000	7,750	10,000	7,750	7,080	6,000	7,980	4,000
Total Acres	**13,770**	**10,160**	**12,910**	**11,930**	**9,720**	**7,890**	**10,680**	**7,740**

INSECT AND WILDFIRE DISTURBANCES

The hazard ratings for forested vegetation were derived from the amount of conifer and quaking aspen in mature and old age classes on the Forest predicted by VDDT. As discussed in Chapter 3, both insect and wildfire hazards increase as forested stands mature. For instance, stress from competition for resources influences insect outbreaks and dispersal. More mature stands tend to have higher wildfire hazards because of dead and down trees, ladder fuels, and other factors affecting fire dispersal. (See the *Forested Vegetation Diversity* section of this chapter for a complete discussion of the vegetation groupings and VDDT.)

The conifer percentage was added to the quaking aspen percentage, and a mean was calculated for percentage of forested vegetation in mature and old age classes. The Hazard ratings were applied on the following basis: Low, 49 percent or less of the forested vegetation in mature and old age classes; Low-Moderate, 50-59 percent; Moderate, 60-69 percent; Moderate-High, 70-79 percent; and High when 80 percent or more of the forested vegetation on the Forest is predicted to be in mature and old age classes.

Insect hazard ratings were not predicted for non-forested vegetation. The Wildfire Hazard for non-forested vegetation is based on the predicted amount of sagebrush with greater than 15 percent canopy cover on the Forest. As described in Chapter 3, when sagebrush canopy cover density reaches about 15 percent, the understory is impacted from competition for moisture and nutrients. This competition increases as the canopy of the sagebrush closes in. As the canopy closes, it is easier for fire to travel from sagebrush plant to sagebrush plant, thereby increasing the fire hazard. (See the *Non-forested Vegetation* section of this chapter for a complete discussion of the methods used to predict the amount of sagebrush with greater than 15 percent canopy cover on the Forest.) The Wildfire Hazard rating was applied on the following basis: Low, 44 percent or less; Low-Moderate, 45-49 percent; Moderate, 50-54 percent; Moderate-High, 55-59 percent; and High when 60 percent or more of the non-forested vegetation on the Forest is predicted to be in the greater than 15 percent canopy cover class. These categories are different than those used for forested vegetation predominantly because fire behaves differently in non-forested stands than in forested stands (Betz, pers. comm. 2003).

In order to evaluate the overall hazard presented by wildfires on the Forest, the Wildfire Hazard ratings for both forested and non-forested vegetation were combined to provide an inclusive ranking for the Alternatives. The Low to High ratings were converted to a numeric rating system and then a mean was calculated to portray the rating for each Alternative. Because the Forest contains approximately equal amounts of forested and non-forested vegetation, the combined numeric ratings are weighted nearly evenly.

EM3: FIRE CONDITION CLASS

The Fire Condition Classes (Schmidt, *et al*, 2002) describe the vegetation composition and structural conditions, as they currently exist, thereby serving as generalized wildfire hazard ratings. The risk of losing key ecosystem components due to wildland fire increases from Condition Class 1, which has the lowest risk, to Condition Class 3, which has the highest risk.

Condition Class percentages for the Alternatives were developed based on changes in the amount of vegetation on the Forest as described below. First, the vegetation classifications used by the Forest were converted into standard Fire Groups and Fire Regimes as described in Appendix B, Issue 3: Disturbances and Chapter 3, Fire Management. Next, the changes in vegetation predicted due to the alternatives were converted into changes in fire condition classes.

Because treatments were not predicted for all vegetation types, the analysis assumes that several fire groups would be unaffected. The largest of these types makes up only one percent of the upland vegetation on the Forest. These small, scattered stands may receive incidental effects when larger, neighboring stands are disturbed; thus, disturbance is generally expected to keep pace with succession. Thus, the percentage of Condition Class 3 in the Woodland, Limber Pine, and Xeric Douglas-fir fire groups in Fire Regime III, and Mesic Englemann Spruce/Subalpine Fir fire group in Fire Regime V would remain constant. All treatments were assumed to take place in Condition Class 3 vegetation since those would be the most mature stands. The detailed assumptions and calculations are described in detail in Appendix B, Issue 3: Disturbances.

Effects Common to All Alternatives

Disturbances change the environment in a number of predictable ways. For instance, disturbances reduce standing biomass, soil organic matter, and ground cover; recycle nutrients; control plant species composition and structure; allow establishment of shade-intolerant species; and directly influence wildlife habitat (Pickett and White, 1985; Kozlowski and Ahlgre, 1974; Agee, 1993; Loope and Gruell, 1973; Kilgore, 1973; Walter, 1977; Heinselman, 1978; Swanson, 1978; Parsons, 1978).

In general, the risk of insect epidemics and uncharacteristically large wildfires rise as the proportion of mature and old vegetation increases. Additionally, some synergy exists between an increased insect hazard and an increased wildfire hazard for forested vegetation (Rogers, 1996). Mortality from insects contributes to higher fuel loads, which in turn, increases the probability of uncharacteristically large wildfires that are resistant to fire control efforts (Amman, 1978; Atkins, *et al,* 1999). According to many experts, such wildfires can increase soil erosion, which can increase the probability of several undesirable effects, including a reduction of long-term soil productivity, poor watershed conditions, and a potential decrease in the proper functioning of riparian zones (Thomas and Mealey, 2002; Bisson et al. 2002). Restoring vegetative conditions to those approximating their historic condition would reduce the risk of insect epidemics and uncharacteristically large wildfires, yielding long-term benefits to riparian zones and watershed conditions (Barrett, 1994).

Trade-offs arise between actions (human induced disturbances) and no action (risking natural disturbances). Initiating disturbance generally results in environmental consequences perceived to have negative effects in the short-term, while taking no action avoids the negative consequences in the short-term but may produce a greater amount of the same effects if a natural disturbance occurs. For example, prescribed fire will produce particulate matter (*i.e.,* smoke) that can adversely affect air quality in the short-term, but can reduce the risk of an uncharacteristically large wildfire that produces a greater amount of particulates in the future. Likewise, regeneration harvest results in a certain amount of watershed disturbance but can reduce the risk of insect epidemics and large wildfires that may have larger and more longer-lasting effects on watershed conditions. Thus, both initiating human-induced disturbance and taking no action have environmental consequences.

Human-Induced Disturbance

Human-induced disturbances include but are not limited to harvest and fire, which includes both, prescribed fire, and wildland fire use. In general, these ecosystem management activities have approximately the same kinds of environmental effects as natural disturbance processes, but may differ in intensity or amount (Oliver and Larson, 1996). For example, prescribed fire usually produces similar environmental effects as wildfire but may be less intense. Prescribed fire is often planned for ignition during the spring or autumn rather than during more critical fire weather, which typically results in less intense fires with less severe effects. Regeneration harvest generally produces environmental effects comparable to natural events resulting in regeneration but may produce higher amounts of effects. According to Oliver and Larson (1996), "most silvicultural manipulations are mimics of natural disturbances and other processes." This does not imply that human-induced disturbances are perfect substitutes for natural disturbances. For example, the soil compaction that may occur when using wheeled vehicles while harvesting timber has no parallel in nature. Nor is a clearcut identical to a stand-replacing wildfire.

Perhaps the most significant human-induced disturbances that do not appear to have a natural or historic analog are roads and trails constructed to provide access to the Forest, which typically have altered hydrologic run-off and sediment production rates within Forest watersheds. In addition, invasive plants can increase as a result of ground-disturbance from activities, such as any timber harvest, road construction and maintenance, fire use, or wildfire.

The various environmental consequences of human-induced disturbances associated with the alternatives are disclosed in the appropriate sections of this document; for example, the effects of smoke from prescribed fire are discussed under *Air Quality*, and they will not be displayed here.

Direct and Indirect Effects, which vary by Alternative

EM 1: INSECT HAZARD RATING

The Insect Hazard was derived from the amount of conifer in mature and old age classes predicted by VDDT (See the *Forested Vegetation Diversity* section of this chapter for a complete discussion of the vegetation groupings and VDDT). In the next decade, all alternatives would result in 80 percent or more of the forested vegetation in the mature and old age classes. Thus, all alternatives rank high in the insect hazard rating (Table 4.10). In the short term, all alternatives result in a high risk to resources from insect epidemics.

Some variation occurs among Alternatives in the long-term however, with the Insect Hazard rating ranging from Low-Moderate to Moderate-High (Table 4.11). A lower ranking represents those conditions which carry a lower risk from insect epidemics than Alternatives ranked higher. Alternative 4 has a lower risk due to the higher, sustained level of probable treatments and resulting smaller percentage of the forested vegetation in the old and mature age classes. This difference is very minor, however. For Alternatives 1, 2, 3, 7, and 7R a moderate insect risk is predicted. Alternatives 5 and 6 would result in a greater risk over the long-term to resources from insect epidemics (Table 4.11).

- *Table 4. 10 Estimated Insect Hazard in the Short-Term (10 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Mature and Old Conifer	81%	80%	80%	80%	82%	83%	81%	80%
Forested Vegetation Insect Hazard	High	High	High	High	High	High	High	High

- *Table 4. 11 Estimated Insect Hazard in the Long-Term (100 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Mature and Old Conifer	68%	64%	64%	59%	75%	76%	63%	67%
Forested Vegetation Insect Hazard	Mod	Mod	Mod	Low-Mod	Mod-High	Mod-High	Mod	Mod

EM 2: WILDFIRE HAZARD RATING

FORESTED VEGETATION

In the short-term, Alternative 7R has the lowest wildfire hazard rating of any alternatives. It was rated as moderate because it places a greater emphasis on treating quaking aspen than the other alternatives. Alternatives 1 through 7 were assigned a Wildfire Hazard of Moderate-High and rated behind Alternative 7R. (Table 4.12)

- *Table 4. 12 Forested Wildfire Hazard in the Short-Term (10 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Mature and Old Conifer	81%	80%	80%	80%	82%	83%	81%	80%
Mature and Old Aspen	68%	73%	73%	72%	73%	74%	76%	54%
Forested Vegetation Wildfire Hazard	Mod-High	Mod-High	Mod-High	Mod-High	Mod-High	Mod-High	Mod-High	Mod

In the long-term, however, Alternative 4 would result in the lowest wildfire hazard with a Low-Moderate rating due to the higher treatment levels likely to meet DFCs for the alternative. Alternative 7R was next with a Moderate rating. Alternatives 1, 2, 3, 5, and 7 were all rated Moderate-High. Alternative 6 would result in a High Wildfire Hazard rating since it would likely have the lowest levels of forested vegetation treatments in order to meet the DFCs of the alternative (Table 4.13).

- *Table 4. 13 Forested Wildfire Hazard in the Long-Term (100 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Mature and Old Conifer	68%	64%	64%	59%	75%	76%	63%	67%
Mature and Old Aspen	82%	82%	82%	53%	71%	84%	76%	55%
Forested Vegetation Wildfire Hazard	Mod-High	Mod-High	Mod-High	Low-Mod	Mod-High	High	Mod-High	Low-Mod

Non-Forested Vegetation

As discussed previously, the hazard rating is based on the amount of sagebrush in the greater than 15 percent canopy cover class. Tables 4.14 and 4.15 display the long and short term hazard ratings by alternative. The alternatives having the highest probable treatment levels in order to meet alternative DFCs result in a lower hazard rating. Because all non-forested treatment levels were held constant throughout the 100 years, this analysis does not consider the emphasis put on wildland fire use in Alternative 7R. It is likely that both the short and long-term outcomes for Alternative 7R would result in more acres "treated" by wildland fire, both planned and escaped. This may result in lower hazard ratings for Alternative 7R. Due to the unpredictable nature of wildland fire, more specific information is not available, nor is it necessary to compare alternatives.

- *Table 4. 14 Non-forested Wildfire Hazard in the Short-Term (10 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Sagebrush in >15% Canopy Cover	35%	48%	43%	48%	50%	53%	48%	58%
Non-Forested Vegetation Insect Hazard	Low	Low-Mod	Low	Low-Mod	Mod	Mod	Low-Mod	Mod-High

- *Table 4. 15 Non-forested Wildfire Hazard in the Long-Term (100 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Sagebrush in >15% Canopy Cover	36%	62%	51%	62%	65%	70%	61%	80%
Non-Forested Vegetation Insect Hazard	Low	High	Mod	High	High	High	High	High

Overall Wildfire Hazard Rating

The Wildfire Hazard ratings for both forested and non-forested vegetation were combined to give a ranking of the overall hazard on the Forest (Table 4.16, below). In the short-term Alternatives 1 and 3 are ranked first, having the lowest relative risk of uncharacteristically large wildfires. Alternatives 2, 4, and 7 are ranked second, and Alternatives 5, 6, and 7R have the greatest risk of uncharacteristically large wildfires. As discussed previously, this analysis does not consider wildland fire in Alternative 7R. If wildland fires occur on a significant number of acres, this could reduce the wildfire hazard rating for Alternative 7R, in the long and short-term.

- *Table 4. 16 Overall Wildfire Hazard in the Short-Term (10 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Forested Vegetation Wildfire Hazard	Mod-High	Mod-High	Mod-High	Mod-High	Mod-High	Mod-High	Mod-High	Mod
Non-forested Vegetation Wildfire Hazard	Low	Low-Mod	Low	Low-Mod	Mod	Mod	Low-Mod	Mod-High
Ranking	1	2	1	2	3	3	2	3

Over the long-term Wildfire Hazard generally rises, primarily due to the "High" rating for non-forested vegetation in many of the Alternatives. Once again, Alternative 1 is ranked first, resulting in the lowest risk from wildfires. Alternatives 2, 3, and 4 are ranked second, followed by Alternative 7R and then Alternatives 5 and 7. Alternative 6 has a High rating for both forested and non-forested vegetation and therefore has the greatest Wildfire Hazard rating in the long-term (Table 4.17).

- *Table 4. 17 Overall Wildfire Hazard in the Long-Term (100 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Forested Vegetation Wildfire Hazard	Mod-High	Mod-High	Mod-High	Low-Mod	Mod-High	High	Mod-High	Low-Mod
Non-forested Vegetation Wildfire Hazard	Low	High	Mod	High	High	High	High	High
Ranking	1	2	2	2	4	5	4	3

EM3: FIRE CONDITION CLASS

The Fire Condition Classes (Schmidt, *et al*, 2002) describe the vegetation composition and structural conditions, as they currently exist, thereby serving as generalized wildfire hazard ratings. The risk of losing key ecosystem components due to wildland fire increases from Condition Class 1, which has the lowest risk, to Condition Class 3, which has the highest risk.

The Condition Classes were ranked for each Alternative on an relative scale with "1" being the most favorable ranking and carrying less risk from wildland fire, and higher numbers being less favorable with greater risk from wildfire. A lower ranking indicates that the vegetative conditions carry a lower risk from uncharacteristic wildland fire and the loss of key ecosystem components than an alternative that ranked higher.

In the short-term the percentage of the Forest in Condition Class 3 ranged from 48 to 71 percent. Alternative 1 has the lowest risk of uncharacteristic wildland fire and loss of key ecosystem components. Alternative 3 was ranked second followed by Alternatives 2, 4, 5, 6, and 7 in the third category. Alternative 7R has the greatest risk of uncharacteristic wildland fire considering treatments only (Table 4.18). As described previously, however, Alternative 7R also emphasizes the use of wildland fire and those acres are not considered in this analysis. Thus, if wildland fire use plans are completed and wildland fire can be used, acres in fire condition class 3 would be less in Alternative 7R than shown here. In addition, in

Alternative 7R, fuel reduction in the wildland urban interface is a management emphasis. Thus, acres in fire condition class 3 would also be distributed differently across the Forest. In more remote areas such as the Caribou Range and Deep Creek/Clarkston areas, fire hazards would be higher unless wildland fire is used. In areas such as the foothills around Pocatello or near subdivisions along the Bear River Range Front, the acres in fire condition class 3 would be reduced due to fuel reduction projects.

- *Table 4. 18 Vegetation in Condition Class 3 in the Short-Term (10 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Vegetation Condition Class 3	48%	61%	55%	63%	62%	67%	62%	71%
Ranking	**1**	**3**	**2**	**3**	**3**	**3**	**3**	**4**

Over the long-term the percentage of the Forest in Condition Class 3 exhibits little change, as shown in Table 4.19, below. The percentage of the Forest in Condition Class 3 ranged from 45 to 73 percent. Again, Alternative 1 was ranked first with the lowest risk from wildfire and Alternative 3 maintains its second ranking. Alternatives 2, 4, and 7 were ranked in the third tier. Alternatives 5, 6, and 7R ranked in the fourth category representing the greatest amount of the Forest in Condition Class 3 at risk of uncharacteristic wildland fire and the loss of key ecosystem components.

- *Table 4. 19 Vegetation in Condition Class 3 in the Long-Term (100 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Condition Class 3	45%	67%	55%	67%	73%	73%	67%	72%
Ranking	**1**	**3**	**2**	**3**	**4**	**4**	**3**	**4**

SUMMARY OF WILDFIRE HAZARD AND CONDITION CLASS

In order to give an overall rating of the risk of wildfire, the Wildfire Hazard and Condition Class ratings were combined, as shown in Tables 4.20 and 4.21 below.
In the short-term there is only a small distinction in the estimated risk from wildfire between Alternatives. Alternatives 1 and 3 are ranked first above Alternatives 2, 4, 5, 6, 7, and 7R that carry greater risk from wildfire. Over the long-term more differences emerge among Alternatives. Alternative 1 is ranked first, Alternatives 3 and 4 fell into the second tier, and Alternatives 2, 5, 6, 7, and 7R are placed in the third category which has a greater long-term risk to resources from wildfire. If the projected levels of disturbance are not achieved, however, then the Insect Hazard and Wildfire Hazard would likely be "High" for all Alternatives, and the percentage of the Forest in Condition Class 3 would be expected to increase.

- *Table 4. 20 Estimated Wildfire Hazard and Percentage of Vegetation in Condition Class 3 in the Short-Term (10 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Forested Vegetation Wildfire Hazard	Mod-High	Mod-High	Mod-High	Mod-High	Mod-High	Mod-High	Mod-High	Mod
Non-forested Vegetation Wildfire Hazard	Low	Low-Mod	Low	Low-Mod	Mod	Mod	Low-Mod	Mod-High
Condition Class 3	48%	61%	55%	63%	62%	67%	62%	71%
Ranking	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**2**

- *Table 4. 21 Estimated Wildfire Hazard and Percentage of Vegetation in Condition Class 3 in the Long-Term (100 Years).*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Forested Vegetation Wildfire Hazard	Mod-High (40)	Mod-High (40)	Mod-High (40)	Low-Mod (20)	Mod-High (40)	High (50)	Mod-High (40)	Mod (30)
Non-forested Vegetation Wildfire Hazard	Low (10)	High (50)	Mod (30)	High (50)	High (50)	High (50)	High (50)	High (50)
Condition Classes 3	45%	67%	55%	67%	73%	73%	67%	72%
Ranking	**1**	**3**	**2**	**2**	**3**	**3**	**3**	**3**

Cumulative Effects

Cumulative effects consider past, present, and reasonably foreseeable actions. As described in the Introduction to Cumulative Effects at the beginning of this chapter, a Forest Plan necessarily looks at a larger, and longer time-frame, picture. The distinction between cumulative and direct and indirect effects is not as clear as with projects at a smaller scale. For this issue and its indicators, past actions and their effects on the resources are described in Chapter Three, Affected Environment. The direct and indirect effects section describes long-term impacts from reasonably foreseeable actions. The synergistic effects that the entire forest management program would have on the insect and wildfire hazards on the Forest are also described in the direct and indirect effects. Thus, this cumulative effects section concentrates on the combination of off and on-Forest disturbances and how they would affect insect and wildfire hazards.

As discussed in Chapter 3, most of the habitats and communities on the Forest have evolved with fire. The frequency and intensity varies by vegetation type and is displayed in Chapter 3, Fire. Historically, vast acres of shrub and timber were burned each year. There is evidence to suggest that Native Americans used fire to herd game and provide feed for their stock. According to fire records, in the first half of the 20th century, an average of 30 million acres burned each decade in the west (Wildland Fire Statistics, 2002). Before that, settlers report seeing vast acreages of blackened land (Gruell, 1983). With the settlement of the west, came the notion that these fires were bad. Then, following the great fires of 1910, however, the Forest Service began its campaign to suppress wildfires.

Instead of fire, settlers employed plows, railroads, saw blades, sluice boxes, cattle, sheep, and other accoutrements as "disturbance agents." Settlers converted many acres of rangelands to farm ground, primarily in the lower elevations while ranchers grazed horses, cattle and sheep on the less productive sites. At the turn of last century, livestock grazed uncontrolled throughout the forest, introducing a new disturbance on what would later become the National Forest System lands (See Chapter 3, Issue 4: History of Livestock Grazing on the Caribou). High levels of livestock grazing reduced the fine fuels needed to carry many wildfires.

Together, these actions reduced the wildfire disturbances on NFS lands. Timber harvest replaced fire as the major disturbance on the Forest but it did not affect an equivalent number of acres. This has led to an increase in older age classes of timber, higher density sagebrush stands, and the other vegetation conditions described in Chapter 3. These changes have occurred throughout the West. According to the Interior Columbia River Basin Ecosystem Management Project scientific assessments, forests generally are more mature, less diverse and carry higher fire risks. Rangelands on NFS lands generally have denser shrub canopies and less vigorous understories. Much of the lower elevation sagebrush/grasslands have been converted to farms, cities, and urban sprawl (ICBEMP 2000).

Despite the changes, wildfires are on the rise. In the past decade, 10,000 to 20,000 lightening caused wildfires have occurred each year. Human caused fires, range between 80,000 to 140,000 fires caused each year. More fires are occurring adjacent to residential areas as subdivisions are built along public land boundaries. Again, these changes are happening west-wide (Wildland Fire Statistics, 2002).

EM1: INSECT HAZARD RATING

The risk of insect activity affecting lands adjacent to National Forest lands is considered to be low, because the vast majority of adjacent land is shrubland or agricultural lands, rather than forested vegetation. Where the Caribou National Forest is adjacent to forested vegetation, for example in the Bear River Range where the Wasatch-Cache National Forest is contiguous, an increased risk in insect epidemics could affect adjacent lands.

As discussed in Chapter 3, there is a synergistic relationship between insect hazard and wildfire hazards. As trees mature and become old, or are growing in very dense "thickets" competing for sunlight and nutrients, the risk from insect epidemics increases. In turn, the dead and dying trees catch fire more easily and result in hotter, more intense fires. This progression has been demonstrated in recent years. In the past, these dead and dying trees, along with healthy surrounding trees, were harvested in grand-scale salvage operations. On the Targhee National Forest, vast acreages of mountain pine beetle killed lodgepole was salvaged in the 1960's and 1970's. Interestingly, the North Fork fire, which was in part responsible for the fires of Yellowstone in 1988, started in one of the beetle-killed drainages that had not been salvage harvested. This demonstrates the relationship between insect epidemics and wildfire.

While concentrated areas of insect infestations vary in space and time, current stand ages favor endemic levels of insects across large areas (Caribou-Targhee Monitoring and Evaluation Reports, 2000-2001; 1997-1999). From 1999 through 2001, bark beetles killed 26,486 trees on 5,749 acres of the Caribou (Hoffman and Mocettini, 2002). This is only approximately one third of one percent of the forested acres per year. In the life of the plan, new beetle infestations would be affecting approximately 5 percent of the forested acres. This is more than the amount of timber harvest planned in any of the alternatives.

A summary of aerial detection surveys across 25 million acres in the Intermountain Region (NFS lands in Utah, Nevada, and parts of Idaho, Wyoming, and California), including intermixed state and private lands was compiled in 2000. In this area, spruce beetle killed more trees than any other insect in the year 2000. While infestations were largest in southern Utah, significant mortality also occurred on the Bridger-Teton and Wasatch-Cache NF, to the east and south of the Caribou. Scattered spruce mortality occurred on the Targhee, north of the Caribou (Hoffman, 2001).

Mountain pine beetle activity was most prominent in central Idaho, however it has been affecting high elevation stands in the Centennials, north of the planning area. In recent years, mountain pine beetle has begun to vigorously attack the whitebark pine stands on the Targhee, to the north. According to a report by the Boise Field Office of the Forest Health Protection branch, aerial surveys in the Centennials showed that from 1995 through 1999, about 120 trees were affected by bark beetles. In 2000 and 2001, however, that increase to 1,500 trees and 6,810 trees, respectively (Thier, 2002). Generally, "mountain pine beetle infestations often persist until the suitable host is depleted" (Amman et al. 1995 in Thier, 2002). In this case, the suitable host is large diameter whitebark pine. It is unknown if these same problems are occurring on the Caribou, but it is likely given the similar vegetative structures. Mountain pine beetle outbreaks have been detected in lodgepole stands on the Bridger-Teton NF (Hoffman, 2001).

Douglas-fir beetle activity was observed on the Caribou and surrounding forests. On the Bridger-Teton, however, activity actually decreased in the year 2000. Western spruce budworm heavily defoliated several thousand acres on the Targhee NF. Several foliage diseases of aspen were observed at endemic levels throughout the survey area, including southeastern Idaho. Douglas-fir needlecast and other diseases were noted in the conifer stands on the Caribou (Hoffman, 2001).

Cumulatively, insect activity is lower across the Intermountain Region than many other years. For instance, Douglas-fir beetle activity was highest in the early 1980's while other beetle activity spiked in the mid-1990's. Defoliation by Douglas-fir tussock moths and western spruce budworm peaked last in the early 1990's and mid-1980's, respectively. During those two most recent spikes, however, significantly more trees were killed than the spikes occurring in the 1960's (Hoffman, 2001).

While it is not readily evident that the forests in the Intermountain Region are headed towards an insect epidemic, it appears numbers are on the rise. In smaller pockets, such as the Centennial mountains, these outbreaks may be quite significant. Activities which move stands closer towards their historic ranges of variability should stem this tide (Hoffman, 2000 in Thier, 2002). Of the alternatives in this FEIS, alternatives 5 and 6 would have the fewest treatments to combat insect and diseases. Alternative 7R has the greatest potential to keep insects at endemic levels since it has a greater component of forested vegetation treatments on unsuitable lands and allows greater flexibility in treatment type and design. While other alternatives may allow more treatment, they would likely have different desired outcomes. Overall, the alternatives in this revision would not significantly alter the cumulative insect and disease risks in the Intermountain Region.

EM2: WILDFIRE HAZARD RATING

An increased risk of wildfires is possible where fires could move from National Forest lands to adjacent lands and *vice versa*, however. The long-term wildfire hazard is expected to be moderate to high under most alternatives. The higher hazard reduces the opportunities to suppress wildfires when they are smaller and easier to control. A higher fire hazard increases the risk that large wildfires resistant to fire control efforts will spread to adjacent lands. Additionally, more development in interface communities adjacent to wildlands may result in more human-caused ignitions on National Forest lands and adjacent private lands.

As discussed above, wildfire is again on the rise and public land management agencies are attempting to deal with the issues. The National Fire Plan and Cohesive Strategy, described in Chapter 3, Fire Management, directs land management agencies to reduce fuels in wildland urban interface areas, among other things. On the Caribou and the surrounding lands, this has become a significant issue. The Forest, Bureau of Land Management, and State Department of Lands are working on fire use plans and other ways of increasing the sustainability and resiliency of public lands. To the north, the Targhee portion of the Forest has recently completed a Fire Use Guidebook to enable them to allow wildland fire to burn in specific areas of 3 ecological subsections (Carroll, 2002). The Upper Snake River District of the BLM has initiated a Fire Management Plan Amendment in order to address wildland fire (BLM, 2002). To the east, the Bridger-Teton National Forest is planning to amend its Plan in regards to fire management. The Wasatch-Cache Plan Revision, currently in progress, is addressing wildland fire use and fuel reduction in the urban interface (Scott, pers. comm. 2002).

Many of the counties and landowners surrounding the Caribou are addressing and/or concerned about the wildland fire risks. These include Rich and Cache Counties in Utah which are addressing limiting potential fire hazards by increasing defensible space adjacent to the Forest (Caribou Adjacency Analysis, Rine 2001). Franklin County Idaho's development code includes standards for mitigating wildfire danger (Franklin County Comprehensive Plan and Development Code). Oneida County, Idaho is particularly concerned about the increasing development along the wildland urban interface and the lack of adequate fire protection. The county will use its development code to require firebreaks and provision for an adequate water supply for fire suppression. Lincoln County, Wyoming is requiring that subdivisions provide adequate fire protection to meet national standards. Other counties are also concerned about wildland fire risks and think the Forest should conduct salvage sales and prescribed burns to reduce those risks. The city of Pocatello is including wildland urban interface fire prevention in its new land use plan. Other government and private efforts to reduce wildfire hazard are being analyzed and/or implemented (Caribou Adjacency Analysis, Rine 2001).

Cumulatively, these efforts should reduce the risk from uncharacteristically large wildfire in the wildland urban interface. Because of the magnitude of changes in the vegetation, however, it is unlikely that fire risks will be significantly reduced outside of these areas. All of the alternatives in this FEIS provide for wildland fire use, some more than others. Alternatives 4 through 7R provide more direction for allowing wildfires to burn within certain parameters. Alternatives 7 and 7R focus on fuel reductions in the urban interface as well as wildland fire use in the more remote landscapes. Alternative 7R has the most flexibility and with increases in staff and/or budget could further address wildfire hazards. While the conditions on the Caribou will continue to contribute towards wildland fire risks, none of the alternatives are expected to significantly alter the cumulative trends.

Irreversible and Irretrievable Effects

No irreversible effects are associated with human-induced disturbance by any of the proposed alternatives.

A rise in the long-term hazard rating could produce an irretrievable effect. Therefore Alternatives 6 and 7 are likely to produce an irretrievable insect hazard. All alternatives except Alternative 4 are likely to generate an irretrievable wildfire hazard for forested vegetation, and all alternatives, except Alternatives 1 and 3, are likely to produce and irretrievable wildfire hazard for non-forested vegetation.

No irreversible effects are associated with the insect hazard or wildfire hazard presented by any of the proposed alternatives.

Forested Vegetation Diversity

Analysis Scale: Forest-wide

Scale of Analysis:

All forested vegetation was analyzed forest-wide and includes approximately 583,700 acres identified as forested, excluding intermingled forested private lands and intensively developed areas (active mines, etc.).

Indicators:

- **EM.4 Percent of conifer and aspen acres in mature and old condition classes in year 100.**
- **EM.5 Percent of acres in mature and old condition class in Year 10.**
- **EM.6 Number of decades to reach desired range of future conditions.**

Analysis Assumptions and Methods

The key to a healthy ecosystem is structural and functional diversity across forested landscapes (Franklin and Forman, 1987). The achievement of multiple-use objectives dictates that Forest managers maintain biological diversity. A diversified forest provides a greater array of products, biological organisms, and greater inputs to soil organic matter and nutrients. A variety of vegetative conditions may represent climax vegetation in the absence of disturbance or display conditions of an earlier ecological status that are directly related to the amounts and types of disturbance.

Forested vegetation was analyzed by calculating the acres remaining in mature and old age classes after 10 years and 100 years for each management alternative, factoring in succession and a set of management and natural disturbances, and comparing these acres to a desired range of future conditions (DRFC). The DRFC call for a fairly even distribution of size classes on forested lands and were assigned in terms of a distribution of acres by structure class and species composition, focusing on the mature and old age classes. Forested vegetation treatment alternatives and assumptions are described in Chapters 2, 3 and 4 of the FEIS, the Forest Plan and Process Paper BP5.

As a first step, analysis units were developed for each alternative, made up of forested land with different characteristics that could be estimated, modeled and then projected through time to analyze change. Structural stage (size class and canopy closure) and cover type were the two characteristics used to develop the basic modeling analysis units, which were then overlaid with management prescription categories to produce acres by alternative.

Modeling effects on forested vegetation was accomplished using the Vegetation Dynamics Development Tool (VDDT). VDDT is a computer model that provides a framework for examining the role of various disturbance agents and management actions in vegetation change, was used to project changes in vegetation structure and composition over time (See Appendix B for a discussion of the model).

The treatment/disturbance scenario acres were used as goals and constraints to help determine disturbance probabilities arrayed against natural succession in the model. Disturbance probabilities were developed for prescribed fire, wildfire that escapes suppression, tree harvest, and insect activity. The model was used to project each alternative, by decade, one hundred years into the future, to determine status of progression towards Desired Ranges of Future Conditions (DRFCs).

The ecosystem management principle of sustainability implies our ability to define and measure the status of ecosystems now, as compared to their historic range of variability. The concept of "historic range" recognizes that ecosystems are dynamic in nature and that disturbance and change is a common component. The primary model for vegetation dynamics is that an analysis unit of vegetation will change over time, succeeding through a set of stages if undisturbed or if disturbed naturally or by management. Each set of stages is called a pathway.

Successional pathways were developed for each cover type for use in the VDDT model. These pathways summarize scenarios in vegetation dynamics which define assumptions about undisturbed succession, natural and management disturbances by assigning probabilities to the successional pathway. A set of natural and management probabilities were developed for each alternative and applied to the analysis units within the model through successive runs. Outputs from each run were analyzed for its proximity to the desired future condition. Additional information on pathways and probabilities can be found in Appendix B.

The VDDT model projects a variety of outcomes from the different alternatives applicable to forested vegetation dynamics. The primary output is the acres of the different forest vegetation structures by cover type, displaying how forested vegetation changes over time with and without the application of management actions. This output is then compared to desired future conditions established for the cover type by alternative.

In the VDDT (Vegetation Dynamics Development Tool) modeling and analysis included in the discussions throughout Chapter 4, the numbers for acres of timber harvest, road miles, percent of acres by structural stage, and acres treated by decade are all best estimates, based on the latest available information. The modeling and analysis conducted for this EIS were intended and designed to indicate relative differences between the alternatives, rather than predict absolute amounts of activities, outputs or effects.

Direct and Indirect Effects

EM 6 NUMBER OF DECADES TO REACH DRFC

INTRODUCTION

The Desired Range of Future Conditions for forested vegetation varies by alternative and by vegetation type. These DFRCs are detailed in Chapter 2, Alternatives and shown in Chapter 3, Table 3.29. For this issue, the indicators used to measure the effects between alternatives are the percent of acres of forested vegetation, by cover type, in the mature/old age condition class, after one hundred years. The narrative below further describes the desired characteristics of certain conifer and aspen vegetation.

- *Table 4. 22 Attainment of Forested Vegetation Desired Range of Future Conditions by Alternative.*

Alternative	Attainment of DRFC in Years
Alternative 1	Not Applicable
Alternative 2	100 Years
Alternative 3	50-100 Years
Alternative 4	100 Years
Alternative 5	100 Years
Alternative 6	Inside Recommended Wilderness – Natural Outside Recommended Wilderness – 100 Years
Alternative 7	100 Years
Alternative 7R	100+ Years

Desired Outcome for Conifer Cover Types for Alternatives 2 through 7R

Douglas fir and Limber pine types (DF & LBP) - Early forest stages are usually dominated by aspen, lodgepole pine, limber pine and eventually Douglas-fir or limber pine. Early forest stages are maintained by disturbance processes, including fire, harvest, insects, and disease. Douglas-fir, with or without associated species (conifer and aspen), is dominant among the abundance and persistence of mature and old forest. The majority of fires are non-lethal underburns. Lethal fires, which kill the overstory, occur where topography funnels wind. Dominant Douglas-fir and limber pine are resistant to low intensity fire. Endemic insect and disease populations are present. Patterns, usually consisting of open forest, are within the historical range.

Mixed conifer and lodgepole pine types (MC & LPP) - Early forest stages are dominated by lodgepole pine with a component of subalpine fir, Douglas-fir, and aspen. Most fires are mixed severity on a fifty to eighty-year frequency. The lethal fire regime has a 100- to 300-year return interval. Insect and disease populations are endemic, and early successional stages are maintained through these endemic populations, vegetation management, including harvest, and fire. Stands are distributed in large mosaics of age classes.

Engelmann spruce and subalpine fir (ES & SAF) - Early forest stages are dominated by lodgepole pine and aspen, with a component of Engelmann spruce, subalpine fir and Douglas-fir. Most fires are mixed severity on a fifty-to eighty-year frequency. The lethal fire regime has a 100- to 300-year return interval. Insect and disease populations are endemic, and early successional stages are maintained through these endemic populations, vegetation management, including harvest and fire. Stands are distributed in large mosaics of age classes.

Desired Outcome for the Aspen Cover Type for Alternatives 2 through 7R

Quaking aspen (AS) - Quaking aspen continues in its role as an early seral species when associated with conifers. The majority of fires are non-lethal underburns at twenty- to fifty-year intervals, which kill some small conifers, slowing the development of shade-tolerant understories. Patterns are within historical ranges with fire and vegetation management practices influencing structural class distribution and patterns across the landscape.

EM 4, 5 PERCENT OF ACRES IN MATURE AND OLD AGE CLASS, YEARS 10 AND 100

Tables 4.23 and 4.24 show model output for acres of mature and old forested vegetation, by cover type, by alternative, at Year 10 and Year 100.

- *Table 4. 23 Percent of Acres in Mature and Old Age Class, by Cover Type by Alternative in Year 10.*

Alternative	Douglas-fir and Limber Pine	Mixed Conifer and Lodgepole Pine	Engelmann Spruce and Subalpine fir	All Conifer[1]	Aspen
Alt 1	85%	79%	80%	81%	68%
Alt 2	85%	76%	79%	80%	73%
Alt 3	83%	74%	81%	80%	73%
Alt 4	83%	77%	81%	80%	72%
Alt 5	85%	79%	75%	82%	73%
Alt 6	85%	80%	73%	83%	74%
Alt 7	85%	79%	73%	81%	76%
Alt 7R	78%	81%	82%	80%	64%

1 This column represents the mean of columns 2, 3, and 4.

- *Table 4. 24. Percent of Acres in Mature and Old Age Class by Cover Type by Alternative in Year 100.*

Alternative	Douglas-fir and Limber Pine	Mixed Conifer and Lodgepole Pine	Engelmann Spruce and Subalpine fir	All Conifer[1]	Aspen
Alt. 1	67%	71%	52%	68%	85%
Alt. 2	61%	67%	51%	64%	82%
Alt. 3	61%	62%	51%	64%	82%
Alt. 4	54%	66%	42%	59%	53%
Alt. 5	76%	76%	46%	75%	71%
Alt. 6	78%	78%	49%	76%	84%
Alt. 7	60%	69%	44%	63%	76%
Alt 7R	65%	76%	52%	67%	55

[1] This column represents the mean of columns 2, 3, and 4.

DOUGLAS-FIR AND LIMBER PINE

Summary of Short Term Effects – 1st decade

In the first decade, all Alternatives begin moving forested vegetation toward DRFC, slightly reducing mature and old age classes and encouraging recruitment of early seral species, primarily aspen.

Summary of Long Term Effects – 10 decades

The level of treatment in the Douglas-fir and limber pine types has a direct effect on the rate of attaining the desired age class proportions (mature and old) over the long term. Approximately ninety percent of the treated acres would occur in the Douglas-fir type. Table 4.25 displays the decadal treatments/disturbances proposed for the Douglas-fir/limber pine types by alternative for one hundred years.

- *Table 4. 25. Range of Douglas-fir/Limber pine Acres Treated per Decade by Fire and Harvest (Shown in Thousands of Acres).*

Alternative	Average Acres Treated by Fire (including wildfire) Per Decade	Average Acres Treated by Harvest Per Decade
Alternative 1	2.0 – 3.0 M	2.0 - 4.0 M
Alternative 2	3.0 – 4.0 M	1.0 - 5.0 M
Alternative 3	3.0 – 4.0 M	2.0 - 5.0 M
Alternative 4	4.0 – 6.0 M	0.7 - 2.0 M
Alternative 5	3.0 – 4.0 M	0.8 - 2.0 M
Alternative 6	3.0 – 4.0 M	1.0 - 2.0 M
Alternative 7	4.0 – 5.0 M	0.7 - 1.7 M
Alternative 7R[1]	1.0 – 2.0 M	2.0 – 4.0 M

[1] Alternative 7R does not include acres affected by wildfire, and acres affected by wildfire would not be deducted from treatment acres in this alternative.

Alternative 1

This alternative does not consider the restrictions placed on the timber harvest program by the Roadless Area Conservation Initiative. It proposes to treat the second largest amount of acres through harvest and the lowest number of acres through the use of prescribed fire. This alternative improves the health and productivity of Douglas-fir and limber pine stands through silvicultural management on a small scale. Although it moves the types toward the Desired Ranges of Future Conditions (DRFC), it does not meet DRFC structure objectives within a 100-year timeframe. Alternative 1 provides some recruitment of early seral species (quaking aspen) with regeneration harvest treatments, but most stands continue developing dense understories and gaining acres from the aspen type through natural succession. With no emphasis on prescribed fire, the potential to alter the fire regime from frequent light surface fires to long interval fires that produce mixed or high severity burning increases.

Alternatives 2 and 3

These provide for slightly higher disturbance through tree harvest and higher disturbance through fire through the introduction of a prescribed fire program, compared to Alternative 1. Similar to Alternative 1, Alternatives 2 and 3 do not consider the restrictions placed on the timber harvest program by the Roadless Area Conservation Initiative. Both Alternatives employ a balance of harvest and fire disturbances to progress towards DRFC, however they do not meet DRFC structure objectives within a one hundred-year timeframe.

Alternative 4

This alternative treats the highest amount of acres overall, primarily due to its aggressive emphasis on prescribed fire relative to all other alternatives, although it has one of the lowest tree harvest levels. This Alternative and Alternatives 5 through 7 are subject to restrictions placed on the timber harvest program by the Roadless Area Conservation Initiative. It brings the type closest to DRFC by providing for the greatest reduction in mature and old age classes with prescribed fire and increasing acres in the seedling, sapling, and immature stages. It reintroduces fire to the most acres, assisting in recruitment of early seral species more than any alternative.

Alternatives 5 and 6

These alternatives treat the fewest acres with harvest and fewer acres with prescribed fire than all alternatives except Alternative 1, thereby introducing the least disturbance to the type. They rank lowest in moving the type towards DRFC, maintaining the most acres in mature and old age classes, and recruiting the fewest acres of early seral species.

Alternative 7

Alternative 7 treats the third most acres with fire and about the same acreage with harvest as Alternatives 5 and 6. It brings the type closer to the structural objective of DRFC than any Alternative except Alternative 4, due primarily to its emphasis on prescribed fire in the mature stage. It reintroduces fire to the second most acres, assisting in recruitment of early seral species.

Alternative 7R

Alternative 7R is likely to treat the same amount of acres with fire in this type as Alternative 4. In Alternative 7R, however, wildland fire is not considered a treatment and the acres affected by wildfire would be additive. The major objective of this treatment is to restore aspen, which is an early seral species in many habitat types in which Douglas-fir is late seral. This alternative also proposes the same harvest in this alternative as in Alternative 3, with the primary objectives of providing wood products and restoring aspen. Treatment of these conifer stands with early seral aspen in conjunction with prescribed fire and mechanical felling in aspen stands brings aspen closer to DRFC in the short- and long-term than any other alternative, except Alternative 4. As the shading overstory canopy of conifers is removed by harvest, or fire, more sunlight reaches the forest floor, which encourages the sprouting and growth of young aspen within the stand.

MIXED CONIFER AND LODGEPOLE PINE TYPES

Summary of Short Term Effects – 1st decade

In the first decade, all alternatives begin moving the types toward DRFC, slightly reducing the mature and old age classes and encouraging the recruitment of the principal early seral lodgepole pine and aspen.

Summary of Long Term Effects – 10 decades

The level of treatments in the mixed conifer and lodgepole pine types has a direct effect on the rate of attaining the desired age class proportion (mature and old) over the long-term. Table 4.26 displays the decadal treatments/disturbances proposed for the Mixed Conifer/Lodgepole types by alternative for one hundred years.

- *Table 4. 26 Range of Mixed Conifer/Lodgepole Acres Treated per Decade by Fire and Harvest(Shown in Thousands of Acres)*

Alternative	Average Acres Treated by Fire (including wildfire) Per Decade	Average Acres Treated by Harvest Per Decade
Alternative 1	2.0 – 3.0 M	7.0 – 12.0 M
Alternative 2	3.0 – 4.0 M	7.0 – 11.0 M
Alternative 3	4.0 – 5.0 M	7.0 – 13.0 M
Alternative 4	6.0 – 7.0 M	3.0 – 5.0 M
Alternative 5	3.0 – 4.0 M	4.0 M
Alternative 6	3.0 – 4.0 M	2.0 – 3.0 M
Alternative 7	5.0 – 6.0 M	3.0 – 4.0 M
Alternative 7R[1]	1.0 - 2.0 M	5.0 - 6.0M

1 Alternative 7R does not include acres affected by wildfire, and acres affected by wildfire would not be deducted from treatment acres in this alternative.

Alternative 1

The current management plan would treat the second highest amount of acres by timber harvest and the lowest amount through prescribed fire. It improves the health and productivity of mixed conifer and lodgepole pine stands through silvicultural management on a small scale. Although it moves the types toward DRFC, it does not meet structural objectives within 100 years. It provides for some recruitment of the early seral species (lodgepole pine and aspen) through regeneration harvest; however, stands continue to develop dense understories of shade-tolerant subalpine fir and gaining acres from early seral lodgepole pine through natural succession. With no emphasis on prescribed fire, fuel loads continue to build as insect and disease attacks increase tree mortality.

Alternatives 2 and 3

These treat slightly higher acreages of the types with tree harvest and introduce a prescribed fire program, which increases disturbance relative to Alternative 1. Both alternatives use a balance of fire and harvest disturbances to progress toward DRFC; however neither achieves DRFC in a 100-year timeframe. Alternative 3, with its emphasis on timber harvest, brings the types closer to the structural objectives of DRFC more so than any of the alternatives. The harvest program concentrates on the mature and old age classes of the mixed conifer and lodgepole pine types in this Alternative, assisting in the recruitment of early seral lodgepole pine. As the older mixed conifer overstory trees are removed through harvest, more sunlight reaches the forest floor and more nutrients and moisture are available to encourage the germination and growth of early seral, shade-tolerant lodgepole pine seedlings.

Alternative 4

This alternative treats the second highest amount of mature and old age classes, and the most acres with prescribed fire. With fire, it assists in recruiting the second most acres of early seral lodgepole pine, and brings the types closer to DRFC than any alternative, except Alternative 3, in the 100-year timeframe.

Alternatives 5 and 6

These alternatives treat the fewest acres with harvest and fewer acres with prescribed fire than any of the alternatives, except Alternative 1, thereby introducing the least disturbance to the type. They rank lowest in moving the type towards DRFC, maintaining the most acres in mature and old age classes and recruiting the fewest acres of early seral species. They employ a combination of harvest and fire on a small scale. Under these Alternatives, most stands will continue to develop dense understories of shade tolerant subalpine fir and gain acres from early seral lodgepole pine through natural succession. Fuel loads will continue building as insect and disease attacks increase tree mortality.

Alternative 7

To meet DFCs, Alternative 7 treats the second most acres with fire and similar acreage with harvest as Alternatives 5 and 6 through the 100-year timeframe. It reintroduces fire to the second most acres, assisting in recruitment of early seral species.

Alternative 7R

Alternative 7R would likely treat nearly the same acreage with fire as Alternative 7 but proposes a higher harvest level to provide wood products and move the mixed conifer and lodgepole cover types toward the DRFC by encouraging the development of early seral lodgepole pine stands. As the older mixed conifer overstory trees are removed by harvest or fire, more sunlight reaches the forest floor, and more moisture and nutrients are available to encourage the germination and growth of early seral, shade intolerant lodgepole pine seedlings.

ENGELMANN SPRUCE AND SUBALPINE FIR TYPES

Summary of Short Term Effects – 1st decade

In the first decade, all alternatives begin moving the types toward DRFC, slightly reducing the mature and old age classes and starting recruitment of early seral species, primarily aspen.

Summary of Long Term Effects – 10 decades

The level of treatments in the Engelmann spruce and subalpine fir types has a direct effect on the rate of attaining the desired age class proportion (mature and old) over the long term. Table 4.27 displays the decadal treatments/disturbances proposed for the Engelmann spruce and subalpine fir types by alternative for one hundred years.

- *Table 4. 27. Range of Engelmann spruce and Subalpine fir Acres Treated per Decade by Fire and Harvest (Shown in Thousands of Acres).*

Alternative	Average Acres Treated by Fire (including wildfire) Per Decade	Average Acres Treated by Harvest Per Decade
Alternative 1	2.0 – 3.0 M	0.1 M
Alternative 2	3.0 – 4.0 M	0.1 – 0.2 M
Alternative 3	3.0 – 4.0 M	0.2 M
Alternative 4	4.0 – 6.0 M	0.2 – 0.3 M
Alternative 5	3.0 – 4.0 M	0.2 M
Alternative 6	4.0 – 5.0 M	0.1 M
Alternative 7	5.0 – 6.0 M	0.1 – 0.2 M
Alternative 7R[1]	1.0 – 2.0 M	.3 - .5 M

[1] Alternative 7R does not include acres affected by wildfire, and acres affected by wildfire would not be deducted from treatment acres in this alternative.

All alternatives propose a small amount of tree harvest (100 – 5300 acres) per decade, thereby maintaining some of this type's mature and old stand structures on the Forest and encouraging the development of old growth. Fire is the largest disturbance proposed for the type over the 100-year timeframe. Overall, this type comes closest to DRFC among all conifer types through implementation of the treatment scenarios in the alternatives.

Alternative 1 allows for the least amount of prescribed fire, followed closely by **Alternatives 2, 3, and 5**. **Alternative 4** brings the type closest to DRFC of all alternatives, primarily because of fire disturbance. **Alternatives 6, 7, and 7R** also move the type toward DRFC with fire. The mature and old age component will be reduced with high intensity fire and minor amounts of harvest, thereby encouraging some future recruitment of early seral species (primarily aspen) to the type.

QUAKING ASPEN

Summary of Short Term Effects – 1st decade

In the first decade, all alternatives begin moving the type toward the DRFC, slightly reducing the mature and old age classes and recruiting early seral aspen age classes.

Summary of Long Term Effects – 10 decades

The level of treatments in the aspen type has a direct effect on the rate of attaining the desired age class distribution (mature and old) over the long-term. Table 4.28 displays the decadal treatments/disturbances proposed for the aspen type by alternative for one hundred years.

- *Table 4. 28. Range of Aspen Acres Treated per Decade by Fire, Mechanical Felling and Harvest (Shown in Thousands of Acres).*

Alternative	Average Acres Treated by Fire (including wildfire) Per Decade	Average Acres Treated by Harvest and Mechanical Felling Per Decade
Alternative 1	6.0 – 8.0 M	0.2 – 0.5 M
Alternative 2	8.0 – 11.0 M	0.3 – 0.6 M
Alternative 3	11.0 – 13.0 M	0.3 – 0.7 M
Alternative 4	24.0 – 31.0 M	0.3 – 0.4 M
Alternative 5	12.0 – 13.0 M	0.3 – 0.4 M
Alternative 6	8.0 – 11.0 M	0.2 – 0.3 M
Alternative 7	10.0 – 11.0 M	0.3 – 0.4 M
Alternative 7R[1]	10.0 – 11.0 M	6.0-8.0 M

1 Alternative 7R does not include acres affected by wildfire, and acres affected by wildfire would not be deducted from treatment acres in this alternative.

All alternatives propose small amounts of tree harvest (200 – 700 acres) per decade, except Alternative 7R. Merchantability of the species fluctuates widely depending on markets, and most harvest is done by firewood cutters. Fire is proposed to provide the great majority of disturbance in the type over the next 100 years.

Alternative 1

This alternative treats the least amount of aspen through either fire or harvest. This encourages an increase of acres in the mature and old age classes and an increase in the eventual loss of aspen, where it associates with conifers, through natural succession. It provides for little early seral aspen recruitment and will contribute to the steady loss of aspen to conifers.

Alternative 4

To attain HRV, Alternative 4 treats the most acres with fire, twice as many acres as any of the alternatives, primarily through an aggressive prescribed fire program over the next one hundred years. It contributes towards recruitment of early seral aspen, retards aspen displacement by conifers and advances the type further towards HRV more than any other alternative.

Alternative 2, 3, 5, 6, and 7

These alternatives propose treatment levels of harvest and fire between Alternatives 1 and 4. None move the type toward DRFC structure objectives, providing for an increase in mature and old age classes and loss of aspen through natural succession.

Alternative 7R

Due to the management emphasis put on aspen restoration, this alternative would likely propose the second highest level of fire treatment. It also proposes the highest level of aspen harvest and mechanical felling. As the older parent aspen trees are removed from the shading overstory canopy by harvest, mechanical felling, or fire, auxins[1], which suppress suckering, are cut off (DeByle, *et al*, 1985). This encourages suckering of young aspen. These treatment, in conjunction with treatments in conifer stands where aspen is an early seral, are designed to move aspen toward the DRFC. This alternative brings the aspen type closest to the DRFC than any other alternative, except Alternative 4.

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[1] **Auxin** is a natural organic compound formed in actively growing parts of plants, particularly in the growing points of shoots, which in minute concentrations regulate cell expansion and other developmental processes (SAF).

Cumulative Effects

The species composition, size class, density, snags and coarse woody debris and the distribution of these components are difficult to cumulatively assess, because they encompass a diverse array of forested vegetation types that vary in their distribution across the landscape. These elements differ in the degree to which Forest Service management and other management may affect their status. The amount of current scientific information and distribution data available also varies, thus limiting the assessment of the cumulative effects of all management activities and environmental consequences on vegetation components.

Some components may require many years before noticeable changes occur on the landscape. Other, more localized changes can be dramatic and immediate. The removal of large trees affects not only size class distributions of forest stands, but the recruitment of snags and early seral species and would reduce the density of large snags on a landscape basis for a period of time exceeding fifty years. Therefore, any removals of large trees, snags, or down logs could affect these distributions on a landscape scale. This makes retention of these components essential to providing habitat elements needed by many species.

In some cases, particularly where there may be listed or sensitive species, vegetation may be managed to improve conditions for those species, but not specifically to meet vegetative desired conditions. Connectivity of forest types is provided through riparian forests. Activities or restoration that improves habitat for wildlife, fish, and botanical species in these corridors would provide ecological benefits for these species across the landscape.

Indirectly, the restoration or maintenance of vegetation conditions to reduce the levels of uncharacteristic and undesirable disturbances such as fire, insects, and pathogens would benefit forest species composition, size classes, canopy cover, structure and the creation of a variety of sizes of snags and down logs in the in the long-term. However, structural simplification of stands, through either mechanical activities or uncharacteristic disturbance can alter vegetative condition and associated habitat. This could include changes in species composition, soil erosion, and stream temperature. These actions can eliminate some large trees, snags, and fallen trees, thus reducing the range of tree sizes and growth forms which would be available as a future recruitment pool of large woody debris (Franklin and Maser, 1988).

In other cases, mechanical activities and uncharacteristic disturbance can increase levels of snags and down logs. Mechanical activities can be used as a management tool to increase the levels where they are low; uncharacteristic disturbance, however, can increase the levels beyond what was historical. Approximately fifty percent of soil organic material is from annual litter fall and can have effects regarding uncharacteristic lethal fire (Covington and Sackett, 1984; Laiho and Prescott, 1999; Tiedemann, *et al*, 2000)

A large portion of the coniferous riparian areas and headwaters in the region exist on the Forest. Forest Service management activities affecting these areas would, in general, affect the overall ecology and watershed integrity of the Forest and adjacent land ownerships. The removal of large trees affects the recruitment of large woody debris over time and would reduce the presence of large trees in riparian areas on a landscape basis for a period exceeding fifty years. These removals would affect riparian functions at a landscape scale.

Vegetation communities on nearby or intermingled private lands have been experiencing changes in recent years that will likely continue in the future. Some private ranch lands have been converted to rural home sites resulting in changes in lower elevation vegetation communities. Most aspen on adjacent National Forests is in a later successional stage and many areas are being dominated by conifers through plant succession thereby further reducing acres occupied by this tree species.

Cumulatively for the Forest and adjacent private and public lands, impacts of forested vegetation treatments will be relatively low due to the total acres treated per decade for each Alternative. However, impacts of forested vegetation treatments and impacts from other resource management on forested vegetation management will be higher in some individual areas, such as the Bear River Range, since a greater concentration of treatments are planned for that area.

Watershed management and fisheries constraints will most likely influence forested vegetation treatments the greatest in Alternatives 4, 3, and 7R, followed by Alternative 7, 2, and 1, particularly in the Bear River Range, since these are the most aggressive treatment alternatives.

Critical wildlife habitat/corridor management would affect forested vegetation in different ways. Alternative 4 and 7R, with aspen restoration focus, would improve habitat for a variety of wildlife, primarily bird species while treatments may temporarily disrupt travel corridors or change habitats. Connectivity of forest types is provided through riparian forests. Numerous standards and guidelines are included in the Forest Plan to deal with forested vegetation treatments and riparian and other wildlife habitat. Alternatives 6 and 5 provide for minimum management disturbance to habitat, but do not create as many early successional stand structure acres, particularly in aspen, for habitat.

Because of lower mechanical and prescribed fire treatment levels, Alternatives 1, 5 and 6 would have slightly greater effects from insects and disease in forest-dominated vegetation communities, than Alternative 2, 3, 4, 7, and 7R. The resulting fuel accumulation could result in uncharacteristically large fires, which could threaten adjacent private land. Alternative 4 would have the least effect due to its aggressive treatment of forested vegetation through harvest, thinning and prescribed fire.

Minerals development, principally phosphate leasing, usually impacts 50-200 acres of forested vegetation each year. This development will have the greatest impact on forested vegetation in Alternatives 4, 5, 6, and 7 due to roadless and wilderness area restrictions on future leasing. Impacts would be essentially the same for all alternatives relative to development of existing leases, as these could be developed regardless of roadless area location.

Livestock grazing would impact forested vegetation the greatest in Alternative 4, 7R, and 7, due to the need for grazing protection following the higher level of mechanical and fire treatments, a particularly with the focus on aspen regeneration. Alternatives 6, 5 and 1 would be impacted the least from grazing, unless uncharacteristically large wildfires returned vast acreages to early seral aspen, requiring protection.

Recreation would have the greatest impact through Alternative 6, precluding timber mechanical treatments on the greatest number of acres due to wilderness recommendations, and incorporating the Roadless Area Conservation Initiative (RACI). Alternatives 5 and 7 would follow as RACI would confine harvesting to roaded areas. Prescribed fire would, however, be permitted. Alternative 4 and 7R would be least impacted by recreational activity and management due to their more aggressive treatment scenarios and prescription emphasis. Alternatives 1, 2, and 3 are intermediate in their impacts from recreation on forested vegetation.

See Table 4.35 in the Cumulative Effects section of the Non-Forested Vegetation Diversity portion of this Chapter for a display of cumulative acres treated in all treatment types, for all vegetation types, including forested vegetation, by Alternative on the Forest.

Prescribed fire was used primarily for site preparation of tree planting sites in the past and has been used minimally in forested vegetation for the last 20 years. Past wildfire effects are mainly limited to two large fires (Trail Creek, 1988– 9,000 acres and Brown's Canyon, 1994 – 2,000 acres) on the Soda Springs Ranger District. Both fires were confined to Caribou National Forest lands.

Table 4.29 below displays regeneration harvest treatments that have occurred on the Forest in the past 40 years, as represented by the Forest GIS harvest unit layer. These acres have reforested naturally or been planted with early seral species (lodgepole pine and aspen). The table also shows expected future harvest treatments by alternative and the cumulative total.

- *Table 4. 29 Estimated Cumulative Acres of Forested Vegetation Treated (Past Regeneration Harvest, Future all harvest) by Alternative.*

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt.6	Alt. 7	Alt 7R
Past and Present HarvestTreatments (Acres Treated)	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000
Future Harvest Treatments (Acres Treated)	16,800	16,700	21,900	7,100	6,500	4,900	7,300	11,100
Total Treatments (Acres)	42,800	42,700	47,900	33,100	32,500	30,900	33,300	37,100

Bureau of Land Management (BLM), Bureau of Indian Affairs, State of Idaho and private landowners have also treated lands, through timber harvest, adjacent or in close proximity to the Forest. Most of this harvesting, approximately 1,000 acres, has occurred on State of Idaho lands, in the mid to late 1990's through the early 2000's in the south portion of the Portneuf Mountain range, west of Grace, Idaho and east of Downey, Idaho.

Irretrievable/Irreversible Effects

Alteration of vegetative conditions can involve other activities such as road construction. Often this activity involves excavation and displacement of soil layers from their original location. Even though roads can be re-contoured, this displacement can be considered an irretrievable consequence of vegetation management since re-contouring cannot restore the original layer configuration of the displaced soil and may alter the soil-hydrologic function.

Non-Forested Vegetation Diversity

Analysis Scale: Forest-wide

Scale of Analysis:

The sagebrush/mountain shrub vegetation group was analyzed forest-wide and includes approximately 404,500 of the 461,100 acres identified as non-forested acres in the Caribou National Forest vegetation classification updated in year 2000. The remaining 56,600 acres are occupied by maple, mountain mahogany, and juniper. Because of their limited acreage extent across the Forest, no objectives have been set for these woodland/shrubland vegetation types, but will be evaluated for treatment levels and other ecological requirements at a site-specific level.

Indicators:

- **EM.7 Percent of non-forested acres in the greater than 15 percent canopy cover density class in year 10 and long-term compared to the historic range of variability criteria.**
- **EM.8 Number of decades to reach the historic range of variability.**

Analysis Method

Sagebrush/mountain shrub vegetation was analyzed by calculating the amount of acres remaining in the greater than 15 percent canopy cover density condition class after ten years and long-term (fifty to one hundred years), factoring in succession and disturbances. Because data is not available to further separate canopy cover density classes, in the analysis only two cover classes were used: acres in the greater than 15 percent canopy cover class and acres in the less than 15 percent canopy cover class.

Baseline information from assessments, monitoring, and site data indicates that approximately fifty percent of the sagebrush/mountain shrub acres on the Forest are in the greater than 15 percent canopy cover density class (Field transects, 1999; Montpelier-Elk Valley Allotment Management Plan Environmental Assessment, 1993; Transtrum Analysis, 2001). The analysis was designed to determine how each alternative would achieve specified desired future conditions for sagebrush/mountain shrub vegetation. Information used in this analysis is based on the most recent information available currently.

SUCCESSION

To analyze age canopy cover density for the sagebrush/mountain shrub vegetation group, succession was factored in when calculating canopy cover density classes over a ten-year period. Re-establishment of sagebrush is often variable, because many factors may influence succession, such as size of treatment area, proximity to seed source, climate, and soils. Based on experience from past treatments on the Forest and information from fire effects studies discussed in Chapter 3, the amount of time generally required for a treated site (0-5 percent canopy cover density) to re-establish canopy cover densities greater than fifteen percent is twenty to thirty years (Heyrend, 2001; Bunting, *et al*, 1987; Frass *et al*, 1992; Harniss, *et al*, 1973; Bushey, 1986; Walhof, 1997; Curlew EIS, 2002; and Beaver Creek EA, 1998)). Studies have also shown that when sagebrush canopy cover density reaches between twelve and twenty percent in some sagebrush plant communities, the herbaceous production is restricted. As the canopy cover density increases, the communities become closed to new herbaceous seedling recruitment (Winward, 1991; Sturges, 1975). Based on this information, the canopy cover densities were divided into two classes: less than 15 percent canopy cover density and greater than 15 percent canopy cover density.

When considering succession over time, it is estimated that all of the existing acres in the zero to fifteen percent canopy cover density class, that are capable of establishing canopy cover densities of greater than fifteen percent, will move into the greater than fifteen percent canopy cover density class over the next twenty years, if all of these acres are left untreated. This means that an average of five percent (5% x 20 years = 100%) of the acres in the zero to fifteen percent canopy cover density class are expected to move into the greater than fifteen percent canopy cover density class annually because of succession. Wildfires, including wildland fire use, were considered as part of the acres treated in each alternative for analysis purposes and were not considered additive to the treated acres, except in Alternative 7R. In Alternative 7R, approximately 3,000 acres per decade of wildfire were added to the acres treated. A mathematical model that factors in treatments with succession rates was used to calculate outcomes in each alternative.

In the modeling and analysis included in this chapter, information presented is intended and designed to indicate relative differences between the alternatives, rather than to predict absolute quantities of activities, output, outcomes, and effects.

PROPERLY FUNCTIONING CONDITION

A properly functioning condition assessment for the various forested and non-forested vegetation types was completed for the Forest in 1997. Existing conditions of structure, composition, disturbance regime, and patterns were compared with the Intermountain Region's PFC Assessment, Sub-regional Scale Criteria (USDA-FS, 1996) for sagebrush and mountain shrub vegetation to determine the degree of departure from the historical range of variability (USDA-FS, 1997). From this assessment a desired range of future conditions was established based on an historical range of variability (Swanson, *et al*, 1994). The effects of each alternative on sagebrush/mountain shrub vegetation group conditions within the Forest were evaluated and compared to the desired range of future conditions (DRFC) established in each of the alternatives. Structure (canopy cover density) was the primary criteria used to compare the alternatives for effects on the sagebrush/mountain shrub vegetation group. These criteria were used to determine if alternatives would result in a trend toward DRFC in the short- and long-term. A rating system of low, low to moderate, moderate, moderate to high, and high was used to estimate the degree of departure from the historical range of variability.

The farther the vegetation condition is from DRFC criteria, the higher the rating for degree of departure from the historical range of variability. The DRFC would also provide for a greater biodiversity in these ecosystems by providing a variety of ecological conditions. The tall forbs cover type focuses on ground cover and indicator species.

DESIRED FUTURE CONDITIONS

Managing vegetation to achieve the desired future conditions that represent some range of historic variability depends on current and site-specific information about vegetation conditions, methods of vegetation treatment or management, duration and intervals of treatments, and biophysical limitations. These factors are not easily addressed at the Forest Plan programmatic level. Where these factors are not addressed in this programmatic document, watershed and vegetation management planning processes will address all of these factors at the appropriate scale, such as subsection, watershed, or project area level(s). Through these processes, adjustments in management practices would be made to address resource concerns in a timely, effective, and site-specific manner that includes public involvement in land management actions on the Forest. Management actions will be monitored and evaluated for any needed future adjustments. Improvements in technology and inventory information, such as LANDSAT imagery and GIS databases, allow Forest managers to better identify current vegetation conditions and to monitor any changes that take place over time.

Where vegetation is actively managed under any alternative, vegetation components (structure, composition, disturbance regimes, and patterns) that have the highest risk of losing resiliency to disturbance would receive the highest priority for treatment.

Ecosystems change over time and space because of succession and disturbance. Changes in an ecosystem's composition, structure, processes and patterns may be rapid or gradual, but should be within a range of historic conditions to which the ecosystem is adapted. A system functioning within the historical range of variability is expected to be resilient and sustainable (USDA-FS, 1996). Conversely, a system that has a high departure from the historic range of natural variability may be subject to conditions that may not be sustainable over time (Swanson, *et al*, 1994).

Successional changes and disturbances determine the condition and extent of the non-forested vegetation cover across the Forest. The variety of vegetation conditions may represent climax vegetation in the absence of disturbance, or it may display conditions of an earlier ecological status (early seral) directly related to the amounts and types of disturbance that have occurred. Because of this direct relationship to disturbance, canopy cover closure or density can be used as an indicator to determine successional changes and ecological conditions in some non-forested vegetation type such as sagebrush and mountain shrubs. For example, some undisturbed shrub and woodland overstories eventually out-compete herbaceous understories (grasses and forbs) which can affect composition and productivity (Winward, 1991; Laycock, *et al*, 1994).

Direct and Indirect Effects

EM 8 DRFC FOR NON-FORESTED VEGETATION

The desired range of future conditions (DRFC) for non-forested vegetation varies by alternative and by vegetation type. These are described in Chapter 2 – Alternatives. The narrative below further describes the desired characteristics of certain non-forested vegetation types.

SAGEBRUSH/MOUNTAIN SHRUB VEGETATION GROUP

Alternative 1

Provide for a variety of canopy cover density classes and conditions in the sagebrush/mountain shrub vegetation that favor production of herbaceous vegetation in the understory.

Alternatives 2 through 5, 7 and 7R

Provide for a structure that is within the historical range of variability, where approximately thirty to fifty percent (forty percent was used as a mid-point) of the acres have greater than fifteen percent canopy cover densities, and fifty to seventy percent of the acres have less than fifteen percent canopy cover densities. Sagebrush is dominant on all but zero to five percent of the historical habitat. Mountain shrub types have a balanced range of shrub/herbaceous understory components in various canopy cover density classes. Disturbance regimes and patterns are within historical ranges.

Alternative 6

Provide for a structure where more than fifty percent of the acres have greater than fifteen percent canopy cover densities. Mountain shrub types display a trend toward the denser canopy cover classes.

- *Table 4. 30 Attainment of the DRFC in Sagebrush/Mountain Shrub Vegetation Group By Alternative. [Indicator EM.8]*

Alternative	Desired Attainment of DRFC in Years	Number of Fire Return Intervals Needed to Achieve DRFC
Alternative 1	Not Applicable	Not Applicable
Alternative 2	75 Years	2.0
Alternative 3	50-75 Years	0.5
Alternative 4	50-75 Years	2.0
Alternative 5	100 Years	Not Applicable
Alternative 6	100 Years	Not Applicable
Alternative 7	50-75 Years	2.0
Alternative 7R	100 Years	Not Applicable

No prescribed fire treatments are planned in Management Prescriptions 2.8.3 and 4.3. Any prescribed fire treatments that might occur in prescription 2.8.3 must meet the goals, objectives, standards, and guidelines for that prescription. Treatments associated with wildland fire use will not be allowed in prescriptions 2.1.3, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, and 8.1 in all alternatives.

TALL FORB COVER TYPE

To estimate the effects on the tall forb cover type, the estimated increase or decrease of percent ground cover in the tall forb cover type after ten years and long-term was used.

Because the tall forb cover type was not delineated in the Forest vegetation classification, the actual extent of this type has not been determined. This cover type was analyzed qualitatively on a forest-wide basis. The analysis was based on treatments to improve these sites using inferences derived from range ocular and site analysis collected in the 1960s, where ground cover and species composition were identified for this cover type (USDA-FS, 1997).

Alternatives 1 through 7R

On areas capable of tall forb dominance, the tall forb type reflects historical ranges of ground cover leading into the winter season. Composition reflects a mosaic dominance of tall forb indicator species. Disturbance regimes demonstrate a stable or upward trend in tall forb indicator species, and fire regimes are within historical ranges. Patterns occur within historical ranges. Historical tall forbs sites, which currently are not capable of tall forbs dominance, are managed to maintain watershed stability. The rate of attaining the Desired Range of Future Conditions (DRFC) is approximately 100 years for all alternatives, except Alternatives 1 and 3 which do not treat tall forb sites.

WOODLAND COVER TYPES

Short- and long-term objectives for woodland cover types, such as juniper, maple and mountain mahogany, have not been established. Analysis of these cover types will be conducted at the site-specific level to determine treatment levels and other ecological requirements.

Direct and Indirect Effects That Vary by Alternative

SAGEBRUSH/MOUNTAIN SHRUB

Changes in Structure and Composition

Areas of sagebrush/mountain shrub vegetation that do not have the capability to achieve canopy cover densities greater than fifteen percent were not considered as treatable, due to ecological conditions or species characteristics (growth form). These areas should remain in less than fifteen percent canopy cover density over the long-term (fifty to seventy-five years) and should not be considered for treatments. Canopy cover on other areas, where disturbance does not occur, will continue succession toward a denser canopy cover class condition until reaching maximum canopy closure of approximately twenty to thirty-five percent (Winward, 2001). Over time, a reduction could be expected in understory composition and new herbaceous seedling recruitment. Acres proposed for treatments in each alternative would be in the greater than 15 percent canopy cover density condition class with the majority of treatments occurring in the greater than 25 percent canopy cover density condition class.

All treatments using prescribed fire or wildland fire use are considered lethal in the sagebrush/mountain shrub vegetation group. When disturbances such as lethal fire occur, an increased risk of undesirable and non-native plant invasion also occurs. Some shrubs, such as rabbitbrush, sprout after fire and may increase or even become dominant. Land management activities, such as grazing, will continue to have an influence on the rate and outcome of succession over time. Factors that have influenced succession in the past are grazing intensity and season of use, fire regimes, and encroachment of or expansion into adjacent vegetation communities. Proposed treatments in each alternative are the maximum allowable to achieve management objectives. Considerations and conditions that may reduce treatment accomplishment are weather conditions, funding, wildfire disturbances and other uncertainties.

EM 7, 8 Attainment of DRFC and Acres in > 15 % CC Class

The level of treatments in the sagebrush/mountain shrub vegetation group has a direct effect on the proportions of canopy cover density condition classes on the Forest and the rate of attaining the desired canopy cover density condition class proportions. Table 4.31 displays the annual and decadal treatments proposed for the sagebrush/mountain shrub vegetation group in each alternative. Prescribed fire would be the primary method of treatment; however, other treatments, such as chemical applications, wildland fire use, and mechanical treatments may also be included. All fire treatments would be considered lethal treatments, in that fire reduces the canopy cover from greater than fifteen percent to less than fifteen percent. The majority of treatments would occur in the greater than 25 percent canopy cover density class.

Priority will be given to sagebrush/mountain shrub vegetation treatments that occur in prescriptions 3.3, 5.3, and 6.3 in Alternatives 4 through 7. For Alternative 7R priority will be for treatments in 3.3, 5.2, and 6.2. Treatments must be increased after twenty years in Alternatives 2, 3, 4, 5, 7, and 7R to maintain or achieve DRFC goals and objectives, because after twenty years the acres treated in the greater than 15 percent canopy cover density class equals the amount of acres moving into the greater than 15 percent canopy cover density class from the less than 15 percent canopy cover density class due to succession. No DRFC objectives have been established for Alternative 1.

Acres disturbed by wildfire will count as treated acres in all alternatives, except 7R. In Alternative 7R, wildfire acres are additive to treated acres, because treated acres were reduced in this alternative.

- *Table 4. 31. Acres of Sagebrush/Mountain Shrub Vegetation Treated Annually and Decadal By Alternative.*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Acres Treated [1] Per year	13,000	7,750	10,000	7,750	7,080	6,000	7,975	4,300
Acres Treated Per Decade	130,000	77,500	100,000	77,500	70,800	60,000	79,750	43,000[2]

[1] Treatment acres are based on the theme of the alternative.
[2] Includes acres expected to be disturbed by wildfire.

Alternative 1

Continuation of the current management plan would treat the greatest amount of acres of sagebrush/mountain shrub vegetation of all alternatives. This alternative treats approximately 130,000 acres of sagebrush/mountain shrub in the greater than fifteen percent canopy cover density class over the next ten years, primarily using prescribed fire to improve wildlife habitat and increase forage for permitted livestock. Wildland fire use would not be allowed. Wildfire, insects and disease would be aggressively suppressed in this alternative.

This level of treatment provides for a variety of age classes and conditions in the non-forested cover types that favor production of herbaceous vegetation in the understory and would have the greatest effect on reducing the number of acres in the greater than 15 percent canopy cover density class. It also meets the requirements for DRFC in the short-term and is expected to improve biodiversity. Over the long-term (fifty to seventy-five years), a variety of sagebrush/mountain shrub canopy cover classes favoring the less than 15 percent canopy cover density class would be the expected outcome; however, no long-term goals were established for the sagebrush/mountain shrub vegetation group in this alternative. This alternative would reduce the number of acres in the greater than 15 percent canopy cover density class by about fifteen percent after the first decade when accounting for succession. The result would be a moderate to high degree of departure from the historical range of variability in the long-term. Although no DRFC goals have been set for this alternative, approximately 0.7 decades would be required to move canopy cover density classes within the historical range of variability with this level of treatment.

Alternative 2

This alternative proposes to treat 7,750 acres annually (77,750 decadal) of sagebrush/mountain shrub vegetation in the greater than 15 percent canopy cover density class over the next ten years, primarily using prescribed fire. Other methods of treatment may include chemical applications, mechanical, and wildland fire use to achieve management goals, based on site-specific conditions or other resource objectives. The objectives of this alternative are to manage vegetation resources based on ecological need and to restore systems to an historical range of variability.

Approximately 55,700 acres of sagebrush/mountain shrub vegetation occur in prescriptions that exclude wildland fire use in this alternative. The objective would be to achieve DRFC within two fire return intervals (approximately sixty years).

This alternative reduces the number of acres in the greater than 15 percent canopy cover density class in the sagebrush/mountain shrub vegetation group by approximately two percent after the first decade when accounting for succession. Over the long-term (seventy-five years), a balanced range of canopy cover density classes and increased biodiversity would be the expected outcome across the Forest. The long-term goal for the sagebrush/mountain shrub vegetation group is to maintain thirty to fifty percent of the acres in the greater than 15 percent canopy cover density class to meet DRFC objectives. This alternative would result in a low degree of departure from the historic range of variability after the first decade. Approximately six decades will be required to move vegetation canopy cover density classes into the historical range of variability in this alternative.

Alternative 3

Alternative 3 would likely result in treatment of 10,000 acres annually (100,000 decadal) of sagebrush/mountain shrub vegetation in the greater than 15 percent canopy cover density class over the next ten years, primarily using prescribed fire, to achieve DRFC within one-half of a fire return interval (approximately fifteen years). Other methods of treatment may include chemical applications, mechanical treatment, and wildland fire use, based on site-specific conditions that meet resource objectives. The objective in this alternative is to actively manage disturbances to maintain a long-term low risk of uncharacteristic wildland fire and other disturbances within the historical range of variability. Approximately 76,700 acres of sagebrush/mountain shrub vegetation occur in prescriptions that excluded wildland fire use in this alternative.

This alternative reduces the number of acres in the greater than 15 percent canopy cover density class in the sagebrush/mountain shrub vegetation group by approximately seven percent after the first decade when accounting for succession. Over the long-term (fifty to seventy-five years), a balanced range of canopy cover density classes, with about forty percent of the acres in the greater than 15 percent canopy cover density class. An increase in biodiversity is the expected outcome. The long-term goal in this alternative for the sagebrush/mountain shrub vegetation group is to maintain thirty to fifty percent of the acres in the greater than 15 percent canopy cover density class to meet DRFC objectives. This alternative would result in a low to moderate degree of departure from the historic range of variability after the first decade. Approximately 1.4 decades will be to achieve the historical range of variability in this alternative.

Alternative 4

This alternative would have the same effects as Alternative 2. The objectives are to manage vegetation resources based on biological need to restore processes and functions to achieve the historical range of variability while maintaining wildlife habitat. Approximately 39,400 acres of sagebrush/mountain shrub vegetation occur in prescriptions that excluded wildland fire use in this alternative.

Alternative 5

This alternative proposes to treat 7,080 acres annually (70,800 decadal) of sagebrush/mountain shrub in the greater than 15 percent canopy cover density class over the next ten years, primarily using prescribed fire to maintain the existing canopy cover density class percentages of sagebrush/mountain shrub vegetation group. The objective is to allow disturbances, such as fire, insect and disease, to play a role in shaping the landscape when other resources, structures, public safety and private property are not at risk and where recreational values are not reduced. Approximately 30,300 acres of sagebrush/mountain shrub vegetation occur in prescriptions that excluded wildland fire use in this alternative. Other methods of treatment may include chemical applications, mechanical treatments, and wildland fire use based on site-specific conditions that meet resource objectives. This alternative is expected to increase biodiversity.

This alternative maintains the existing number of acres in the greater than 15 percent canopy cover density class in this vegetation group during the first decade and over the long-term (one hundred years). The long-term goal in this alternative is to maintain thirty to fifty percent of the acres in the greater than 15 percent canopy cover density class to meet DRFC objectives. This alternative would result in a moderate degree of departure from the historical range of variability after the first decade and over the long-term. More than ten decades will be required to achieve the historical range of variability in this alternative.

Alternative 6

Alternative 6 would likely result in proposals to treat approximately 6,000 acres (60,000 decadal), representing an estimate of the average annual amount of acres that would burn in a fire suppression environment. This alternative would primarily use prescribed fire or wildland fire use treatments. These 6,000 acres include 2,000 acres of treatments that would occur outside the recommended wilderness prescription (1.3) using primarily prescribed fire. The remaining 4,000 acres, using wildland fire use in the recommended wilderness prescription (1.3), would be permitted to burn, based on site-specific conditions that meet resource objectives. The objectives are to allow natural processes to occur within recommended wilderness areas and restore areas, based on priority, outside recommended wilderness areas with the use of prescribed fire and other methods. Approximately 23,500 acres of sagebrush/mountain shrub vegetation occur in prescriptions that exclude wildland fire use in this alternative.

This alternative would result in an increase of approximately three percent of acres in the greater than 15 percent canopy cover density class during the first decade when accounting for succession. It would increase the number of acres even more over the long-term (one hundred years), because the acres treated do not exceed the amount of acres moving annually into greater than 15 percent canopy cover density class due to succession. This alternative is expected to result in a reduction of biodiversity in the sagebrush/mountain shrub ecosystems. The long-term goal for the sagebrush/mountain shrub vegetation group is to maintain greater than fifty percent of the acres in the greater than 15 percent canopy cover density class. This alternative would result in a moderate to high degree of departure from the historical range of variability after the first decade. Non-forested vegetation will not achieve the historical range of variability in the foreseeable future in this alternative.

Alternative 7

In Alternative 7, approximately 7,975 acres annually (79,750 decadal) of sagebrush/mountain shrub in the greater than 15 percent canopy cover density class would be proposed for treatment over the next ten years using prescribed fire to achieve DRFC within fifty to seventy-five years. Other methods of treatment may include chemical applications, mechanical treatments, and wildland fire use, based on site-specific conditions and other resource objectives. The objectives are to manage vegetation resources based on biological need to restore processes and functions to within the historical range of variability and to maintain wildlife habitat. Approximately 29,900 acres of sagebrush/mountain shrub vegetation occur in prescriptions that exclude wildland fire use in this alternative.

This alternative reduces the number of acres in the greater than 15 percent canopy cover density class after the first decade by about two percent when accounting for succession. This alternative is expected to result in an increase in biodiversity. Over the long-term (fifty to seventy-five years), the result would be a balanced range of canopy cover density. The long-term goal for the sagebrush/mountain shrub vegetation group is to maintain thirty to fifty percent of the acres in the greater than 15 percent canopy cover density class to meet DRFC objectives. This alternative would result in a low degree of departure from the historic range of variability after the 1st decade. Approximately 4.5 decades will be required to achieve vegetation conditions that are within the historical range of variability in this alternative.

Alternative 7R

This alternative would likely result in proposing to treat the fewest number of acres of all the alternatives. Approximately 4,000 acres (40,000 decadal) would be treated annually of sagebrush/mountain shrub vegetation in the greater than 15 percent canopy cover density class over the next ten years using prescribed fire and other treatments to achieve DRFC within one hundred years. Treatments may include prescribed fire, chemical applications, mechanical treatments, and wildland fire use, based on site-specific conditions and other resource objectives. The objectives are to manage vegetation resources based on biological need to restore processes and functions to within the historical range of variability and to maintain wildlife habitat. Approximately 42,620 acres of sagebrush/mountain shrub vegetation occur in prescriptions that exclude wildland fire use in this alternative. This alternative does not count acres burned by wildfire as part of the acres treated. In this alternative acres burned by wildfire are additive to the treatments proposed. Based on historic burns on the Forest, approximately 300 acres of sagebrush/mountain shrub burn each year. This additive number of treatment acres accounts for the additional 3,000 acres over the decade.

When considering treatments only, this alternative increases the number of acres in the greater than 15 percent canopy cover density class after the first decade by about eight percent when accounting for succession. Adding in the expected acres affected by wildfires (assuming all average annual acres burned occur in the sagebrush/mountain shrub vegetation group), an additional 1,210 acres could be affected. Wildfire acres were derived from Table 3.19 and based on past conditions that 25 percent of the acres disturbed by wildfire are in the non-forested vegetation types (IDT Meeting Notes, 2002). This would reduce from eight percent increase to about a five percent increase in the number of acres in the greater than 15 percent canopy cover density class. A reduction in biodiversity would also be expected in this alternative. Over the long-term (one hundred years or longer), with increased treatments in future decades, the result would be a balanced range of canopy cover density classes. The long-term goal for the sagebrush/mountain shrub vegetation group is to maintain fifty percent of the acres in the greater than 15 percent canopy cover density class to meet DRFC objectives. This alternative would result in a high degree of departure from the historic range of variability after the first decade. More than 10 decades will be required, with increased treatments in future decades, to achieve vegetation conditions that are within the historical range of variability in this alternative. Without increased disturbance, the sagebrush/mountain shrub is expected to display a dominance of acres in the greater than 15 percent canopy cover density class across the Forest.

Table 4.32 compares the alternatives by displaying the existing canopy cover density class, desired range of future conditions, first decade outcome, long-term goals, and estimated time to attain PFC for each alternative.

- *Table 4. 32. Summary Comparison of Alternatives for Sagebrush and Mountain Shrub Vegetation Group.*

Alternative	Existing Condition % of Acres in >15% cc	Desired Range of Future Conditions % Acres in >15% cc	1st Decade Outcome % of Acres in >15% cc	Long-term Goal % of Acres in >15% cc	Estimated Time to Attain DRFC In Decades
1	50%	None Established	35%	None Established	~0.7
2	50%	30-50%	48%	40%	6.0
3	50%	30-50%	43%	40%	1.4
4	50%	30-50%	48%	40%	6.0
5	50%	30-50%	50%	40%	>10.0
6	50%	>50%	53%	>50%	N/A
7	50%	30-50%	48%	40%	4.5
7R	50%	50%	58%	50%	>10.0

Table 4.33 shows the relative changes from treatments in the greater than 15 percent canopy cover density class and the differences between long-term goals after the first decade for each alternative.

- *Table 4. 33. Percent (%) Change in Acres in the Greater than 15 Percent Canopy Cover Density Class for Sagebrush/Mountain Shrub Vegetation and the Differences in Long-term Goal After 1st Decade.*

Factor	Alt. 1	Alt.2	Alt.3	Alt.4	Alt.5	Alt.6	Alt.7	Alt. 7R
Estimated Change in Acres >15% Canopy Cover Density Class After 1st decade	15% Decrease	2% Decrease	7% Decrease	2% Decrease	No Decrease	3% Increase	2% Decrease	7% Increase
Estimated Difference from Long-term goal After 1st decade	N/A	8% Greater	3% Greater	8% Greater	10% Greater	Achieved	8% Greater	7% Greater

After approximately twenty years of sagebrush/mountain shrub vegetation treatments, the amount of acres moving into the greater than 15 percent canopy cover density class is nearly equal to the amount of acres being treated annually and taken out of the greater than 15 percent canopy cover density class because of the twenty-year rotation cycle. Therefore, in the long-term, if treatments remain the same, the number of acres in the greater than 15 percent canopy cover density class would tend to increase over time due to succession. Table 4.34 displays the long-term outcome on the greater than 15 percent canopy cover density class for each alternative.

- *Table 4. 34. Percent of Acres in the Greater than 15 Percent Canopy cover Density Class for Sagebrush/Mountain Shrub Vegetation Over the Long-Term.*

	Alt. 1	Alt.2	Alt.3	Alt.4	Alt.5	Alt.6	Alt.7	Alt.7R
Percent of acres in > 15 Percent Canopy Cover Density Class the long-term	36%	62%	51%	62%	65%	70%	61%	89%

Vegetation conditions have an indirect effect on other biological and physical elements of the ecosystem, such as soils, wildlife, water quality, susceptibility to disturbances, and production potential. Indirect effects on these resources are disclosed in the soils, wildlife, and riparian/water quality sections. Using the PFC concept, when vegetation conditions and other ecological processes are within the historic range of variability, other resources should be self-sustaining (USDA-FS, 1996). Most indirect effects in the sagebrush/mountain shrub vegetation group are short-term, because of the short period required for recovery after disturbance. Forest-wide standards and guidelines in the Revised Forest Plan should reduce or mitigate long-term effects on the sagebrush/mountain shrub vegetation group.

TALL FORB

Treatments on areas that have the capability to maintain tall forb vegetation communities will occur in all alternatives. However, in Alternatives 1 and 3, treatments will be determined at the site-specific level, along with the effects associated with these treatments. Treatments will mostly occur in management prescriptions 3.1, 3.2, 5.1, 5.2, 6.1, and 6.2.

Currently, treatments to reestablish tall forb plant communities have included the use of herbicides, plowing and fencing to eliminate tarweed infestations and other undesirable plants, seeding to re-establish native and desirable non-native grass species, and reduced grazing pressure. Treatments on these vegetation communities have had limited success. Research is currently developing information to better understand and improve the success of treating these areas. Treatments will depend on future budgets, development of research technology, and site-specific analysis. All treated sites in these alternatives are expected to have the direct effects of increased existing ground cover and improved species diversity. No long-term goals have been set for Alternatives 1 and 3.

Alternative 2 and Alternatives 4 through 7R will treat to retain/maintain and restore tall forb vegetation communities where they exist currently. Areas that once were capable of supporting tall forb sites, but have lost the capability to maintain tall forb vegetation communities as a result of losses in topsoil or site potential, will be managed for watershed stability. Treatments will primarily occur in Management Prescriptions 3.1, 3.2, 5.1, and 6.1 in Alternative 2; in Management Prescriptions 3.3, 5.3, and 6.3 in Alternatives 4 through 7; and Management Prescriptions 3.1, 3.2, 5.2, and 6.2 in Alternative 7R. Treatments will depend on future budgets and the development of research technology that is proven successful. All treated sites in these alternatives are expected to have the direct effects of increased existing ground cover, improved species diversity and increased production. Over the long-term (one hundred years), levels of ground cover and species diversity on capable sites treated should be within the historical range of variability when more than seventy-five percent ground cover is achieved and a dominant tall forb component exist with fifty percent or more of the community composed of tall forb species. Regardless of whether treatments are evaluated at the site-specific level or at the programmatic scale, no differences in outcomes between alternatives were identified. Long-term goals were set to achieve the historical range of variability within one hundred years for Alternative 2 and Alternatives 4 through 7R.

Indirect effects related to the treatment of tall forb communities in all alternatives, where they occur, include improved watershed stability and improved nutrient cycling. Treated areas are expected to increase biomass production from current levels, especially on sites infested with tarweed (*Madia glomerata*), or mulesear wyethia (*Wyethia amplexicaulus*) by creating more organic matter for nutrient cycling and soil protection.

Cumulative Effects

SAGEBRUSH/MOUNTAIN SHRUB

Cumulative effects analysis for sagebrush/mountain shrub vegetation is at the Forest-wide scale with consideration given to adjacent lands using the Caribou Adjacency Analysis (UDSA-FS, 2001) and the Bureau of Land Management data (Paris, BLM, 2002). The cumulative effects analysis includes effects on achieving the DRFC and overall treated acres for each alternative.

Cumulative effects related to non-forest vegetation were evaluated based on the Desired Range of Future Conditions (DRFC) long-term goals and the degree of departure from the historic range of variability. Alternatives that treat non-forested vegetation to achieve a balanced range of canopy cover density classes result in vegetation conditions that are more resilient and resistant to wildfire. Alternatives that result in condition classes with dense canopy cover leave vegetation more susceptible to wildfire disturbances that may be outside the historical range of variability.

For example, non-forested vegetation types that have a predominance of acres in the greater than 15 percent canopy cover density class are at risk of having uncharacteristic wildland fire disturbances outside the historic fire disturbance regime, similar to those witnessed during the last several years. These kinds of events may create risks to sustainability. Alternatives 1 and 3 treat the most acres in the greater than 15 percent canopy cover density class thereby reducing these risks in the shortest period of time. Alternatives 2, 4, and 7 treat acres to achieve the historical range of variability but over a longer period of time. As a result these three alternatives reduce the risk over the long-term. Alternative 5 treats acres to maintain the current number of acres in the greater than 15 percent canopy cover density class, which in turn retains the current level of risk. Alternatives 6 and 7R treat fewer acres than the number of acres expected to move into the greater than 15 percent canopy cover density class through succession, which increases the risk of these disturbance events occurring over time.

The cumulative effects of treating non-forested vegetation were also considered by taking into account all past, present and foreseeable future treatments. Treatments in sagebrush/mountain shrub vegetation are expected to regain pretreated conditions within twenty to thirty years after treatments occur, except on mined sites (Heyrend, 2001; Bunting, et al, 1987; Frass, *et al*, 1992; Harniss, *et al*, 1973; Bushey, 1986; Sturges, 1975; Walhof, 1997; Curlew EIS, 2002; and Beaver Creek EA, 1998). Therefore, treatments that occurred in sagebrush/mountain shrub vegetation before 1970 are not part of the cumulative treated acres, because they are expected to have achieved pre-burn conditions. Since 1970, approximately 25,500 acres of non-forested vegetation have been treated using prescribed fire primarily. Cumulative acres treated in the sagebrush/mountain shrub vegetation group on the Forest for each alternative are displayed in the following table.

- *Table 4. 35 Cumulative Acres of Non-Forested Vegetation Treated and/or Wildland Fire by Alternative, by Decade.*

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 7R
Past & Present Treatments (Acres Treated)	25,500	25,500	25,500	25,500	25,500	25,500	25,500	25,500
Future Treatments (Acres Treated)	130,000	77,500	100,000	77,500	70,800	60,000	79,750	43,000[1]
Total Treatments (Acres)	155,500	103,000	125,500	103,000	96,300	85,500	105,250	68,500
Percent of Non-forested Vegetation Disturbed	14%	9%	11%	9%	9%	8%	10%	6%

1 3,000 acres have been added for wildfire acres burned.

Total treatments that include the addition of treatments of forested vegetation are also presented. Past and present treatments that include harvesting, mining, and prescribed fire total approximately 58,100 acres (See Table 3.18 and Chapter 3, Issue 5: Minerals). Most of these acres were treated in the sagebrush/mountain shrub vegetation group and have returned, or will shortly return, to pretreatment conditions, except on mined sites. An additional 37,500 acres of forested and non-forested vegetation have been affected by wildfires over the past thirty years (See Table 3.19 in Chapter 3). Approximately 3,000 acres burned in the sagebrush/mountain shrub vegetation group over the past ten years. Total cumulative acres that have been treated in all vegetation types on the Forest are shown for each alternative in the following table.

- *Table 4. 36 Total Cumulative Acres Treated in All Vegetation Types by Alternative.*

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 7R
Past & Present Treatments (Acres)	95,600	95,600	95,600	95,600	95,600	95,600	95,600	95,600
Future Treatments (Acres)	146,800	111,600	141,800	133,600	96,500	85,700	113,850	86,100
Total Treatments (Acres)	242,400	207,200	237,400	229,200	192,100	181,300	209,450	181,700
Percent of Forest Treated	22.0%	18.8%	21.5%	20.8%	17.4%	16.5%	19.0%	16.5%

Bureau of Land Management (BLM), Bureau of Indian Affairs, State of Idaho and private landowners have also treated areas of non-forested vegetation (sagebrush/mountain shrub vegetation) outside the Forest boundaries. Many acres have been converted to agricultural use and urban development. As much as 48 percent of the watersheds in the Interior Columbia River Basin show moderate to strong decline in sagebrush habitats (ICBEMP 1997). Alternatives that treat the most acres of sagebrush (Alternatives 1, 3 and 7) would have the greatest cumulative effect on decline of sagebrush habitats. Alternative 7R would have the smallest effect.

Most of the land adjacent to the Caribou National Forest boundaries is privately owned. Small amounts of state lands, BLM lands and lands owned by the Fort Hall Indian Reservation also adjoin the Forest boundaries (USDA FS Adjacency Analysis 2001). Land use includes farming, ranching, mining, recreation, wildlife habitat, and watershed uses. Private lands, currently used for farming practices, are unlikely to regain natural vegetation conditions in the foreseeable future. Some treatments in the sagebrush/mountain shrub vegetation group will likely occur on private lands in the future, but the amount of treatment is unpredictable. The BLM has reduced treatments in sagebrush in southeast Idaho because of the loss of sagebrush habitat from wildfires (Pellant, BLM, pers. comm., 2002). Approximately 100-400 acres of sagebrush/mountain shrub vegetation were treated in past years on lands surrounding the Caribou National Forest with prescribed fire. Approximately 400,000 to 500,000 acres of sagebrush habitat have burned on the Upper Snake River desert as a result of wildfires (Pellant, BLM, 2002). Future BLM treatments for the next three years that are in the planning stage amount to approximately 14,200 acres (Paris, BLM, 2002). Long-term treatments total approximately 32,000 acres over the next ten years (Paris, BLM, 2002).

Alternatives 6 and 7R may have a cumulative effect on achieving the historical range of variability of the sagebrush/mountain shrub vegetation group in the short term, because they trend this ecosystem toward an abundance of acres in the greater than 15 percent canopy cover density class that may be outside the historical range of variability. Biodiversity is expected to be less in these two alternatives.

Past, present and future grazing also has an effect on the rate of non-forested vegetation succession. Current range condition on some non-forested vegetation types may be a result of past historic grazing practices that have created steady or "stable" states in range condition (Laycock, 1991; Tausch, *et al*, 1993; Blaisdell, *et al*, 1982; Beaver Creek EA, 1998). When conditions of a stable lower successional state occur, response from changes in grazing pressure or even removal of livestock may not cause improvement. Even though a steady improvement of past rangeland conditions is occurring (Gruell, 1983), the DRFC in the sagebrush/mountain shrub vegetation types will take a longer period of time to achieve where rates of succession are affected by these conditions and could be considered a cumulative effect (See Issue 4, Livestock Grazing). No other cumulative effects on the sagebrush/mountain shrub vegetation group have been identified from treatments in any of the alternatives.

TALL FORB

In the Intermountain Region, approximately 50 percent of this type has been lost due to improper grazing. Since these types are generally at higher elevations, few sites are found on private land (USFS, 1996, PFC Assessment). In all alternatives, cumulative effects from treating tall forb communities that have been invaded with tarweed and other undesirable plants would result in increased watershed stability, reduced sediment and erosion, and increased site potential and productivity. Many tall forb communities were lost years ago in the Intermountain Region due to improper grazing practices, particularly sheep grazing (USDA-FS, 1996; Shiflett, 1994). However, most tall forb communities on the Forest, where potential still exists, indicate an improving or stable trend from past conditions and management (Field Notes, 2001 and 2002). Although few in acres, sites that remain in poor watershed condition, but have potential to support tall forb plant communities, will continue to experience soil loss and over time, may lose the potential for restoration to a tall forb vegetation community. Cumulatively, Alternatives 2, and 4 through 7R should improve the Tall Forb cover type by applying an adaptive approach to restore vegetation using research findings. No other cumulative effects have been identified for the Tall Forb cover type.

Irretrievable/Irreversible Effects

A net reduction in the number of sagebrush/mountain shrub acres in the greater than 15 percent canopy cover density class over the next ten years as a result of treatments could be considered an irretrievable effect in each alternative. Table 4.37 shows these effects for each alternative.

- *Table 4. 37 Changes in the Number of Acres in the Greater than 15 Percent Canopy Cover Density Class in Sagebrush/Mountain Shrub Vegetation Group After 1st Decade by Alternative.*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Change in Acres in >15% Canopy Cover Class After 1st Decade	59,200 Less	6,700 Less	29,200 Less	6,700 Less	No Change	10,800 More	8,900 Less	27,800 More

No irreversible commitments of non-forested vegetation resources were identified for any alternative.

In all alternatives, acres that have the potential to return to a tall forb cover type that remain untreated, or sites that have been invaded by tarweed or other undesirable plants, will continue to be outside the DRFC criteria. Loss of potential production and the contributions these sites make to watershed stability and species diversity would be considered an irretrievable effect. Over the long-term, as more sites are restored to the DRFC, or managed for watershed stability, these effects would be reduced.

Issue 4

Livestock Grazing

Analysis Scale: Forest-wide

Scale of Analysis:

Livestock grazing effects were analyzed at the forest-wide scale and include proposed treatments and utilization levels in each alternative for the planning period (10-15 years).

Issue Indicators:

♦**LG.1 Estimated suitable rangeland acres on the Forest.**
Baseline Indicator: 469,000 acres suitable for cattle
719,000 acres suitable for sheep (includes cattle acres)

♦**LG.2 Potential forage production for livestock on suitable acres**
Baseline Indicator: 420 million pounds (213,600 AMs) of forage available on suitable cattle range
625 million pounds (1,640,600 AMs) of forage available on suitable sheep range

♦**LG.3 Change in actual use based on current management**
Baseline Indicator: 71,707 Animal Unit Months (AUMs) of cattle permitted
37,441 Animal Unit Months (AUMs) of sheep permitted

♦**LG.4 Vegetation response to grazing**
Baseline Indicator: Current condition and trends (satisfactory or unsatisfactory on Forest).

Analysis Methods and Assumptions

Grazing animals affect plant and aquatic communities in several interrelated ways, including: plant defoliation, nutrient redistribution, and mechanical impact to soil and plant material through trampling. Forest Plan management direction for livestock grazing varies by alternative, direction for all alternatives has been developed to maintain or improve rangeland conditions on National Forest System lands. Direction occurs at both the forest-wide and Management Prescription Area levels.

As explained in Chapter 3, Issue 4: Livestock Grazing, the Forest Plan analysis is not a decision on grazing allotment carrying capacity. Implementation of the direction in the Plan, however, may result in changes to animal unit months (AUMS). These changes would be made at the site-specific level through several means, including allotment management planning, annual operating instructions, and actual use adjustments to comply with grazing standards. In this analysis estimations were made regarding the potential change in actual AUMs grazed due to the implementation of the alternatives. **These are estimates based on current livestock management efforts and are used solely to compare alternatives.**

LG 1 RANGELAND SUITABILITY

The Forest has analyzed acres that are suitable to grazing and browsing as required in 36 CFR 219.20 (1982 Planning Regulations as published prior to 2001). The background for and details of the process used are explained in Chapter 3-Livestock Grazing, Appendix B of this FEIS, and in the Project File.

The 1982 forest planning regulations require Forests to identify areas suitable for livestock grazing during the planning process. Areas identified as not suitable in this analysis would not necessarily be closed to grazing. Although an area may not be suitable for livestock grazing, incidental grazing can still occur. The forage produced on unsuitable acres would not be considered when determining the grazing capacity of an allotment, however. In some prescriptions, areas were identified where grazing would be phased out on an "opportunity basis[2]."

Some areas identified as not suitable at this time, such as deteriorated rangelands, could become suitable if resource conditions improve. Where occasional grazing of these areas does not conflict with other uses and resource objectives, it would not be necessary to physically prevent livestock access to the area, but no forage allocation would be made. In addition, site-specific analysis at the Allotment Management Plan level may determine that areas identified as "not suitable" in this process may be suitable, and vice versa. For additional information, see Appendix B, Issue 4: Livestock Grazing, Suitability Analysis.

LG 3 CHANGES IN ACTUAL USE BASED ON CURRENT MANAGEMENT

As discussed in Chapter 3, livestock allotment administration is not based solely on the numbers on the permit, it is also based on proper use of the vegetation. When forage utilization standards have been met, the livestock are moved. In this type of administration, livestock are managed to provide for the most limiting factor which is generally the riparian standards. This is based on livestock management by the permittee as well as environmental conditions. Since it is difficult to determine this at the programmatic level, assumptions were made to determine how the rangeland practices such as prescribed burning and the utilization standards would affect livestock levels. First and foremost, this analysis assumes that the permittees do not change their management level in response to the alternatives. For instance, the permittees would **not** increase their riding to keep livestock out of the riparian areas and lengthen the amount of time it would take to reach riparian standards. The potential reductions shown by this indicator are for comparative purposes only and would not change livestock grazing permits. The following discussion explains the assumptions for some of the "potential reduction factors".

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[2] **Opportunity** is defined as a suitable or favorable time close an allotment or area to livestock grazing because of nonuse violations, term permit waivers, resource protection, or permit actions resulting in cancellation of the permit. If opportunities do not arise, then efforts will be made to relocate or accommodate animals to other areas within the planning period.

Prescribed fire treatments using natural regeneration on sagebrush acres in the greater than 15 percent canopy cover class would not change understory composition on non-native sites. If treatments occur on crested wheatgrass sites, crested wheatgrass would naturally regenerate along with other highly competitive non-native species, such as alfalfa, that may still remain on the site. Native grasses and forbs would not be expected to reinvade the community to any great extent, due to the competitive nature of crested wheatgrass, which is capable of surviving fire (Curlew National Grassland FEIS, 2002).

Removing dense sagebrush canopy cover would stimulate understory production as additional moisture and nutrients become available. Any existing forbs in the understory could be lost as a result of prescribed fire treatments, because of the highly competitive nature of crested wheatgrass. Without treatment, the sagebrush overstory would become denser on crested wheatgrass sites, up to 30-40 percent (Bunting, *et al*, 1987). Moisture and other nutrients would not be available for understory vegetation. As a result, understory vegetation would become sparser and less vigorous and less productive.

Prescribed fire treatments on native plant communities would move them into an early seral stage. More annuals could be expected in the understory immediately after treatment. Individual plants of cheatgrass can be found scattered along disturbed sites on the Caribou. If cheatgrass is present in the existing vegetation prior to treatment, prescribed fire treatments could hasten its invasion into treated areas by removing herbaceous competition. By opening up the overstory, perennial forbs and grasses would appear within a year, depending on growing conditions. Forb species existing on-site at the time of treatment would reappear after treatment in greater densities and vigor with grasses germinating soon after. Over time, early seral species would gradually become sparser as the canopy cover increases over a twenty- to forty-year cycle. Production capacity would be weighed more heavily to the herbaceous layer until shrubs reestablished.

It is expected that treated mountain brush acres would respond similarly to sagebrush in native plant communities after treatment. By opening up the overstory, more annuals could be expected in the understory immediately after treatment. If cheatgrass is present in the existing vegetation prior to treatment, prescribed fire treatments could actually hasten its invasion into treated areas due to lack of herbaceous competition. Perennial forb and grass species would appear within a year, depending on germination and growing conditions. Forb species existing on-site at the time of treatment would reappear after treatment in greater densities and vigor with grasses germinating soon after. Over time, early seral species would gradually become sparser as the canopy cover increases over a 20 to 40 year cycle. Production capacity would be weighed more heavily to the herbaceous layer until shrubs reestablished.

As described in Chapter 4, Issue 3: Ecosystem Management, Non-Forested Vegetation Diversity, between 4,000 and 13,000 acres of sagebrush and mountain shrub vegetation would be treated annually using prescribed fire, depending on treatment proposals in each alternative. Nearly all of these acres are within grazing allotments and are capable and suitable for livestock grazing. To accomplish these treatments, livestock grazing practices would be adjusted.

Treatment areas that are burned must be rested from livestock grazing for at least one year prior to treatment to build an adequate amount of fine fuels to carry fire. After treatment (burning) these areas usually need at least a two-year rest from grazing during the growing season to restore plant vigor and ground cover. As a result, treated areas would likely not be grazed for at least three years. In some cases the areas that are burned may be lightly used or grazed as early as two years after a fire, but only if desired conditions from treatment are achieved. This time factor was used to calculate potential decreases in AUMs due to treatments. In addition, an assumption is made that 65 percent of the treatments proposed in each alternative would occur on cattle allotments and 35 percent would occur on sheep allotments, because of the vegetation types grazed by these domestic animals and the elevation where these vegetation types are found (Grows, pers. comm., 2001).

Prescribed burning would also occur in the forested ecosystems of the Forest. Depending on treatment proposals in the alternatives, between 1,740 acres and 4,990 acres will be treated. Treatment on these areas is not expected to significantly affect livestock grazing activities or available forage and these were not factored into this analysis.

EFFECTS OF FORAGE UTILIZATION STANDARDS ON LIVESTOCK GRAZING

To determine changes in AUMs by alternative, the forage use standards described in each alternative description in Chapter 2 were used. For Alternatives 4, 7, and 7R, the current version of the Caribou Riparian Grazing Implementation Guide was used. Alternatives that propose streambank trampling standards are likely to show more of a potential reduction. Streambank trampling standards are generally reached prior to reaching utilization standards. For example, less forage would be available in those alternatives with trampling standards, because livestock would be moved once the trampling standard was met, regardless of forage availability or use.

In general, sheep grazing is not affected greatly by riparian utilization standards. Typically, sheep are herded, graze areas "once over," and then leave. Utilization standards are rarely met in any one particular area because of frequent movement to fresher forage. Proposed riparian standards should result in fewer reductions in sheep AUMs than those expected for cattle.

The effects of grazing on vegetation and to the plant community development and processes are influenced and/or determined by many factors and their interrelationships. The impacts of livestock are determined by the control of a) when (season of use), b) where (distribution patterns), c) how long (length of grazing season), and d) how intensively (numbers of livestock) livestock graze vegetation on grazing lands (CAST, 2002). Some of the main factors are explained below. (Stoddart et al. 1975; FSH 2209.21, 1964.)

Kind of Animal

Each kind of grazing animal has certain characteristics that make them differently adapted to ranges of various sorts. These differences are reflected in the animal's use of the range and the influences of the range on how the animal grazes. Forage preferences of animals are a major influence on vegetation. Each kind of animal also has a different tolerance to poisonous plants and the toxin associated with different species. Generally the kind of animal grazed is determined by economic or cultural factors, not necessarily because it is the most biologically suited to a particular range.

Forage Preferences

Sheep and goats are considered to be browsers and will make more use of woody species. Sheep can eat large quantities of grass, but generally the grass must be young and green to be fully utilized. They prefer forbs more than any other kind of livestock and will actively select more "weedy" species. Cattle tend to be predominantly grass eaters or, grazers. In the fall they eat more shrubby species, such as willows and bitterbrush, particularly after the first hard frost. Broad leaf forbs are also taken with grass especially early in the season, but they are taken in smaller amounts and smaller numbers of species than what sheep will eat.

Grazing one kind of livestock over a long period of time can lead to an imbalance of grasses and forbs in the understory. Because cattle generally favor grasses over forbs, rangelands grazed by cows for long periods trend to a heavier proportion of forbs. Sheep, being more selective for forbs, can cause a trend to more grass production and less forb production and variety.

Within the categories of grasses and forbs, individual species may be more palatable and active sought by a particular animal. Their abundance and the number of times they are grazed will have an effect on the composition of the stand.

Topography

Sheep, because of their smaller size, sure-footedness, and climbing instinct can graze steeper topography than cattle. Herders usually control sheep bands and move them frequently to areas with fresh forage. Sheep are more likely to graze ridge tops and side slopes and only hit the bottoms of slopes for water or shading. They will bed on ridgetops with open visibility.

Cattle tend to graze lower slopes and avoid travel through rocky areas. They also like to congregate in cooler, flatter areas, such as meadows, canyon bottoms, or riparian areas where feed is abundant. Cattle are usually not controlled by riders and wander to areas that provide more of the plant species they prefer.

The use of a particular landscape is also influenced by the location and distance of water (such as in the valley bottoms or in springs on hillsides) and the availability of overstory vegetation for shade. Cattle generally will travel shorter distances to water than herded sheep. Herded animals often make better use of suitable ranges that are not connected because some animals are not very investigative.

Grazing Behaviors

Sheep have the ability to crop forage closely, but they nibble at vegetation. They do less damage to grass, because they prefer the leaves and not the stems or seed heads. If sheep are herded tightly, they have the potential to trample vegetation and compact the soil. If herded properly, sheep tend to cause less damage because of their smaller size.

Cattle graze with a pulling motion. If the soil is moist, cattle may actually uproot plants. Cattle can do more damage to grasses, because they eat the stems and seed heads. Cattle may cause greater soil disturbances, due to their larger size, especially on wet soils and hillsides. They are less damaging to timber plantations, however, because of their forage preferences.

Terracing on slopes by animals moving back and forth can affect soil movement and compaction. This can affect infiltration and vegetative growth.

Animals with young will generally travel less distance to feed and water especially early in the season when travel is difficult for young animals. Different age classes of animals will use the landscapes differently. Yearling animals (both cattle and sheep) tend to range much farther achieving more even use and distribution. Conversely, some animals tend to stay near areas they were raised and that are familiar to them.

Vegetation

Because of its ecological response to its environment, vegetation can be a very valuable indicator of grazing use, both by permitted livestock and wildlife. Historical use patterns will influence current conditions, trends, composition, plant vigor and seral stages. Plant succession changes under grazing will favor less desirable plants, and more bare soils may become apparent. Grazing of the desirable species first every year, or hardest every season, also gives a competitive advantage to the overstory at the expense of the herbaceous understory. Quality of forage may also suffer, because the most desirable species are usually those that are also highest in nutritive values. Actual forage production can decrease as understories disappear and woody shrubs become denser.

Large proportions of certain plants may also indicate overuse, such as weeds that are able to spread because of reduced competition. Other conditions of concern include the preponderance of plants of low palatability, the presence of few species, a high percentage of annual plants, and hedged shrubs.

Season of use can skew the composition to those plants that germinate later or to older (tougher) plants. Also, some plants are used when they are green and their foliage is tender but later in the season or during dry periods they may be passed over for tender or younger plants.

Invasive Plant Species

Ecological functioning and productivity are threatened by invasive plant species. Proper utilization levels should maintain vigorous plant communities that are able to compete with invading plants.

Nutrient Distribution

Selective grazing will change plant composition and plant proportions thereby affecting structure and function of plant communities. (CAST, 2002). Grazing can redistribute nutrients from areas grazed to areas used for resting and watering. However, few studies have been done on how livestock change these nutrient distribution patterns and the results are not well understood but it is closely tied to soil-water relationships. (Vavra, et al. 1994; National Research Council, 1994) Also, nutrient cycling can be speeded up by the faster breakdown of organic matter through digestion, making it more available for soil microorganisms. However, abiotic processes such as actions by wind, water and sunlight are also important to decomposition and a plant's exposure to these processes can be influenced by livestock use.

Summary

The factors described above can be linked in endless combinations. How the factors influence effects to soil and water from grazing animals increase the number of permutations. For all these reasons, grazing management is a site-specific decision and the effects best disclosed at that level. Utilization rates that are appropriate and sustainable will depend on the animal grazed, topography, climate, soil, water locations, nutrients, and other factors. Specific site characteristics must be considered for an understanding of the relationships involved. The estimates made for changes in cattle and sheep months for some of the suitability factors in Tables 4.44 and 4.45 are for comparative purposes only. Changes to management or some of the factors described above could easily change the conditions at a specific site.

As discussed previously, grazing can be prolonged through improved livestock management, such as daily riding to move livestock out of sensitive areas, salting strategically to improve distribution, or other management actions. These site-specific livestock management details are adjusted in the day-to-day management of allotments. **For this analysis, it was assumed that permittees would not change their management in response to stricter grazing standards.** Thus, the analysis may show a "worst case scenario." In other words, if on-the-ground cattle or sheep management is not adjusted, the permittees may have to reduce their use to meet standards and guidelines for other resources. In most instances, however, some of the AUMs "lost" can be regained with improved animal management.

Integrating professional resource knowledge with experience and science, and local monitoring of appropriate indicators or criteria is essential to understanding the effects of the livestock use levels. Local managers must then also be prepared to apply adaptive management where the effects indicate changes are needed to sustain the ecosystem and its processes and functions.

Direct and Indirect Effects Common to all Alternatives

LIVESTOCK GRAZING PROGRAM

The interactions of the grazing program with other resources are discussed in the direct and indirect effects for those resources. For example, fish, water, and riparian sections discuss effects from livestock grazing.

GRAZING PERMITS AND ADMINISTRATION

Livestock use and its associated activities are authorized under the Grazing Permit system. The authority to protect, manage, and administer National Forest System lands for range management is in accordance with the Terms and Conditions specified in Parts 1 through 3 of the term grazing permit issued for a specific allotment. Grazing administration responsibilities do not vary by alternative, because they are determined by existing policy (*FS Manual 2230, Term Grazing Permit Administration and FSH 2209.13, Grazing Permit Administration Handbook*) and annual budget priorities.

ALLOTMENT MANAGEMENT PLANNING

Proper livestock grazing generally depends on current and site-specific information about biophysical conditions, livestock numbers, timing and duration of use, livestock management practices, range development and improvement levels, and permittee responsibilities. These factors are not easily addressed at the programmatic level and the impacts from them are similar in all alternatives. Allotment management plans will continue to be updated following the schedule developed by the Forest in response to Public Law 104 (Recission Act). This is common to all alternatives.

RANGE IMPROVEMENTS

It is likely that the following structural improvements would be reconstructed within the first ten years of implementation of the Revised Forest Plan:

- 77 miles of fence
- 86 water troughs
- 10 miles of pipeline
- 125 ponds
- 1 corral

The total estimated cost for these improvements is approximately $842,000.

Capable Rangelands

Chapter 3—Livestock Grazing and Appendix B of this FEIS discuss the capability analysis and determination done for the Plan revision. A forest-wide map at the 1:250,000 scale was developed that shows lands that are capable for livestock grazing; this map is available in the Project File. The Rangeland Capability analysis determined that 719,000 acres on the Forest are capable of supporting sheep grazing on a sustained basis, and 469,000 acres are capable of supporting cattle grazing on a sustained basis.

Rangeland capability is no longer used to determine livestock permit numbers. Existing permits have an established number of livestock and a defined season of use that was determined over time with effectiveness monitoring. Any adjustments in livestock numbers will continue to be based on short- and long-term monitoring. Capable lands are lands that meet biophysical criteria and can sustain lifestock use over the long-term (See Appendix B-Livestock Grazing for Capability criteria and model outcomes).

Suitable Rangelands

The following land areas were considered NOT SUITABLE for livestock grazing in all alternatives:

- Research Natural Areas identified by Management Prescription 2.2;
- Developed recreation sites identified by Management Prescription 4.1;
- Pocatello Municipal Watershed identified by Management Prescription 2.1.3;
- Portions of the Mill Creek and Elkhorn watersheds that have been closed to grazing until watershed restoration goals are achieved.
- Mining reclamation areas that show unacceptable selenium levels are considered NOT SUITABLE for SHEEP only.

Direct and Indirect Effects that Vary by Alternative

LG 1 RANGELAND SUITABILITY

Rangeland suitability "represents the integration of rangeland capability and the appropriateness of grazing livestock on an area, considering such things as economics, social concerns, and grazing compatibility with other uses." Suitable rangelands are defined as capable lands that can support sustained grazing and that are allocated to grazing use, based on decisions related to social, economic, or environmental choices and uses foregone. Suitable acres are established to provide prescriptive management direction for project-level analyses and subsequent site-specific environmental decisions. Suitable acres may vary by alternative, depending on the emphasis of the alternative (See Appendix B-Livestock Grazing for a description and outcome determination of rangeland suitability). The following two tables, 4.38 and 4.39, display rangeland suitability by alternative and vegetation type. As discussed previously, capable acres do not change by alternative.

Except for Alternative 6, the suitable acres do not vary significantly between alternatives. They do vary, however, in response to localized issues and concerns identified in the analysis process (See Appendix B). Acres determined to be unsuitable would not necessarily be closed to livestock grazing either physically or administratively. They would not be counted when determining overall grazing capacity. In some cases, unsuitable acres would be closed to grazing or fenced. This would be determined on a site-specific basis and would vary by alternative. For instance, in Alternative 6 Yellowstone and Bonneville cutthroat trout stronghold watersheds would not be suitable for grazing. This would remove large portions of several allotments from the forage base. This reduction in available forage may make grazing the entire allotment impractical. Again, this would be determined on a site-specific basis. For this programmatic analysis, overall acres and forage associated with those acres are displayed. It is likely, however, that in Alternative 6, there would be significantly fewer cattle and sheep grazing on the Forest than in any of the other alternatives.

In Alternative 7R, grazing would be phased out on an opportunity basis in two areas determined to be unsuitable. These are Elk Valley Marsh and St. Charles Creek. Grazing would be eliminated through fencing or another method when an opportunity arises such as through permit waivers, transfer to another allotment, etc. This phase-out on an opportunity basis was used very successfully on the Targhee National Forest to close sheep allotments in the grizzly bear management units (Caribou-Targhee National Forest Plan Monitoring and Evaluation Reports 1997-1999 and 2000-2001). In Alternative 5, livestock grazing would be phased out of the Scout Mountain area.

- *Table 4. 38 Suitable Cattle Acres by Vegetation Type and Alternative.*

Alternative	Potential Acres	Aspen/ Conifer	Aspen/ Maple	Aspen	Douglas-Fir	Grass/ Sagebrush	Juniper	Mahogany	Maple	Mountaint Brush	Riparian
Capable Acres[1]	**469,162**	**64,839**	**7,293**	**91,094**	**61,481**	**199,595**	**1,769**	**5,725**	**12,466**	**21,433**	**4,113**
Suitable Acres											
Alternatives 1 through 3	460,303	64,744	7,242	89,925	59,543	196,067	1,659	5,625	11,949	20,162	3,387
Alternative 4	407,942	59,056	6,835	79,109	50,800	172,159	1,433	5,408	10,933	19,390	2,819
Alternative 5	401,051	58,830	6,835	77,734	50,395	168,876	1,433	5,278	10,671	18,734	2,265
Alternative 6	255,269	32,067	6,784	53,192	30,306	100,729	1,376	4,912	10,202	14,725	976
Alternative 7	452,251	64,259	6,835	88,790	58,778	192,200	1,651	5,331	11,527	20,027	2,853
Alternative 7R	452,621	64,278	6,835	88,792	58,835	192,232	1,651	5,367	11,751	20,027	2,853

1 Capable acres do not change between alternatives.
2 These acres are estimates based on GIS analysis and there may be variation in the acres due to the mapping and tabulation process.

- *Table 4. 39 Suitable Sheep Acres by Vegetation Type by Alternative.*

Alternative	Potential Acres	Aspen/ Conifer	Aspen/ Maple	Aspen	Douglas-Fir	Grass/ Sagebrush	Juniper	Mahogany	Maple	Mountaint Brush	Riparian
Capable Acres[1]	**718,745**	**97,436**	**13,255**	**132,934**	**107,032**	**295,379**	**4,587**	**11,752**	**20,009**	**32,218**	**4,143**
SuitableAcres[2]											
Alternatives 1 through 3	701,942	97,269	13,144	131,150	103,346	287,715	4,350	11,354	19,096	30,496	4,022
Alternative 4	630,160	89,320	13,144	115,969	89,083	257,111	4,043	11,261	17,692	29,190	3,347
Alternative 5	621,256	88,895	13,144	114,364	88,410	252,925	4,043	10,999	17,341	28,396	2,739
Alternative 6	403,149	47,411	13,052	79,387	55,282	155,153	3,831	10,289	16,329	21,223	1,192
Alternative 7	693,115	96,909	12,599	129,867	102,360	283,615	4,330	10,897	18,746	30,340	3,452
Alternative 7R	694,066	96,945	12,599	129,837	102,625	283,694	4,330	11,027	19,180	30,340	3,452

1 Capable acres do not change between alternatives.
2 Suitable acres for sheep also include all suitable acres for cattle.
3 These acres are estimates based on GIS analysis and there may be variation in the acres due to the mapping and tabulation process.

LG2: POTENTIAL FORAGE OUTPUT ON SUITABLE RANGE

The tables below show the potential forage output and associated available animal unit months (AUMs) for each alternative. Table 4.40 shows the vegetation community types used for this analysis and the pounds of potential forage produced on those types (Hironaka, *et al*, 1983).

The next table, Table 4.41, shows the suitable acres by livestock type and alternative along with the total forage production on those acres expected each year.

Table 4.42, shows the expected annual forage output in terms of animal unit months. These figures assume uniform use of all of the vegetation. For instance, in Alternative 1, the allowable utilization rate is 55 percent of the total production. If all of the acres suitable for cattle in Alternative 1 were grazed to 55 percent, there would be 213,632 AUMs available. If all of the acres suitable for sheep in Alternative 1 were grazed to 55 percent, there would be 1,640,639 sheep months available (328,127 AUMs). Because all acres suitable for cattle are also suitable for sheep, the latter number represents the total available forage for livestock in Alternative 1. These figures are shown for all alternatives in Table 4.42 below. All alternatives have the potential to produce more forage than needed for the number of livestock currently permitted on the Forest, **if uniform use could be achieved.**

The final table in this section, Table 4.43, displays the forage available for wildlife in each alternative, along with an estimate of the capacity for big game animals. For this analysis, acres capable for sheep grazing were used. The calculations involved two sets of acres and forage production for each alternative: 1) range that is capable but not suitable and 2) suitable range. All of the forage produced on the acres capable but not suitable for sheep was allocated to wildlife. For the suitable acres, allowable utilization for wildlife is whatever was not allocated to livestock. The wildlife capacity estimate is very conservative, for the following reasons:

- The forage production figures are based mainly on herbaceous forage species for cattle and do not include the browse species utilized by wildlife.

- Acres used are those considered capable for sheep. Many of the acres not considered capable for sheep would be capable for wildlife species.

- Allowable utilization for wildlife is whatever was not allocated to livestock: 45 percent in Alternative 1 and 55 percent in Alternatives 2 through 7R. Since livestock will not use the vegetation uniformly and will actually consume much less than is shown by this indicator, the amount left for wildlife will be far greater than shown.

- Livestock will be moved when the use levels are met, regardless of the animal species that has used the vegetation. That is, if elk graze 20 percent of the forage in a meadow prior to livestock entering an allotment, the livestock will only be able to remove another 25 percent before the 45 percent standard is met. Thus, if wildlife graze an area prior to livestock, the forage available to them will be greater than shown in these estimates.

- *Table 4. 40 Potential Production by Community Type.*

Community Type	Forage Production Potential (Pounds per Acre per Year)
Aspen	1,041
Aspen/Conifer	805
Aspen/Maple	1,016
Douglas-fir	655
Grass/Shrub (Sagebrush)	937
Juniper	440
Mahogany	710
Maple	990
Mountain Brush	1,052
Riparian	1,750

- *Table 4. 41 Potential Forage Production Output by Alternative.*

Alternative	Suitable Acres		Total Forage Production in Pounds	
	Cattle Range	Sheep Range	Cattle Range	Sheep Range
Alt 1	460,303	701,942	419,495,065	626,425,756
Alt 2	460,303	701,942	419,495,065	626,425,756
Alt 3	460,303	701,942	419,495,065	626,425,065
Alt 4	407,942	630,160	367,116,042	569,066,965
Alt 5	401,051	621,256	361,119,499	555,495,370
Alt 6	255,269	403,149	233,684,494	342,921,492
Alt 7	452,251	693,115	411,678,569	624,896,221
Alt 7R	452,625	694,066	412,010,585	625,761,005

- *Table 4. 42 Potential AUMs Based on Potential Forage Production on Suitable Acres and Utilization Rates in Each Alternative.*

Alternative	Suitable Acres		Total Forage Production in Pounds per year		Upland Forage Use Rate	Potential Output in animal months** (based on uniform use)	
	Cattle	Sheep	Cattle	Sheep		Cattle	Sheep
Alt 1	460,303	701,942	419,495,065	626,425,756	55%	213,632	1,640,639
Alt 2	460,303	701,942	419,495,065	626,425,756	45%	174,790	1,342,340
Alt 3	460,303	701,942	419,495,065	626,425,065	45%	174,790	1,342,340
Alt 4	407,942	630,160	367,116,042	569,066,965	45%	152,965	1,219,429
Alt 5	401,051	621,256	361,119,499	555,495,370	45%	150,463	1,190,347
Alt 6	255,269	403,149	233,684,494	342,921,492	45%	97,369	734,832
Alt 7	452,251	693,115	411,678,569	624,896,221	45%	171,533	1,339,256
Alt 7R	452,625	694,066	412,010,585	625,761,005	45%	171,671	1,340,916

** Potential Capacity measured as Cow/Calf Month (1,080 lbs./mo) or Ewe/Lamb Month (210 lbs./mo)

- *Table 4. 43 Estimated Herbaceous Forage Potentially Available for Wildlife on Capable Sheep Range by Alternative.*

Alternative	# of forage available for wildlife on capable sheep range	Forage available to wildlife shown as[1]:			
		Animal Months	Antelope Months	Mule Deer Months	Elk Months
Alt 1	311,812,354	288,715	3,464,580	2,309,720	721,787
Alt 2	437,454,930	405,050	4,860,610	3,240408	1,012,625
Alt 3	437,455,245	405,051	4,860,610	3,240408	1,012,625
Alt 4	463,266,385	428,950	5,147,400	3,431,600	1,072,375
Alt 5	469,373,600	434,605	5,215,260	3,476,840	1,086,512
Alt 6	565,031,848	523,177	6,278,124	4,185,416	1,307,942
Alt 7	438,143,219	405,688	4,868,256	3,245,504	1,014,220
Alt 7R	437,754,065	405,327	4,863,924	3,242,616	1,013,317

1 The amount of forage consumed by a domestic cow/calf pair for one month (1080 pounds of forage). To convert to the wildlife species shown: Antelope months = (AM * 12); Mule Deer months = (AM * 8); Elk months = (AM * 2.5) (Hironaka, *et al*, 1983).

LG3: CHANGES IN ACTUAL USE BASED ON CURRENT MANAGEMENT

Tables 4.44 and 4.45 below display potential reductions in AUMs based on the various management activities in each alternative. See Appendix B—Livestock Grazing for more information on how the calculations were made.

- The potential change in AUMs for cattle varies greatly among alternatives. Alternative 6 has the potential for the greatest decrease in AUMs for cattle. Alternative 5 could have the next greatest impact, followed by Alternative 4. Alternatives 7 and 7R are similar with fewer potential impacts to cattle AUMs than Alternatives 4, 5, and 6.

- The potential change in AUMs for sheep does not vary greatly between alternatives except for Alternative 6; which would likely have a significant reduction due to native cutthroat stronghold streams being unsuitable for grazing.

- *Table 4. 44 Estimated Potential Change in Current Cattle Animal Unit Months (AUMs) based on current management by Alternative.*

Potential Reduction Factor	Potential Loss of AUMs							
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt.6	Alt. 7	Alt.7R
Existing AUMs	**71,707**	**71,707**	**71,707**	**71,707**	**71,707**	**71,707**	**71,707**	**71,707**
Riparian and Upland Use Criteria	0	2,208	205	7,791 to 12,756	9,034 to 14,606	14,387 to 14,784	7,791 to 12,756	7,791 to 12,756
Winter Range Rx 2.7.1, 2.7.2	0	0	0	906	733	757	410	410
Recreation, Unique Ecosystems (Unsuitable)	0	0	0	0	3,857	3,857	2,207	2,207
Nonfunctioning/303d listed streams (Unsuitable)	0	0	0	5,225	5,225	5,225	0	0
Prescribed burning	5,070	3,023	3,900	3,023	2,761	2,340	3,110	1,555
Yellowstone and Bonneville strongholds (Unsuitable)	0	0	0	0	0	20,407	0	0
Existing AUMs minus potential lost AUMs	66,637	66,476	67,602	49,797 to 54,762	44,525 to 50,097	24,337 to 24,734	53,224 to 58,189	54,779 to 59,744
Percent Change from Existing	**-7%**	**-7%**	**-6%**	**-24% to –31%**	**-30% to 38%**	**-65% to -66%**	**-19% to –26%**	**-17% to –24%**

- *Table 4. 45 Estimated Potential Change in Current Sheep Animal Unit Months (AUMs) based on current management by Alternative.*

Potential Reduction Factor	Potential Loss of AUMs							
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt.6	Alt. 7	Alt.7R
Existing AUMs	**37,441**	**37,441**	**37,441**	**37,441**	**37,441**	**37,441**	**37,441**	**37,441**
Riparian and Upland Use Criteria	0	320	0	517	517	1,199	517	5217
Winter Range Rx 2.7.1, 2.7.2	0	0	0	517	517	517	517	517
Recreation, Unique Ecosystems (Unsuitable)	0	0	0	0	0	0	0	0
Nonfunctioning/303d listed streams (Unsuitable)	0	0	0	5,225	0	0	0	0
Prescribed burning	2,730	1,627	2,100	1,627	1,487	1,260	1,005	520
Yellowstone and Bonneville strongholds (Unsuitable)	0	0	0	0	0	19,216	0	0
Existing AUMs minus potential lost AUMs	34,711	35,494	35,341	34,780	34,920	15,249	35,402	35,904
Percent Change from Existing	**-7%**	**-5%**	**-6%**	**-7%**	**-7%**	**-59%**	**-5%**	**-4%**

Alternative 1

This alternative could result in an estimated potential reduction of 7 percent of existing AUMs for cattle and 7 percent of existing AUMs for sheep, based on the reduced number of suitable acres, upland and riparian utilization levels, and the effects of the annual vegetation treatments proposed in this alternative.

Alternative 2

This alternative could result in an estimated potential reduction of 7 percent of existing AUMs for cattle and 5 percent of existing AUMs for sheep, based on the reduced number of suitable acres, upland and riparian utilization levels, and the effects of the annual vegetation treatments proposed in this alternative. Many of the problems identified in the issues are a problem with livestock distribution.

This alternative proposes vegetation treatments on 7,750 acres per year in the sagebrush and mountain brush types. Treatments could include fire, herbicides, or other treatment methods. Seedings would be permitted depending on the ecological needs. Implementing the treatment cycles and the standards to protect other resources could have an effect on permitted numbers. If treatments were to occur only on suitable acres, and livestock could not be moved to other suitable acres, then a temporary reduction would be necessary. The amount and length of the temporary decrease in AUMs would be site-specific to allotments where treatments would occur and would be determined at the time of the treatments.

Implementing standards to protect other resources, such as mining operations, riparian areas, and wildlife habitat could also have an effect on livestock AUMs. Reductions would likely occur in areas where cattle or sheep could not be redistributed to other suitable lands. A reduction in cattle AUMs would be expected, because cattle tend to congregate in riparian zones and on the bottoms of slopes. Sheep AUMs are less likely to be affected, because sheep can be herded to new locations once utilization standards are reached. Herding can also be used to avoid areas undergoing vegetation treatments.

Alternative 3

This alternative could result in an estimated potential reduction of 6 percent of existing AUMs for cattle and 6 percent of existing AUMs for sheep, based on the reduced number of suitable acres, upland and riparian utilization levels, and the effects of the annual vegetation treatments proposed in this alternative.

In the short term, AUMs would be suspended on a temporary basis wherever proposed vegetation treatments were to occur. The length of the suspension would depend on the type of treatment, how many suitable acres were being treated, the kind of livestock affected by the treatment, the condition of the vegetation being treated, and how long recovery takes to achieve a desired condition. About 10,000 acres are proposed for treatment each year. Treatments could include fire, herbicides or other methods, seedings of forage producing plants, and installation of structural developments. Similar to Alternative 2, vegetation treatments would be emphasized in sagebrush and mountain brush cover types. Treatments in other cover types would be permitted on a site-specific basis.

Over time, vegetation treatments could be expected to increase forage production, which could lead to an increase in grazing, because production increases would be allocated to permitted livestock in this alternative. Any temporary reduction of AUMs would depend on whether treatment proposals would include seedings to desired non-native plant species that are more productive than native sites (Curlew FEIS 2002) and the number of suitable acres treated.

Alternative 4

This alternative could result in an estimated potential reduction of 24 to 31 percent of existing AUMs for cattle and 7 percent of existing AUMs for sheep, based on the reduced number of suitable acres, upland and riparian utilization levels, and the effects of the annual vegetation treatments proposed in this alternative.

Alternative 4 focuses on accelerating restoration of vegetation cover types to maintain or improve ecosystem processes and functions. About 7,750 acres would be treated each year, mainly in the sagebrush and mountain shrub cover types. Other non-forested cover types could be treated after site- specific analysis. Treatments could include the use of fire, herbicides, and other methods.

In the short term, AUMs would be suspended on a temporary basis wherever vegetation treatments were to occur. The length of the suspension would depend on the type of treatment proposed, how many suitable acres were being treated, the kind of livestock affected by the treatment, the condition of the vegetation being treated, and how long recovery takes to achieve a desired condition. The amount of AUMs affected would depend on whether treatment proposals would include seedings to desired non-native plant species that are more productive than native sites (Curlew FEIS 2002) and the number of suitable acres treated.

Any potential reduction would depend on a redistribution of livestock to other available suitable acres. Temporary reductions would likely occur in areas where cattle or sheep could not be redistributed to other suitable lands or on particular allotments that do not have other suitable acres available for redistribution of livestock. Overall, a reduction of AUMs is likely in this alternative as suitable acres undergoing vegetation treatments are removed from the grazing base, temporarily.

Alternative 5

This alternative could result in an estimated potential reduction of 30 to 38 percent of existing AUMs for cattle and 7 percent of existing AUMs for sheep, based on the reduced number of suitable acres, upland and riparian utilization levels, and the effects of the annual vegetation treatments proposed in this alternative. About 7,080 acres in the sagebrush and mountain brush cover types are proposed for treatment annually. Treatment methods include fire, herbicides, or other methods. Seedings could also be used to meet ecological needs.

Additionally, about 2,570 acres of aspen and mixed conifer would be treated through fire, harvest, thinning or other methods. Conflicts between livestock grazing and recreational users would be mitigated for recreation in this alternative. Livestock grazing would be phased out of the Scout Mountain area on the Westside Ranger District. Upland utilization standards are the same as Alternative 4.

The assumptions and reasons for these potential changes are the same as discussed in Alternative 4.

Alternative 6

This alternative could result in an estimated potential reduction of 65 to 66 percent of existing AUMs for cattle and 59 percent of existing AUMs for sheep, based on the reduced number of suitable acres, upland and riparian utilization levels, and the effects of the annual vegetation treatments proposed in this alternative. Approximately 2,570 acres of conifer and aspen are proposed for treatment annually using fire, thinning, harvest or other methods. About 6,000 acres of sagebrush and mountain brush cover types are proposed for treatment each year in this alternative.

This alternative has the highest potential reduction for both cattle and sheep. This is primarily because native cutthroat stronghold watersheds would not be suitable. Because of this, a significant portion of the forage base would not be allocated to livestock. While there would still be enough forage available if uniform use could be achieved, that is not likely. In addition, this alternative has the most stringent riparian standards which would result in reductions based on current livestock management.

Alternative 7

This alternative could result in an estimated potential reduction of 19 to 26 percent of existing AUMs for cattle and 5 percent of existing AUMs for sheep, based on the reduced number of suitable acres, upland and riparian utilization levels, and the effects of the annual vegetation treatments proposed in this alternative. This alternative could propose for treatment about 3,410 acres of aspen and conifer lands annually with the use of fire, harvest thinning or other methods. In addition, it would also treat 7,975 acres of sagebrush and mountain brush annually with fire, herbicides or other methods. Seedings could be used to meet ecological needs.

The upland use rate is the same for this alternative as it is for Alternatives 2 through 6, 35 percent to 45 percent. This, by itself, would probably not result in any decrease in permitted numbers because the suitability analysis showed there was available forage to support permitted numbers of livestock. A decrease in AUMs could come from distribution problems causing standards for other resources to be met before the livestock use standards are met forcing a livestock move from the unit they are in. For example, riparian standards on the greenline or streambank could be met before upland utilization standards within the same unit thereby forcing all the livestock out of that unit. In this alternative, allowable use levels will vary by stream reach so potential reductions would be based on site specific analysis.

Reductions could be required to meet the aspen restoration targets but in the short term. As the aspen suckers become established and the understory more productive, these areas would become available for livestock. These reductions would be temporary and localized.

Alternative 7R

This alternative is similar to Alt 7 but was developed in response to public comments received from the Draft Forest Plan. It features adaptive management. It would treat about 4610 acres of conifer and aspen each year and 4000 acres of sagebrush and mountain brush annually with fire, herbicides or other methods. With increased staffing or budget, however, there is a potential for more acres to be treated. This alternative could result in an estimated potential reduction of 17 to 24 percent of existing AUMs for cattle and 4 percent of existing AUMs for sheep, based on the reduced number of suitable acres, upland and riparian utilization levels, and the effects of the annual vegetation treatments proposed in this alternative.

The upland utilization rate of 35 to 45 percent is the same as it is for Alternatives 2 through 7. The reasoning and assumptions behind the effects are the same as for Alternative 7.

LG 4: UPLAND VEGETATION RESPONSE TO GRAZING

Alternative 1

According to current trend surveys, it appears that most upland sites are on an upward or stable trend. The level of grazing proposed in Alternative 1 would be expected to continue that trend. Conditions of upland non-forested and riparian vegetation will remain mostly static, but individual sites may show a slow rate of improvement when compared to all other alternatives. Upland herbaceous vegetation trends will show slow improvements in species composition, from species of lower seral status to species of higher seral status. Livestock grazing utilization of fifty to sixty percent usually provides only for maintenance of the most desirable herbaceous plant species. Upland non-forested browse species are likely to improve under this alternative because the allowable utilization would be light to moderate and range from thirty-five to forty-five percent.

Where introduced species are present, these sites will probably continue to support these species, because many of them have special adaptations (rhizomes or bulbs) that make them extremely competitive against native vegetation. It will take mechanical disturbances, in some cases, to change the amounts of non-native vegetation present, particularly on seedings.

Changes to specific cover types would not change except as a result of the treatments. Treatments in aspen, Douglas-fir, sagebrush, and mountain brush, especially would probably see an increase of more desirable vegetation.

For effects of livestock grazing on riparian vegetation see Issue 6.

Alternative 2

Alternative 2 would be expected to have less of an impact on vegetation than Alternative 1, because the upland livestock utilization rate on herbaceous vegetation is 10 percent less overall (45 percent) versus the 55 percent utilization level proposed in Alternative 1. Utilization levels in Alternative 2 should allow sites with an upward trend to continue recovery at a slightly faster rate than Alternative 1. On sites displaying a stable trend, an upward trend could result, but in all likelihood, these sites have crossed a threshold and will remain stable until a catastrophic event, such as fire, or human interference, such as herbicide use, causes a change to the stable state (See Chapter 3 – Livestock Grazing, condition and trend).

For effects of livestock grazing on riparian vegetation see Issue 6.

Alternative 3

The difference between Alternative 3 and Alternative 2 depends on how many suitable acres are grazed at the 45 percent upland utilization rate and how many suitable acres are grazed at the 55 percent utilization level. Areas where a 45 percent or less utilization level is applied would be expected to achieve recovery and desired conditions at a slightly faster rate, particularly on sites that are currently in an upward trend. Areas where a 55 percent utilization level is applied could be expected to occur at a rate similar to what is expected in Alternative 1. No changes would be expected on those sites that are showing a stable state regardless of the utilization level applied, because these sites have likely passed a threshold that requires some kind of natural or human intervention. Sites that have passed the threshold are hard to identify unless soil losses can be established. Sites that have reached a stable state, because of the current level of grazing, could start to move in an upward trend if the 45 percent or lower utilization rates were applied. If the 55 percent utilization rate is applied, no changes in trend would be expected, and the effects would be similar to Alternative 1.

For effects of livestock grazing on riparian vegetation see Issue 6.

Alternative 4

The difference between Alternative 4 and Alternative 2 depends on how many suitable acres are grazed at the 45 percent upland utilization rate and how many suitable acres are grazed at the 55 percent utilization level. Areas where a 45 percent or less utilization level is applied would be expected to achieve recovery and desired conditions at a slightly faster rate, particularly on sites that are currently in an upward trend. Areas where a 55 percent utilization level is applied could be expected to occur at a rate similar to what is expected in Alternative 1. No changes would be expected on those sites that are showing a stable state regardless of the utilization level applied, because these sites have likely passed a threshold that requires some kind of natural or human intervention. Sites that have passed the threshold are hard to identify unless soil losses can be established. Sites that have reached a stable state, because of the current level of grazing, could start to move in an upward trend if the 45 percent or lower utilization rates were applied. If the 55 percent utilization rate is applied, no changes in trend would be expected, and the effects would be similar to Alternative 1.

Restoration activities that open forest canopies in the aspen and mixed conifer cover types could result in improved composition and productivity. As a result, livestock distribution could improve, particularly in areas that have forced livestock into smaller areas due to succession and the corresponding understory changes as acres move toward older, denser stands. Better distribution and more even grazing could result in more vigorous understories.

For effects of livestock grazing on riparian vegetation see Issue 6.

Alternative 5

Effects to upland vegetation would be similar to Alternative 4. For effects of livestock grazing on riparian vegetation see Issue 6.

Alternative 6

With a reduction in livestock numbers and the continued emphasis on restoring natural ranges of variation to various cover types, understory vegetation would be expected to improve in composition and vigor in this alternative. Ground cover would increase from less use, and bare soil would be reduced. Trends would be expected to continue moving upward, and in some cases, trend would probably even accelerate. Where treatments are occurring, vegetation types in a stable trend would be expected to move in an upward trend as disturbances stimulated regeneration and production. Because native cutthroat stronghold watersheds would not be suitable in this alternative, some of stable trends may also show an upward trend. As with other alternatives, however, many of these sites would not improve if they have crossed a threshold (see Chapter 3).

For effects of livestock grazing on riparian vegetation see Issue 6.

Alternative 7

Effects are similar to those discussed in Alternative 4. For effects of livestock grazing on riparian vegetation see Issue 6.

Alterntaive 7R

Effects are similar to those discussed in Alternative 4 except that with the potentially fewer treatments, the understory improvements would be about half of that expected. For effects of livestock grazing on riparian vegetation see Issue 6.

Cumulative Effects

Livestock grazing on the Caribou National Forest has been a historical and traditional use since before 1900. During the last ten years, actual use by grazing animals has remained relatively constant, but total permitted use has decreased by about 7 percent over the last ten years due to permit reductions for nonuse and resource protection. It is expected that a grazing program within the range described in each of the alternatives will remain in effect on the forest for at least the next ten years.

OFF-FOREST CONSIDERATIONS

Suitable acres and Available AUM's

Many ranchers depend on allotments administered by the Forest Service, Bureau of Land Management (BLM), and State of Idaho Department of Lands to provide a portion of their year-round grazing operations. Discussions with range managers in the BLM indicate that the livestock grazing program is generally stable in southeast Idaho, with the exception of the Malad area where a few decreases are being made (Gunther and Smith, pers comm. 2002).

In the mid-1990's Resource Advisory Committees were given the charge to develop grazing standards for BLM managed lands. This resulted in the "Idaho Standards for Rangeland Health and Guidelines for Livestock Grazing Management" adopted in 1997. The agency is now assessing allotments for rangeland health and implementing these standards. Subsequent monitoring could lead to more changes in permitted livestock numbers.

The State of Idaho also indicated that their program is largely static in this part of the state (Brammer, pers. comm., 2002). State lands within federal grazing allotments are generally authorized for use through an agreement with the federal agency unless they are fenced. Changes in capacity are usually through negotiations with the federal agency when livestock use adjustments are made on the allotment. Leased state lands outside federal allotments are evaluated on resource conditions prior to new leases being issued. These also have been static in southeast Idaho.

Conditions and trends of grazing vegetation

The landscape of southeastern Idaho has been shaped over the past 150 years by agricultural activities. Many acres of native sagebrush steppe have been converted to farmland or used for housing and industry. One need only look at the expansion of the Idaho Falls and Pocatello townsites to see the urban spread into prime landscapes formerly depended upon by wildlife and subsequently grazing livestock and then farmers for crop production. In 1997 Crowley and Connelly did an in-depth study of trends on agricultural lands in Clark and Fremont Counties in Idaho and Beaverhead County in Montana. The results indicate that at least in the Idaho counties, rangeland and pastureland on farms has decreased while harvested cropland has gone up. In Clark County, farmland rose from 80,892ha (199,881acres) in 1954 to 146,709ha (362,514 acres) in 1987. Fremont County showed less of a change although harvested cropland increased to 42 percent of the farmland. "The proportion for range and pastureland on farms has decreased slightly in Fremont and Beaverhead counties and significantly in Clark County up to 1992." Livestock numbers have decreased largely due to declines in sheep numbers (Crowley and Connelly, 1997).

Many acres of native sagebrush steppe have been converted to farmland or used for housing and industry. The remainder of the native rangelands has been grazed by livestock for over a century (See Chapter 3 - History of Livestock Grazing). In the early days of domestic livestock grazing, utilization levels were excessive and could not be sustained. In the dry climate of southeastern Idaho, recovery from past abuses is slow. In the early 20th century, permitting systems were enacted on federally owned land. These established limits on the number, season, and kind of livestock grazing allowed. The permitted livestock numbers were much lower than previously during the "open range" era. In the 1950s and 1960s most Forest Service allotments underwent substantial reductions to further reduce impacts from grazing. Many allotments also were substantially reduced in the 1970s and 1980s again. In some areas of the Caribou-Targhee National Forest, current permitted use is less than 20 percent of estimated use at the turn of the 20th century. This trend is similar on other federal and state-owned lands in the Snake River Plain (Camas Creek Landscape Analysis 1996; Beaver Creek EA 1998; Forest Range 2210 and 2230 Files).

Even with substantially fewer livestock grazing public lands now, the improvement trend is slow in arid climates. Most riparian systems can recover relatively rapidly from excessive use due to access to more moisture. In upland vegetation, however, improvement is slow and in some areas no longer possible without drastic management intervention. Heavy grazing also speeds up the rate of sagebrush domination on a site and can reduce fine fuels to the point that fires cannot be carried. Three-tip sage (*Artemisia tripartita*), an aggressive native, has become established in many areas that were previously dry-farmed and then abandoned. Thus, there have been extensive changes in the ecosystems of southeast Idaho in the past. Combined, these have reduced the quality of native rangelands available for plant and wildlife species as well as human uses. Some of the most productive and healthy native rangelands in the area are found on federal lands. (See Chapter 3, History of Livestock Grazing and Rangeland Vegetation Cover Types, Seedings for activities on rangelands.)

INTERACTIONS WITH OTHER PROGRAM AREAS

Livestock grazing affects or potentially affects numerous other resources and uses which also occur in conjunction with livestock grazing. Other resources and uses include; but are not limited to dispersed recreational activities, wildlife and fisheries habitat, riparian and upland vegetation and soils health and function, aesthetic values, and ranch (permittee) viability. The effects of livestock grazing on other resources are displayed in those sections in the FEIS and will not be repeated here.

Irretrievable/Irreversible Effects

Rangeland Suitability

Acres that are identified as “not suitable” in each of the alternatives would be irretrievably lost to livestock grazing until suitability is redetermined at some point in the future. These acres would not be irreversibly lost, because a new suitability analysis could make them suitable at some point in the future.

Potential Forage Production on Suitable Acres

Potential forage production on acres identified as not suitable or capable would be irretrievably lost to livestock grazing. This forage is not irreversibly lost, however, since it could be used if the areas were determined to be suitable at a later date.

Potential Change in AUMs based on Current Management

The loss of AUMs due to displacement from proposed treatments in each alternative would be irretrieveably lost to livestock grazing until such time as treatment sites recover to allow grazing. The loss of AUMs due to riparian and upland utilization levels proposed in each alternative would be irretrieveably lost unless utilization levels are changed. No irreversible effects have been identified.

Upland Vegetation Response to Livestock Grazing

No irretrievable effects have been identified. Historic grazing may have affected vegetation to the point where plants have crossed a threshold and are now on another successional pathway. Achieving the historical successional pathway may not be possible, and this would be considered an irreversible effect. Sites where successional pathways may be altered are unknown at this time.

Issue 5

Minerals Operation, Reclamation and Associated Hazardous Substances Management

Scale of Analysis: Forest-wide

Abstract:
The minerals program is somewhat different than other Forest Service resource programs. Program activity is almost completely in response to proposals that come from non-Forest Service sources. The Forest Service is responsible for administrating operations to help ensure compliance with applicable laws and regulations and with approved plans of operation, and the processing of new requests for proposed projects. The Forest Service is also responsible for working with the Bureau of Land Management (BLM) and other agencies regarding phosphate mine plan approvals and other leasing actions. The number of proposals received and the number of operations that must be administered is not related to Forest Service budget levels. Worldwide and local economics play a major role in the number of proposals received in any given year, as do the presence of both known and unknown mineral deposits on the Forest.

Issue Indicators:

No comprehensive issue indicators exist for this issue; however, different management direction approaches (prescriptive or adaptive) have been developed which show some differences between Alternatives. These approaches are explained in the following section of the EIS. Another somewhat useful indicator is the potential for reduced mineral activity in Inventoried Roadless Areas (IRAs), because of limited future road construction/reconstruction associated with adoption of the National Roadless Initiative direction in some of the alternatives.

Analysis Methods and Assumptions

Numerous laws, regulations and policies govern the disposal and administration of mineral resources on National Forest System (NFS) lands. The revised Forest Plan will follow and comply with applicable laws and regulations, regardless of whether they are Forest Service regulations or those governing the actions/responsibilities of some other agency, such as the Bureau of Land Management (BLM), as they relate to NFS lands. This will not change by alternative.

Clean-up or removal actions associated with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), including any necessary clean-up or remediation of hazardous substances from phosphate mining-related activities, are outside the scope of the Revised Forest Plan and are not subject to the direction contained in the Revised Plan. One non-time-critical removal action has been initiated using Forest Service CERCLA authority. However, an additional agreement may be successfully negotiated in an

"Administrative Order on Consent" (AOC) to conduct a National Contingency Plan (NCP) compliant "site investigation and Engineering Evaluation and Cost Analysis (EE/CA). No remedial or removal activities are included in the AOC. These activities will be negotiated subsequent to the completion of the site investigation and EE/CA. Seven other sites remain to be investigated.

The National Pollution Discharge Elimination System regulates releases of hazardous substances from mine sites in surface and groundwater, and the Environmental Protection Agency (EPA) administers its permitting process. Mines will not be permitted to "release" hazardous substances without permission and permit from the EPA. Mines will develop management practices to eliminate the release of hazardous substances. Monitoring will be used to determine if management practices are effective in the control of hazardous substances. The use of non- or low-selenium accumulating plants in reclamation and the placement of thick caps of non-seleniferous materials over waste rock containing Se should help keep Se concentrations within advisory levels. Monitoring will occur to evaluate the effectiveness of these measures. If they are not adequate, additional measures will be required.

PHOSPHATE MINING AND RECLAMATION

Rights granted to the lessees through lease issuance remain the same through all of the proposed alternatives. Appropriate site-specific environmental analyses are conducted prior to any developmental activity on any of those leases. The Forest Service will continue to make recommendations to the BLM concerning such proposed activities. The BLM will make the final decision and issue the required approvals, including mitigation measures to be applied to the leased lands for that project. The Forest Service will continue to issue Special Use Permits for mine-related, off-lease disturbances. Changes in Forest Service regulations [36 CFR 251.54] preclude the permanent storage of hazardous materials on Forest Service Special Use Permits. Permanent overburden waste rock storage facilities will no longer be permitted on Special Use Permits.

Individual phosphate mining companies in southeast Idaho determine which leases will be mined and the sequence for development of those leases. The Forest Service and BLM anticipate that overall phosphate mining and production in southeast Idaho will continue at about current rates or slightly increase during the planning period as reserves in the southeastern U.S. start to become depleted.

A possible phosphate lease/mine development scenario for the Forest during the planning period, irrespective of the Forest Plan Revision alternative selected, would include the following, recognizing that timing and development sequence are not determined by the Forest Service:

- The J.R. Simplot Company will probably continue to use their phosphate slurry line and mine their leases at the Smoky Canyon Mine, including the Manning Creek lease, through the planning period.

- Agrium will probably continue mining on their Central and North Rasmussen Ridge leases.

- Monsanto, which is currently shifting their mining operations from the Enoch Valley Mine to their south Rasmussen Ridge leases, will probably continue to mine their south Rasmussen Ridge leases and continue to use their existing office, shop, and phosphate rock handling facilities at the Enoch Valley Mine.

- Astaris will probably continue to mine at their existing Dry Valley Mine.

Based on the above scenario, phosphate mining related activity could disturb as much as 1,600 acres of previously unmined National Forest System (NFS) lands during the planning period covered by this Forest Plan revision. The disturbed areas that could be reclaimed would receive reclamation treatment according to the approved mine/reclamation plan, in order to meet the identified post-mining land uses. Other resource activities at active mine sites, including mine sites receiving reclamation treatments, would be limited. Livestock grazing, recreational activities, vegetation treatments, and other management activities would probably not occur until reclamation was complete and the reclaimed lands released to multiple use management. Soil erosion would be greater on newly disturbed and reclaimed sites than on the pre-disturbed lands for a few years until the reclamation is complete. Lands that had timber stands prior to mining would not be restored to timberlands for a considerable length of time. The visual characteristics of the landscape would be changed and would generally be noticeable for many years. Wildlife habitat on mining disturbed lands would change for a number of years. The precise delineation of all of these potential, future site-specific impacts is beyond the scope of this programmatic EIS, but they have been, are being, or will be detailed in the site-specific environmental analyses that precede any mining developments.

Precious Metals and Other Locatable Minerals

Locatable mineral activity will probably continue at about current rates. Several placer mining claims in the Caribou Mountain area will probably continue to receive some minor gold prospecting, including panning, small suction dredging, and possibly some small sluicing operations. The panning and restricted, small suction dredging activities occur in stream channels, with some minor, short-term effects to the aquatic resources. Sluice box operations are required to have settling basins located away from streams to help keep sediment out of the stream. These kinds of operations are expected to have only minor impacts to the aquatic resources. McCoy Creek, Barnes Creek, Anderson Creek, Bilk Creek and Iowa Creek and their southern tributaries are likely to be the only stream systems impacted by these activities. The existing restrictions on panning and suction dredging activities would continue, unless modified through subsequent environmental analyses (or possible withdrawals associated with Alternative 7R), under all alternatives.

Operating plans for mining claims outside the Caribou Mountain area are not anticipated for any other metal mining or exploration operations within the Caribou NF during the planning period. Should any proposals be made, site-specific environmental analysis would be completed, and proposals would be required to be consistent with existing laws and regulations, and standards and guidelines in the Revised Forest Plan.
A development proposal is pending for the perlite deposit located on patented mining claims (private surface and mineral rights) within the Forest boundary in the Wrights Creek area north of Malad City. Under the proposal, perlite would be mined on private land and hauled

across a very short section of NFS land. This operation would continue to be evaluated under any alternative in the Forest Plan Revision. Perlite production from unpatented mining claims on the Forest in the Wrights Creek area is not anticipated during the planning period.

GEOLOGICAL RESOURCES

PALEONTOLOGICAL RESOURCES

Generally, only surface disturbing activities that encounter bedrock or weathered bedrock would impact fossil resources. Exceptions include fossils of more recent geologic age that may be contained in unconsolidated sediments or those found in a cave environment. Activities most likely to disturb fossils include mining, road construction, construction of buried pipelines and other utility lines. Loss of fossil resources through erosion, vandalism, and illegal collecting would probably continue at about current rates under any alternative. Scientific paleontological research also is expected to continue under all alternatives.

Phosphate mining destroys fossils, because of the extent of disturbances and the large size of the earth-moving equipment used for ore extraction. Some of the fossils destroyed could be of rare and scientifically significant vertebrates. Surveying for fossils in the phosphate mines is difficult, because of the safety concerns associated with large mining equipment, blasting, and the potential for rock fall. Undoubtedly, most fossils uncovered during phosphate mining would be destroyed or buried in pit backfill or in external overburden dumps. This loss is irretrievable and irreversible in most cases.

Prior to surface-disturbing activities where the geology of the area indicates caves or vertebrate fossil remains may be present, surveys and mitigation measures will generally be used to help protect these unique resources from accidental damage. This does not vary by alternative.

Effects Which Vary by Alternative

MINERAL RESOURCES

Because the level of mining is expected to remain about the same in each alternative, the formulation of meaningful measurement indicators is difficult. Any alternative selected in the Plan revision will not change the laws or regulations governing minerals management, nor will the selected alternative determine the number of proposals received or operations needing administration.

A major difference between alternatives from a minerals perspective is in the application of management prescriptions. In all alternatives, except Alternative 6, an adaptive approach is taken to the reclamation of disturbed lands related to phosphate operations. Alternative 6 uses a prescriptive approach.

Alternatives 1, 2, 3, 4, 5, 7, and 7R

Changes have been and are being made to past operating procedures for phosphate mining activities since the 1985 Forest Plan was written, and the discovery that selenium (Se) was leaching from some phosphate mining disturbances in southeast Idaho. (See discussion in Chapter 3, Hazardous Substance Release from Phosphate Mining-Related Disturbances.) New management practices are being developed and evaluated for their effectiveness. These practices include the greater salvage of suitable topsoil, greatly increased volume of pit backfill (with the resultant reduced volume of material in external overburden disposal areas), changes in reclamation plant seed mixes, and capping of overburden disposal areas and pit backfill with thick coverings of non-seleniferous materials. Monitoring of runoff and discharged surface and groundwater will be used to measure the effectiveness of these and future management practices. Designed covers, in addition to the practice of placing thick barriers of non-seleniferous materials between the run of mine wastes and the rooting material used to host the reclamation, are being monitored for inclusion in a list of acceptable management practices[3], based on performance.

Based on what is known and the best science and technology available, management practices for mining and reclamation have been developed and are being implemented. Future research and expanded monitoring and testing will improve the available information and understanding regarding impacts to surface resources. This information will help determine the best methods to eliminate the releases and/or accumulation of hazardous substances. As understanding increases, management practices will be refined, modified, and implemented to keep current with the best science and technology available. This is the adaptive approach. Some current management practices and mitigation measures are displayed in management prescription 8.2.2 and in the Forest-wide standards and guidelines in the Revised Forest Plan.

In addition to the continual refinement of management practices based on monitoring and evaluation, site-specific environmental analyses are required prior to implementation of any new mining proposals. This will help identify important site-specific conditions that could determine which Management Practices to use and how they should be employed. Continued monitoring and evaluation may demonstrate the need to modify or change the management practices being used.

[3] **Management practices** as used in these alternatives may or may not be designated by State and Federal agencies as Best Management Practices (BMPs).

Alternative 6

Alternative 6 would use a "prescriptive" approach to phosphate mining and reclamation mitigation measures. This approach would incorporate specific mining/reclamation methods or procedures into Forest Plan direction. If future monitoring, studies, and evaluations indicate better methods for reclamation or mining, the use of these new methods could require an amendment to the Revised Forest Plan prior to their implementation. These Standards and Guidelines would be used until the Plan was amended, even if new information demonstrates that they are not effective in meeting Clean Water Act requirements. Also, this alternative may violate the Clean Water Act regulations to select new Best Management Practices (BMPs) if the initial BMPs are not effective since that change would require a Plan amendment. Although many of the management prescriptions are the same, or very similar to those used in the adaptive approach, a few significant differences exist.

The prescriptive approach, based on public comments, would require the complete backfilling of all pits with no permanent external overburden dumps. The "swell" factor (expansion of rock material volume as it is broken up and removed from its in-place condition) may make placement of all overburden waste material back into mined out pits very difficult, if not impossible (BLM and USFS, 2000). All of the shales and mudstones that might contain Se and other hazardous substances would be placed back into the pits, above the water table, and then capped with non-seleniferous material. This would require the separate handling and rehandling of the different overburden rock types, with associated temporary storage sites for these rocks, if they could not be directly placed back into a mined out pit, possibly requiring a greater surface disturbance (BLM and USFS, 2000).

The determination that these prescriptive measures would be successful in controlling or reducing selenium and other metal discharges has not yet been established through monitoring efforts. The Final EIS prepared for the Dry Valley Mine, South Extension Project (2000) displays the **projected** water quality impacts of the proposed mine plan and alternatives. Based on the impact models used, complete pit backfill, which at this mine would still require one permanent external overburden dump, has greater projected Se concentrations in the water level leaving the site than some of the other less costly alternatives (BLM and USFS, 2000). Meeting State and/or Federal water quality standards for mining sites may not require such extensive and costly procedures, nor will such measures guarantee compliance with applicable state and/or Federal water quality standards (BLM and USFS, 2000). The handling and re-handling of very large volumes of overburden waste rock and material could greatly increase the cost of mining. Handling and re-handling the overburn material would promote more rapid oxidation of the rocks, which is the first step necessary for the release of Se and other potentially hazardous metals. Requiring the placement of all overburden waste material back into the pits would limit or prevent the use of concurrent reclamation, since all external overburden dumps theoretically would be temporary in nature and as shown in the Dry Valley Mine Final EIS and the Smokey Canyon Mine Panels B and C Final Supplemental EIS (BLM and USFS, 2000; BLM and USFS, 2002).

The prescriptive approach, as currently developed through public comments on the Revised Forest Plan Draft EIS, also requires using seventy-five percent native species in reclamation seed mixes. Because native species may require more time and are generally more difficult to re-establish, it is very possible that increased soil erosion from disturbed areas would occur. Reclamation vegetation may be established quicker using a seed mix with a lower percentage of natives and higher percentage of desirable non-native species. Some native plant species could be selenium accumulators, which is not a desirable attribute for phosphate mining reclamation.

The prescriptive approach involves a liability issue. By establishing a rigid framework of "standards" proposed in this alternative, which are currently unproven in preventing the release of hazardous substances, and requiring industry's compliance with these standards, the Federal government may become partially liable if those measures fail and releases occur. Considerable costs to federal taxpayers could be incurred for the remediation of hazardous substance releases. Part of the Forest Service's oversight responsibility is to reduce the risks of financial or other liability to the Federal government and the American people.

PHOSPHATE LEASING

Alternatives 1, 2, 3, and 7R would not preclude further consideration for the future leasing of approximately 14,000 acres of unleased Known Phosphate Lease Areas (KPLAs) and/or possible other areas that contain unknown phosphate resources. Access to the unleased KPLAs, including about 8,000 acres located in Inventoried Roadless Areas, would be required if exploration drilling and future development were permitted. Lands placed in Management Prescription 8.2.2 do not have road density restrictions. When a phosphate lease is issued, it grants the lessee rights of reasonable access to the lease.

Alternatives 4, 5, 6, and 7 incorporate the prohibitions on road construction and reconstruction contained in the Roadless Area Conservation Initiative. About 8,800 unleased KPLA acres lie within IRAs. Since exploration and mining of the phosphate deposits would require road construction or reconstruction, the Forest Service would be required to recommend against future leasing in the IRAs in Alternatives 4, 5, 6, and 7.

This direction to recommend against phosphate leasing in IRAs in Alternatives 4, 5, 6 and 7 could cause a conflict with the BLM's leasing regulations. The BLM is the agency authorized to issue Federal phosphate leases. The BLM is required to consider the conservation of mineral resources and the economical and efficient recovery of phosphate as part of a logical mining unit [43 CFR 3516.2]. The greatest possibility for conflict would occur when an existing lease inside an IRA needs to be modified to prevent the bypass or waste of minable phosphate reserves. This scenario is likely to occur in Alternatives 4, 5, 6 and 7, because nearly 10,800 acres of **existing** phosphate leases are located inside IRAs, and the need for the BLM to modify leases, once the deposits are more completely characterized, is very common.

Alternative 7R would allow development of existing phosphate leases and possibly unleased KPLAs even if they lie within IRAs. Road construction and/or reconstruction would be necessary for development of the leases and unleased KPLAs if leased. Roads constructed for phosphate exploration or mining are not public roads and would be reclaimed. In these cases, road densities would not be applicable to these activities.

If mining occurs, roadless area characteristics or values on these leases and surrounding lands could be disturbed to the extent roadless characteristics are destroyed until reclamation vegetation has completely re-established.

PRECIOUS METALS AND OTHER LOCATABLE MINERALS

No withdrawals from mineral entry under the general mining laws are proposed in Alternatives 1 through 7, and the entire Forest, except three small existing withdrawals, would remain open to mineral entry (staking of claims), exploration and development of locatable minerals.

In Alternative 7R about 7,000 acres of the 22,800-acre Caribou Mountain recreational/interpretive historical area may be withdrawn from mineral entry, subject to valid existing rights to help protect the interpretive, historical, and recreational values of the area and other surface resources. This means that no future off-claim prospecting/exploration or staking/filing of mining claims would be allowed under the 1872 mining laws in those areas that are withdrawn.

Direction in the Revised Forest Plan allows public panning and limited, small suction dredging in these areas to continue at about present levels. If/when existing mining claims or private inholdings in these proposed mineral withdrawal areas become available, they would be acquired and/or allowed to lapse, and then the area would be withdrawn, potentially allowing recreational panning and possibly suction dredging on those previously claimed areas, as well. The potential costs to the Forest Service for these kinds of acquisitions are unknown. The precise areas that could be withdrawn have not been determined, but they will include some of the highest known potential for locatable mineral activity or occurrence on the Forest. This area contains many historical evidences of early gold mining activities that could be used for future interpretive opportunities.

ABANDONED MINED LANDS

Existing, abandoned, open mine adits, shafts, and prospects will continue to be inventoried. Testing for environmental concerns, such as the release of acid rock drainage or dissolved metals, will occur to see if remedial action is necessary. However, because of the general calcareous and alkaline nature of the rocks and soils on the Forest, such discharges are not expected. If potential physical human safety concerns exist, such as dangerous or unsafe open shafts or adits, the mines could be closed to human entry. These closures would probably include grates that prevent human entry, yet allow continued air flow and access to bats and other small animals that use this limited habitat type.

Closure of existing dangerous openings to human entry would continue under all alternatives. Because installation of the closures usually requires road or motorized trail access, it may be that some of these abandoned, open adits and/or shafts would not be closed in Inventoried Roadless Areas in Alternatives 4, 5, 6, and 7, if gaining access to the site required road and/or motorized trail construction or reconstruction or the reopening of closed motorized access routes.

SALABLE MINERALS

Current levels of use for sand, gravel, and stone are expected to continue throughout the planning period. In Alternatives 1, 2, 3, and 7R undeveloped sources, such as York Creek, could be developed after the appropriate environmental analyses are completed, even in Inventoried Roadless Areas. Alternatives 4, 5, 6, and 7 could preclude the development of future sand, gravel, or stone resources in Inventoried Roadless Areas, because road construction or reconstruction would not be permitted in these areas. Overall, this would generally be considered a somewhat minor impact, because other sources of these materials are generally available; however, the cost to the Forest Service, State, Counties, and other users of transporting these materials from a more distant source to a work project could significantly increase in Alternatives 4, 5, 6, and 7.

OIL/GAS AND GEOTHERMAL RESOURCES

Because of the existing regulations governing oil/gas leasing, no leases will be issued prior to the completion of additional environmental analyses. Decisions regarding availability of lands for oil and gas leasing or actual leasing decisions will not be made in any of the alternatives in this Forest Plan Revision. No lands are proposed for withdrawal from oil/gas leasing in any of the Forest Plan Revision alternatives.

Because of the low development potential and general lack of interest in geothermal resources on the Forest, no exploration or leasing applications are anticipated during the planning period. Geothermal leasing and/or exploration are not prohibited, nor are leasing withdrawals proposed in any of the alternatives. Any leasing or exploration proposals for geothermal resources would have to be preceded by the appropriate site-specific environmental analyses.

Leasing lands for oil, gas, or geothermal resources in Inventoried Roadless Areas may not be permitted in Alternatives 4, 5, 6 or 7, because of the restrictions associated with adopting the Roadless Area Conservation Initiative in these alternatives. Although not a significant concern for the immediate future, new discoveries, reduced foreign oil supply, and/or higher prices for these energy resources could create potential problems or conflicts in the future. The Environmental Assessment for oil/gas leasing prepared by the BLM and the Caribou NF (BLM, 1988) indicates several IRAs contain lands classified as having a high potential for the discovery and/or presence of oil/gas reserves. (Also see Appendix R.)

The Caribou NF was not identified as a priority area or Forest in the National Energy Plan or the Forest Service Energy Implementation Plan (See discussion in Chapter 3, National Energy Plan). Completing an environmental analysis for oil and gas leasing on the Forest is not considered a high national or regional priority for the Forest Service at this time.

GEOLOGICAL RESOURCES

Paleontological and Cave Resources

Because road construction or reconstruction in Inventoried Roadless Areas (IRAs) is prohibited in Alternatives 4, 5, 6, and 7, less potential exists for direct impacts to either fossil or cave resources in these alternatives. Limited access in this case would probably result in fewer people in these areas. A reduction of impacts to fossils and caves, particularly from illegal collection or vandalism, could be expected, even though the reduction of incidences would be minor. Conversely, fewer people in these areas also may result in fewer new discoveries of caves or fossil localities. Depending on the type of fossils present, collection for purposes of preservation and scientific study may not be possible in some cases without road access.

Cumulative Effects

MINERAL RESOURCES

Phosphate

The cumulative effect on the phosphate resource is the depletion of the reserves in southeast Idaho. Phosphate reserves in the eastern Idaho portion of the Western Phosphate Field, which includes those on the Forest, have been estimated at about one billion tons of phosphate rock (Gulbrandsen and Krier, 1980), although not all of these reserves would be economically recoverable under existing technologies and prices. At the current mining rate of about six million tons/year, reserves in the Idaho portion of the western field could last in excess of 100 years, well beyond the expected life of the existing processing facilities.

Several factors affect the development potential for reserves in the Western Phosphate Field including, but not limited to, the quality and quantity of reserves in a given area; presence or lack of infrastructure to accommodate mining/processing/transportation; environmental costs/constraints for development of limitations of current technologies; world-wide demand for phosphate products; and geologic/topographic constraints where reserves are located.

Because of these factors, all of the reserves in the Western Phosphate Field will never be mined. Existing reserves and leases in southeast Idaho appear to be adequate for continued production at current rates into the foreseeable future, although an individual mining company, based on the number and location of their undeveloped leases, may not be viable beyond the planning period. In the distant future, the phosphate resource in southeast Idaho, and throughout the world, will be depleted, causing effects that are not quantifiable. The market supplied by the phosphate operations in southeast Idaho appears to be relatively stable at this time, and overall production rates are projected to remain relatively constant throughout the planning period.

Impacts of phosphate mining on other resources are discussed in other resource sections in the EIS.

Irreversible/Irretrievable Commitment of Resources

MINERAL RESOURCES

PHOSPHATE

The assumption is made for this analysis that phosphate mining and production will continue through the planning period at about current levels. Based on that assumption, about fifty- to sixty-million tons of phosphate rock would be consumed for the production of fertilizers and elemental phosphorus products in the next decade. The mining and hauling of the ore to load-out facilities at the mines could consume about six million gallons of diesel fuel per year (Forest Service and BLM, 1997). The consumption of these resources and products would be irreversible and irretrievable.

Irretrievable losses of soil, vegetation, livestock grazing, recreation opportunities and wildlife habitat will occur as a result of phosphate mining. Most of these losses will be for five to thirty years. One hundred to two hundred years may be required for the replacement of mature timber stands. If pit highwalls remain after mining, they would not return to pre-mining conditions for hundreds or even thousands of years.

GEOLOGIC RESOURCES

Paleontological resources (fossils) are a non-renewable natural resource. Any fossils destroyed by mining or other surface –disturbing activities, erosion, and/or vandalism would be irreversibly lost.

Issue

6 Watershed, Riparian, Water Quality and Aquatic Habitat

Issue Indicators:

♦**R.1** **Watershed Integrity** as defined in the Inland West Watershed Initiative (IWWI) and measured by percent of watersheds disturbed by alternative.

♦**R.2** **Riparian Condition** measured as relative protection by alternative.

♦**R.3** **Water Quality** measured as relative protection by alternative

♦**R.4** **Fish population viability** based on probability of persistence over the long-term[4]

Introduction

When determining if watershed processes are functioning properly, the condition of the entire watershed is evaluated, including the uplands, riparian/wetland areas, and associated drainage systems. The entire watershed can influence the quality, quantity, and stability of downstream resources by regulating production of sediment and nutrients, influencing streamflows and groundwater recharge, and influencing the distribution of chemicals throughout the entire system.

Water plays a part in all physical and biological processes. It is essential to the actions that have developed the Earth's surface as we know it. When precipitation falls, it separates into three components: that which immediately evaporates, that which runs off the ground surface, and that which infiltrates into the ground. Stream channels are fed from two sources: overland follow to a channel and groundwater emerging at the channel boundary. During non-storm periods, all flow in channels is derived from emerging groundwater (Leopold, 1994).

Watershed and riparian/wetland health refers to the ecological status of vegetation, geomorphic and hydrologic development, along with the degree of structural integrity exhibited by the watershed and associated riparian area. The riparian area, in this context, consists of the riparian and/or wetland zone, the associated stream channel or drainage system, aquatic and terrestrial habitat, and water quality. A healthy watershed and riparian area is in dynamic equilibrium with the incoming water and outgoing water and sediments.

[4] **Long term** is considered to be 15 to 100 years.

In a healthy condition, the watershed and associated riparian area can adjust to handle changes in precipitation events and associated runoff with minimal disturbance of the watershed and riparian values (Prichard 1998). Therefore, the entire system is analyzed, including overall watershed function and health, riparian, and in-channel processes. Activities that can substantially affect these systems are analyzed by alternative.

The desired future condition, which is applicable to all alternatives, is to restore or maintain watershed, riparian, and channel processes functioning at their potential. Potential, in this context, is defined within the inherent physical and biological capabilities of the system, given any social, political, and exo-physical constraints. (See Management Prescription 2.8.3 in the Revised Forest Plan for a comprehensive list of DRFCs.) It is not possible to "shut down" the Forest and re-establish pre-European settlement conditions. Impacts from human activities have and will continue to influence watershed function and processes to one degree to another.

Geomorphologists, such as Rosgen (1996), have defined channel systems and evolutionary processes, including the type and condition a channel should be in within a given setting. However, other influences, such as grazing, hydroelectric and irrigation diversions, mining, and roads may affect the actual channel type and condition that would be realistically achievable within a given setting. For example, a road may encroach on a stream channel, reducing its potential to meander across the valley bottom. In this setting, the channel type that is achievable may be very different than what would normally exist if the channel were allowed to meander freely across the valley. In this context, "potential" may be a different or lesser condition than would exist if the system was "natural" and normal watershed processes were allowed to occur unconstrained. (Current watershed conditions are described in Chapter 3, Issue 6.) To this end, the desired future condition of a particular site may be the maintenance of a less desirable condition within the realm of an achievable "potential." This is not to say or imply that lesser conditions are appropriate or even desired. The best achievable condition will be the "desired" condition and will vary by watershed, riparian area, and stream channel.

Riparian Properly Functioning Condition (PFC) (Pritchard, 1998) is used by the Forest Service as an indicator of a desired condition within riparian areas the Forest wants to achieve and maintain. PFC is used as a tool to assess the existing condition of the riparian area and track the changes over time. However, properly functioning condition of riparian areas and stream channels may not necessarily be an end in itself. For example, a stream/riparian area that is functioning properly may not contain appropriate water quality to maintain beneficial uses or meet habitat quality needs for aquatic species. In these instances, the desired condition may be something different than PFC. Desired future conditions will vary between streams and will be assessed and identified in conjunction with proposed projects and plans, such as Allotment Management Plans for livestock grazing. Desired conditions for a specific stream may be a vegetation seral state, water quality standard, aquatic or wildlife habitat feature(s), channel stability rating, condition rating, channel geomorphic feature(s) or some combination of these conditions. The application of PFC in the Revised Forest Plan is described in the Goals, Objectives, Standards and Guidelines.

Groundwater is an integral part of watershed and riparian/wetland health. Hydrogeology is the study of ground water with particular emphasis given to chemistry, migration modes and relationships to the geologic environment. Groundwater hydrogeology within the Forest has not been thoroughly evaluated, although some specific studies have been completed (See Chapter 3). Nationally, the majority of water used for domestic, agriculture, municipal, and industrial purposes has come from streams and lakes primarily. However, the use of groundwater is increasing both nationally and regionally.

Groundwater has several advantages over surface water. These include: reduced occurrence of pathogenic organisms; more constant temperatures; improved turbidity and color; relatively constant chemical compositions; and more constant supplies, especially within larger aquifers (Davis and DeWeist, 1966). For these reasons, many municipalities within southeast Idaho use groundwater almost exclusively for municipal water supplies. The maintenance of clean groundwater is as important as the maintenance of surface water quality. For this reason, those areas identified by the State as domestic use groundwater source areas will be protected according to the goals, objectives, standards and guidelines within the Forest Plan which incorporate Clean Water Act direction. For evaluation purposes, it is assumed that activities affecting surface water may also affect groundwater, but to a lesser degree because of the buffering mechanisms of the soils and subsurface geology. Conversely, measures needed and used to protect surface water will also be applicable to the maintenance of groundwater. Therefore, the term "water quality" will apply to both surface and subsurface waters.

Analysis Method

Basic resource protection will be incorporated into all land disturbing activities that have the potential to affect watershed, soil, water, riparian, and aquatic resources. Guidance is in the form of specific Goals, Objectives, Standards and Guidelines found in each of the prescription areas in the Revised Forest Plan. Some of these protective measures are mandatory. For example, the Forest must comply with the Clean Water Act. Other measures are general in nature and may not necessarily be applicable to all areas. Additional site-specific NEPA analysis is required before any land-disturbing activity can take place. This provides opportunities to identify and minimize or mitigate direct, indirect, and cumulative environmental effects that cannot be determined at the larger, more programmatic, analysis scale of this EIS.

The Forest's water resources have been specifically identified by the public as an area of concern. The health and well being of watersheds, riparian and aquatic resources are a goal common to all alternatives. Some alternatives address the issue with more stringent measures than others, but all alternatives reflect a common commitment to protecting and, where needed, improving the riparian and aquatic resources.

Components of the Inland Native Fish Strategy Environmental Assessment, known as INFISH, have been integrated into all the alternatives. Some alternatives supplement

INFISH direction by providing, for example, additional livestock grazing standards and guidelines. Impacts of timber harvesting on watershed and stream channel stability, as well as riparian and aquatic system function and quality, are addressed through the Idaho Forest Practices Act (IDL, 1992) and subsequent Memorandums of Understanding (USDA-FS, 1994), and other applicable guidelines and direction. Mining impacts are specifically addressed in each mine's operating plan, as well as specific Goals, Objectives, Standards and Guidelines in the revised Forest Plan. BMPs for Mining in Idaho (Idaho Department of Lands, 1992) and other sources are integrated into this direction. Impacts of grazing are specifically addressed in allotment management plans and annual operating instructions.

Natural disturbances, such as wildfire, drought, floods, and windstorms can occur at any given place or time. It is impossible to predict when or where these events may occur; therefore, these events and their effects cannot be readily analyzed at this programmatic level. These disturbances will not be a part of this analysis. If and when these events occur, their effects will be analyzed with ongoing activities at the time they occur. General effects to watershed, riparian and water quality resources from the following programs are described for:

- Timber Harvest
- Livestock Grazing
- Road Disturbances
- Recreation Management
- Minerals Management
- Watershed and Aquatic Restoration
- Fire and other Treatments

Effects Common to All Alternatives—Watershed and Riparian

Resource protection requirements outlined in 36 CFR, Section 219.27 include: conservation of soil and water resources; protection of streams, streambanks, wetlands, and other bodies of water; provide for and maintain diversity of plant and animal communities to meet overall multiple-use objectives; and provide special attention to riparian areas and floodplains, and do not allow management practices to cause detrimental changes in water quality.

Resource protection has been integrated into soil, water, watershed, riparian, and aquatic management direction at various scales, from broad to site-specific. This direction would result in maintaining or improving these resources and affected beneficial uses. Land management activities on federally managed lands are conducted only after appropriate site-specific environmental analysis has been conducted. This provides opportunities to identify and minimize direct, indirect, and cumulative environmental effects that cannot be specifically determined or analyzed at the large scale of this EIS. Appropriate Best Management Practices (BMPs) and mitigation measures will be applied at this point. For example, timber harvesting activities will include BMPs outlined in the Idaho Forest Practices Act, and subsequent State Forester Forum Forest Practices updates. For mining, grazing, road construction and other activities, appropriate BMPs developed by the Idaho Department of Lands (IDL), Natural Resources Conservation Service (NRCS), Forest Service Research, EPA, and others will be applied as appropriate. Effectiveness of the applied BMPs is evaluated through applicable literature reviews and applicable ongoing effectiveness monitoring, both on and off the Forest.

WATER YIELDS AND INSTREAM FLOWS

The potential to increase water yields in forested settings has been investigated in the United States for over 100 years. The ability of the Forest to increase water yields on a watershed scale is limited by many constraints, including land ownership patterns, vegetation type, fish and wildlife needs, legal water quality requirements, elevation and terrain, and climate. Consequences of large-scale vegetation manipulation can include increased landslide activity, increased erosion and downstream sediment, destabilized stream channels, drops in water tables and lost riparian zones The larger the watershed, the more constrains, both physical and legal, that limit the Forest's ability to fully apply a "water yield" prescription (USDA-FS, 2002).

While research has shown that vegetation treatments in watersheds can increase water yield at the local level, the ability to appreciably change the amount and timing of water on a large scale is limited, and the practical physical reality is, the agency is not able to make significant changes on a large watershed scale unless extreme actions are taken, such as extensive clear-cutting, large-scale mining, etc. The principal driver that influences water yields is precipitation (USDA-FS, 2002).

Southeast Idaho is characterized by relatively low precipitation levels, typical of the Intermountain West, with a diverse mosaic of vegetation types, which are generally not contiguous high forest. Research has shown that it takes extensive vegetation manipulation to realize any appreciable increases in water yields, and that the predominant time in which water yields can be increased is during flood events. During short-term "drought" periods, opportunities for yield increases are least effective (Schmidt. 2002). It is usually during these periods of low precipitation that public interests in increased water yields come to the forefront. Our ability to "produce" increased yields is even more limited during these low precipitation periods.

Other values associated with forest watersheds and aquatic resources that may conflict with a sole objective to deliver maximum water yields include water quality, riparian function, sensitive native aquatic species, recreation and scenic values, among others. Large-scale harvesting of trees and the construction of extensive expanses of road systems needed to access the timber can have unintended adverse effects of destabilizing watersheds or riparian systems, particularly if the watershed in already in some degree of impaired condition (USDA-FS, 2002).

Designating certain geographical areas for production of water yields has proved ineffective in other Forest Service regions over the last few decades, and there is no reason to believe a similar approach in the Intermountain Region would be fruitful. Consequently, the most effective management of National Forest System Lands will emphasize "optimal" water yield rather than "maximum" water yield. Optimum water yield implies healthy vegetative and aquatic ecosystems, which supply clean water for all beneficial uses of that water, both consumptive and non-consumptive (USDA-FS, 2002). For these reasons, increased water yields will not be an emphasis item in any alternative. Some alternatives potentially treat more vegetation than others, and may potentially produce slightly more water than other alternatives. However, these differences are relatively minor and un-measurable at the watershed scale and will not be explored further by Alternative.

HYDROPOWER

R.1, R.2, R.3: Watershed Integrity, Riparian and Water Quality

Hydropower projects have the potential to influence forest recreational opportunities, heritage resources, water quantity/quality, and Forest fish and wildlife populations and habitat. Reservoirs associated with hydroelectric structures provide additional recreational opportunities, such as flatwater fishing, boating, and swimming. Dams may also affect recreational river boating opportunities by influencing water flows. Water quantity and/or quality may be affected by hydroelectric projects if diversions or dams are incorporated in the project. Due to the migratory nature of some fish and wildlife species that use habitat on the Forest, a hydroelectric facility located off the Forest has the potential to affect the viability of some of these species. Hydropower projects can affect the ability of fish to migrate upstream and downstream and may inundate fluvial habitat. Wildlife habitat may also be inundated by hydropower projects that can affect wildlife migration corridors. Dams create an artificial, fluctuating lake level regime that may impact wetlands and aquatic habitat conditions.

The operation of existing and the licensing and construction of new hydroelectric facilities would not vary by alternative; therefore, no further analysis of hydropower is conducted. These actions would be analyzed at the site-specific level as they are proposed.

TIMBER HARVEST

R.1 Watershed Integrity

Watersheds are naturally dynamic in nature; they change over time with or without human influence. However, there are limits to their abilities to withstand change and still maintain their integrity, diversity and productivity (Quigley, *et al*, 1996). Watershed stability and function are dependent on a number of physical and climatic factors. Existing watershed conditions are a product of both natural and human history. These include wildland fires (or suppression); climatic fluctuations and events (flood, drought, windstorms); geologic events (landslides); and human activities (timber harvesting, construction of dams, and roads). Of these elements, only human activities can be predicted and analyzed.

The mechanical processes involved in harvesting timber can influence the level of disturbance within a watershed. Watershed and soil disturbance that occur from timber harvest activities can be responsible for increased rates of erosion and sedimentation and modification of water quality, watershed, riparian, and aquatic resources. Physical changes can affect the timing and quantity of runoff events, sediment, stream stability, large woody debris retention, aquatic habitat, and stream temperatures. Roads are perhaps the greatest ground-disturbing activity associated with timber harvesting (Megahan and Kidd, 1972). Early road construction within the Caribou National Forest generally took the path of least resistance, which usually meant constructing the road in a valley bottom, either adjacent to, or possibly displacing a stream. These roads have directly impacted watershed and stream channel stability and aquatic habitat quality in some areas. The effects of these constructed roads within the Forest linger today (Leffert, 2002).

Current timber harvest and road construction practices have substantially fewer adverse environmental effects than those practices undertaken in the early and mid 20th century when there was little or no concern for post-harvest watershed conditions. Better harvesting techniques, road engineering and construction methods, as well as the application of mitigation measures and Best Management Practices (BMPs), have all had positive effects on the intensity and duration of ecosystem disturbances. Megahan, *et al*, (1992) demonstrated that potential sediment yields, using present day BMPs, could be reduced by amounts ranging from forty-five to ninety-five percent depending on the BMP and local environmental factors. The National Council for Air and Stream Improvement (1999) concluded that, once applied, BMPs are effective at reducing management impacts, often to levels that are non-detectable. This conclusion is substantiated through Idaho Forest Practices Act (IFPA) monitoring. On an individual rule basis, and when properly implemented and maintained, the practices described in IFPA rules were effective ninety-nine percent of the time (IDHW, 1997). BMP effectiveness, by practice, is also described in USDA-FS (1981), Seyedbagheri (1996), USDA-FS (1994), and others.

R.2 Riparian Condition

All alternatives identify an Aquatic Influence Zone (AIZ) adjacent to lakes, reservoirs, ponds, perennial and intermittent streams and wetlands. These areas influence the hydrologic, geomorphic, and ecological processes that shape various features within these areas. For this reason a special management area was designed for the Revised Forest Plan that highlights these areas (See Management Prescription 2.8.3). The AIZ is not an area of exclusion; rather it is a zone of emphasis. As with other prescription areas, activities are allowed if they meet the stated Desired Future Conditions, Goals, Objectives, Standards, and Guidelines established in the Revised Forest Plan While cutting of trees is allowed, any timber harvest in the AIZ will not be included in the Forest's Allowable Sale Quantity (ASQ). Generally, timber harvest activities will not be conducted within the AIZ.

If a "buffer" is maintained between harvesting sites and a waterbody, the effects of timber harvesting on riparian and aquatic resources will be reduced (NRCS, 2002; Swift, 1986; Ketcheson and Megahan, 1996; Belt, *et al*, 1992; Murphy, *et al*, 1991; Burroughs, 1989). Buffer areas serve to provide several important functions, including:

1) trap sediment and nutrients generated on the upper watershed;

2) moderate stream temperatures;

3) provide streamside food and cover for wildlife;

4) provide large woody debris and organic matter to riparian areas and aquatic systems;

5) maintain overall channel stability; and

6) moderate cumulative watershed effects (Belt, *et al*, 1992; Murphy, *et al*, 1991).

McEldowner, *et al*, (2002) suggested that the primary variables that influence sediment filtration are vegetation stem density and surface random roughness, which directly influences microchannel flow velocity. The ability for water to transport sediment is exponentially related to velocity. As the velocity of water slows, the ability to transport sediment is diminished. Ketcheson (1996) suggested that there is less than a 0.1 percent probability of non-channelized sediment traveling more than 200 feet, assuming intercepting barriers or vegetation is present on site. Burroughs (1989) cites other studies, such as Swift (1986) who measured travel distance through forest litter on forty-seven percent slopes. Swift found that sediment traveled a maximum distance of 314 feet, with an average travel distance of sixty-five feet. Therefore, in general, maintaining at least a 300-foot "buffer" between land-disturbing activities and a waterbody, water quality and other riparian functions generally will be preserved. This correlates with the Revised Forest Plan's AIZ widths for perennial stream reaches, ponds, lakes, reservoirs and wetlands greater than one acre. Site-specific buffer widths, which are different than the AIZ emphasis zone, between land management activities and waterbodies can and will be adjusted as necessary to meet resource protection needs as identified in the required environmental analysis for all new ground-disturbing projects.

Belt (1992) observed that stream temperatures were also controlled through buffering. He cites several studies that reported negligible changes in water temperatures when buffers were left along stream courses, even though timber harvesting disturbed upper watersheds. Similar observations were cited for maintaining large woody debris sources, providing food and cover for wildlife, reducing streamflow velocities and stabilizing stream channels, and moderating overall cumulative watershed effects.

Even with improved practices, however, timber harvest activities still have the potential to have short-term impacts to watershed processes and associated riparian and aquatic habitat. Potential effects to soil, watershed, water, riparian, and aquatic resources from timber management will vary by alternative, because various amounts of timber harvest are proposed in each alternative.

LIVESTOCK GRAZING

R.1 Watershed Integrity

The effects of livestock grazing on watershed uplands and riparian areas, including stream channel stability, aquatic habitat, and water quality, have been studied and documented by numerous authors. A consensus has evolved that livestock can and do have impacts to the uplands and riparian aquatic systems if improperly managed and can adversely affect the general characteristics and functions of riparian areas (Chaney, *et al*, 1991).

Rangelands throughout western North America evolved with grazing animals. However, in contrast to native herbivores, whose numbers or patterns of grazing varied, domestic livestock can be artificially concentrated, through fencing, supplemental feeding, water developments, etc. By the early 1900s uncontrolled grazing by horses, sheep, cattle and burrows had so degraded vegetation and soils throughout the west that federal legislation (the Taylor Grazing Act of 1934) was enacted in an attempt to curtail further deterioration of watersheds (Vavra *et al*, 1994). Since that time, domestic livestock have been managed on both private and public lands with varying degrees of success.

Watershed response to grazing is largely dependent on soils. The texture, structure, and porosity of soil determine how much rain is captured and how much runs off during a storm or snowmelt period. Soils are storehouses of water and nutrients for plants to draw on. The soil is a living system that is inextricably linked to nutrients cycles, energy flows, and other ecological processes of rangeland ecosystems. Soil degradation affects not only soil attributes, but can also affect other processes. Loss of organic matter in the soil reduces nutrient stores and interrupts nutrient cycles. Accelerated erosion reduces total organic matter and total nitrogen contents of soils and the capacity of watershed soils to hold moisture. Watershed processes are interdependent, synergistic, and even cyclic, with parameters dependent upon or affecting another. For example, reduced water infiltration and water storage can reduce total vegetative biomass production and can result in shifts in species composition, which can affect soil moisture holding capacity, runoff, and so on (NRC, 1994).

NRC (1994) suggested a definition for "rangeland health" as: "the degree to which the integrity of the soil and the ecological processes of rangeland ecosystems are sustained". "Health", they suggest, indicates the proper functioning of complex systems, and conditions in which ecological processes are functioning properly to maintain the structure, organization and activity of the system over time. They suggest that the determination of whether a rangeland is healthy, at risk, or unhealthy should be based on three criteria: degree of soil stability and watershed function; integrity of nutrient cycles and energy flows; and presence of functioning recovery mechanisms. Recovery mechanisms include the capture and cycling of nutrients, the capture of energy, the conservation of nutrients, energy and water, development of resistance to extreme events, and resilience to change.

Numerous studies on the effects of livestock grazing on watershed function are found in the literature. As would be expected, findings are mixed. In one study, Lauenroth, *et al*, (in Vavra, 1994), studied forage production of light, moderate, and heavy grazing treatments on a shortgrass steppe site in the Great Plains. They found that moderate grazing had not affected overall productivity compared with light grazing, but removal of 60 percent of the aboveground vegetation mass (heavy grazing) had significantly reduced overall production. Other studies in South Dakota and Kansas by Lauenroth, *et al*, (1994) found even light grazing had negative effects on total forage production. Savory (1999) found that lack of grazing in some upper watersheds actually had worse overall impacts on some lands than grazing impacts. Under certain circumstances, he found grassland vegetation shifts toward woody vegetation and "weeds" if not grazed. However, the literature is nearly unanimous in that uncontrolled, heavy grazing negatively affects overall watershed stability, health and function.

Pieper (in Vavra, 1994) examined the effects of livestock on watersheds throughout the west, including the Intermountain Region. He found that grazing has impacted rangelands across the entire region. He concluded, however, that even if livestock were completely removed, rangelands would be unlikely to return to pristine, pre-grazing conditions. Other changes, including climatic shifts, increases in other plant species (including introduced species), reduction of fire frequency and human activities are all currently affecting rangeland and watershed conditions. He also concluded that domestic livestock grazing at conservative levels appears to be sustainable, even on sensitive western rangelands. The current condition of watersheds throughout the Forest is discussed in Chapter 3.

R.2 Riparian Condition

Cattle may spend from five to thirty times the amount of time in riparian areas as on adjacent upland areas. Factors for this disproportionate time include higher forage volume and relative palatability of riparian plant species, distance to available water, distance upslope to upland grazing sites, and microclimatic features (Clary, *et al*, 1989). Potential livestock effects on riparian areas and aquatic systems include higher stream temperatures resulting from a reduction of streamside cover; excessive sediment in the stream channel from bank and upland erosion; increased coliform bacteria counts; channel widening from hoof-caused bank sloughing and later erosion by water; change in the form of the water column and the channel; change, reduction or elimination of riparian vegetation; lowering of water tables; and increased winter in-stream icing conditions (Clary, 1989; Winegar, 1977).

Belsky (1999) concluded there were no positive effects of grazing and, at best, had neutral effects. He found that livestock grazing negatively affects water quality and seasonal quantity, stream channel morphology, hydrology, riparian zone soils, instream and streambank vegetation and aquatic and riparian-dependent wildlife. Winegar (1977) found severe icing conditions occurred on grazed stream reaches, but observed only light channel icing conditions within an adjacent ungrazed reach. Other literature, however, suggests grazing is not totally incompatible with riparian areas. Proper grazing may be benign, or even in some cases, beneficial for plant density and vigor, which assists in stabilizing soil, slowing erosion and decreasing in-stream sediment (WDEQ, 1997; Larsen, 1998; Elmore and Kauffman, 1994, Buckhouse, 2000, and Armour, *et al*, 1994). For example, in a Kentucky bluegrass meadow, peak production occurred following six years of rest, then declined until overall production was similar to that in an adjacent area grazed season-long (Clary, *et al*, 1989).

Mosley (1997) found that removal of apical dominance in grass tillers caused more shoots to grow, resulting in a thickening of the grass stand. The literature also suggests vegetation and ecosystem responses can be highly site-specific and there is no single formula or template that can be used to anticipate or evaluate success or failure in all situations (Elmore and Kauffman 1994). Laycock (1994) suggested that many vegetation types on public lands are currently in a stable state and even if livestock were completely removed, overall watershed conditions would change little, which correlates with findings by Pieper (in Vavra, 1994). The literature is also clear that if excessive disturbances occur through improper management, detrimental impacts outweigh any benefits (Clary, *et al,* 1989; Fitch and Adams, 1998; Winegar, 1977; and EPA, 1994).

R.3 Water Quality

Braun (1986) concluded that cattle could be the cause or source of several types of water pollution. Most notable are sediment, bacteria and nutrients, primarily nitrates and phosphates (Buckhouse, 2000). On uplands, cattle accelerate erosion when removing vegetation and trampling soil. Through runoff, eroded soil eventually finds its way into streams leading to sedimentation and turbidity. Sediment can deteriorate stream habitat in at least two ways. Suspended sediment reduces light penetration causing reduction in aquatic plant photosynthesis and dissolved oxygen levels. Sediment can clog gravel areas used by spawning fish for egg deposition and can entomb various aquatic life forms that are major sources of food for fish. In addition, cattle discharge urine and manure, which produce chemical and biological pollution.

In a study by Coltharp and Darling (1973) in Buckhouse (2000), three pastures were studied with different combinations of animals grazing and browsing: wildlife only, wildlife and sheep and wildlife and cattle. Highest concentrations of bacteria were found in the wildlife-cattle pasture. Carter (1999 and 2002) in studies conducted on the Cache National Forest in Idaho and Utah, found elevated concentrations of fecal coliform bacteria within days of cattle entering a pasture. Following removal of cattle, fecal coliform counts declined to lower levels and eventually declined to zero. He also found that during the spring and early summer, prior to the introduction of livestock into the pasture, the numbers of fecal coliform bacteria gradually increased in response to runoff and increasing water temperatures. He concluded that organisms residing in the watershed and stream sediments since the previous grazing season contributed to the source. Biske and others (1988) in Buckhouse (2000), found that 90 percent of bacteria that reaches a stream channel precipitated to the steam bottom and attached to sediments. Sediment samples collected over a period of several weeks found that 90 percent that had lodged into the sediment died within forty days.

Johnson (1978) studied two adjacent pastures in central Colorado and found that bacterial contamination significantly increased in the grazed pasture. Following removal of cattle from the grazed pasture bacterial counts dropped to levels similar to those in the ungrazed pasture. Johnson (1978) studied two adjacent pastures in central Colorado and found that bacterial contamination significantly increased in the grazed pasture. Following removal of cattle from the grazed pasture bacterial counts dropped to levels similar to those in the ungrazed pasture.

Platts (1981) also attributes high concentrations of coliform bacteria in study streams to livestock grazing. He concluded that bacterial concentrations did not directly affect the suitability of habitat for fish, but they are nonetheless an important indicator of water quality. This typifies the dynamic nature of the quality of surface water, particularly from nonpoint sources.

Leffert (2002) sampled surface water in Arizona within a variety of grazed pastures. He observed that base streamflows contained very little fecal coliform bacteria content during base flow periods. However, during runoff flows, when rainstorms generated overland flow to the stream channels, fecal coliform levels increased exponentially, well in excess of State water quality standards. Following the runoff event, when the stream hydrograph returned to base flow rates, bacteria concentrations quickly returned to pre-event levels.

Other water quality parameters that may be affected by livestock include suspended solids, temperature, dissolved oxygen, total dissolved solids, specific conductance, ammonia, orthophosphates, and nitrate nitrogen (Johnson 1978). Johnson, in a Colorado study, did not find any significant increases in any of these other parameters directly attributable to livestock grazing. Buckhouse (2000) cited a nutrient study on the Wood River in Oregon that examined the concern that nutrient loading would be increased when water flowed through grazed land due to fecal contamination. The data refuted this hypothesis, in fact phosphate and nitrate levels actually decreased. It was speculated that the wetlands in the system acted as a natural nutrient sink, reducing the amount of free nitrate and phosphate concentrations in the water. Platts (1981) cited studies by Clarie and Storch (1977) and others that found that removal of streamside vegetation contributed to increases in water temperatures in small headwater streams as well as influencing suspended sediment concentrations. Increased sediments have been found to diminish total productivity of the aquatic system, decrease water permeability of channel materials used by fish for spawning, smother fish embryos, and deplete the food supply for fish by filling channel interstices.

The Clean Water Act addresses water quality in streams and requirements to "restore and maintain the chemical, physical and biological integrity of the Nations waters." Section 303(d) of the act addresses water quality standards to support designated beneficial uses of waterbodies. Each state is required to sample all waterbodies within its boundaries and develop protocols for maintaining those waterbodies in good condition and improve those that are degraded. The application of Total Maximum Daily Loads (TMDLs) is required to be developed for all streams for which beneficial uses are not supported. The Forest is obligated, as are all other landowners, to comply with TMDL requirements. Implementation Plans will be developed that will specify specific actions taken to comply with the regulations and TMDL requirements. These requirements may override all other Forest Plan direction, if TMDLs are more stringent than Forest Standards and Guidelines.

Alternatives differ in their guidance to manage livestock. For this reason, effects of livestock management on watersheds, riparian areas, aquatic habitat and water quality will also be analyzed by alternative.

ROAD DISTURBANCES

R.1, R.2, R.3 WATERSHED INTEGRITY, RIPARIAN CONDITION AND WATER QUALITY

Road-related disturbances can overshadow disturbances associated with other activities such as timber harvesting (Rieman and Clayton, 1997) and can be the primary source of sediment from forested watersheds (IDEQ 1988). Furniss, *et al.* (1991) attributes road-related disturbances to losses of water quality, altered hydrologic conditions, increased frequency of landslides, and loss of aquatic habitat and water quality. Increased road densities and/or road-related sedimentation into nearby streams have also been associated with declines in fish populations (Quigley and Arbelbide 1997, Meehan 1991).

Roads can modify natural drainage networks and can accelerate watershed erosion processes. These changes can alter physical processes in streams, leading to changes in streamflow regimes, sediment transport and storage, channel bank and bed configurations, substrate composition and stability of slopes. These changes can affect all stream ecosystem components, including physical, biological and chemical (Furniss *et al.* 1991).

Construction of a road network can generate accelerated erosion rates in a watershed. Increased sedimentation in streams can have long-lasting consequences. The amount of sediment contribution per unit area from roads can be greater than that generated from other land management activities, including log skidding and yarding. Sediment entering waterways is delivered chiefly by mass soil movements and surface erosion processes. Failure of stream crossings, diversions of streams by roads, washout of road fills, and accelerated scour at culvert outlets are also sources of sedimentation in streams within roaded watersheds (Furniss *et al.* 1991).

Roads can increase the frequency of slope failures and mass movement, depending on variables as soil type, slope steepness, bedrock type and structure, and presence of surface and subsurface water. Road location is the most important factor because it affects how much all of these variables will contribute of surface failure. Mass soil movements triggered by roads can continue for decades after the roads are built. The most common causes of road-related mass movements are improper placement and construction of road fills, inadequate road maintenance, insufficient culvert size, steep hillslope gradient, placement or sidecast of excess materials, poor road location, removal of slope support by undercutting, and alteration of slope drainage by interception and concentration of surface and subsurface water Surface erosion can also be a major source of sediment delivered to drainageways. Surface erosion from roadbed surfaces, drainage ditches and cut-and-fill slopes can severely affect channel processes below the roadway (Furniss *et al.* 1991).

Roads do, however, provide access to the Forest and are used by Forest managers and the public. As such, roads are a necessary part of the landscape.

Much of the past road construction across the Forest is attributed to timber harvesting and general Forest access. Some road corridors were not well thought out or designed, or simply followed a route of "least resistance". Some of these roads have had and continue to have, a negative effect on the watershed, riparian, and aquatic resources (Leffert 2002).

Road construction and decommissioning potentials will vary only slightly by alternative. New roads generally will be associated with timber harvesting. Any new roads would be constructed with strict standards and guidelines, especially those that could influence the Aquatic Influence Zone (AIZ). Road effects to watershed and riparian values can be prevented or minimized through proper planning and reconnaissance, design, construction and maintenance techniques. The basic strategy to prevent or minimize damage from roads is to understand the physical and biotic conditions that could be affected. This includes determining erosion risks, minimizing disturbances to channel morphology and hillside drainage patterns and ensuring aquatic species migration is not impeded (Furniss *et al.* 1991). All of these effects will be considered and potential adverse effects scrutinized prior to construction.

As such, the affects of new roads on a watershed scale should be negligible and will not be evaluated further. New road construction could, however, have localized effects on riparian areas, aquatic habitat and water quality. The potential effects of new roads on riparian and aquatic resources will be analyzed by alternative.

RECREATION

R.1, R.2, R.3: Watershed Integrity, Riparian and Water Quality

Recreation activities can affect watersheds, riparian areas, and aquatic systems. Developed and dispersed camping can result in streambank and instream disturbances and soil compaction and affect the type, density, and vigor of vegetation in and around the recreation site. The increased use of Off Highway Vehicles (OHVs) over the past decade has accelerated riparian and stream damage in many places throughout the Forest (Leffert, 2002). Most of these disturbances are localized, but they can have a measurable effect on the quality of the watershed, riparian and aquatic resources.

Recreational gold dredging and panning has also become more popular over the last several decades. The occurrence of recoverable placer gold deposits is localized within the Forest. The most popular area is within the McCoy Creek watershed. Dredging can destroy small fish, embryos, developing eggs, and macroinvertebrates as a result of processing gravels during the dredging procedures. Dredging also can produce sediment and often can cause localized streamside bank disturbance and riparian area soil compaction (Waters, 1995).

Recreational dredging and panning would not change by alternative. Dredging is regulated by permits that are required by both the Forest Service and the State of Idaho. Prior to issuing a permit, the proposed activity must be evaluated and effects to the environment analyzed. For this reason, recreational dredging will not be analyzed further.

Potential impacts from other recreation-related activities (camping, OHVs, etc.) on the watershed, soil, water, riparian, and aquatic resources will vary somewhat by alternative. For example, several alternatives provide areas of unrestricted cross-country summertime motorized vehicle travel, while other alternatives confine vehicles to designated routes only. Unrestricted vehicle travel has a greater potential to adversely impact a broader range of riparian and aquatic resources than travel restricted to designated routes, which are designed and maintained to minimize broad range impacts to watershed, riparian, and aquatic resources. Recreation effects will be analyzed by alternative.

MINERALS MANAGEMENT

R.1, R.2, R.3: Watershed Integrity, Riparian and Water Quality

Large-scale surface mining probably has a greater effect on watersheds and associated resources than any other human activity. Entire ridge tops can be removed, and valley floors can be filled with excavated materials. As such, the potential for mines to alter watershed function is substantial. Affects include increased erosion and sediment potentials; timing, distribution, quantity, and quality of water; and loss of riparian and upland vegetation and overall watershed values. The Forest contains one of the larger phosphate ore reserves in the world. As such, phosphate mining has and will continue to occur within and adjacent to the Forest. Phosphate reserves have been identified and leases have been issued to allow mining to continue into the foreseeable future.

Each current mining operation has been evaluated the environmental analysis process and has an associated Plan of Operation, which contains environmental constraints to protect watershed, water, riparian, and aquatic resource values as identified in the EIS. The degree of constraints varies only in Alternative 6 for existing and new operations, but the differences in methodology will not substantially alter the final protective outcomes. However, in all alternatives, measures contained in the Clean Water Act must be met, and mining companies will be required to meet state and federal water quality standards under all alternatives. Selenium and other hazardous substances have been found within and downstream from many of the current and past operations. A Task Group, made up of private, state, and federal individuals and agencies, is currently working on the problem. A charge of this group is to specify mitigation and management practices needed to control these substances. Once identified, these measures will be implemented no matter which alternative is chosen.

WATERSHED AND AQUATIC RESTORATION

R.1, R.2, R.3: Watershed Integrity, Riparian and Water Quality

Management of long-term watershed function and health depends on restoration and conservation strategies. These strategies will focus on vegetative condition, pattern, and disturbance regimes. Conservation strategies are designed to reduce human-caused impacts, such as roads, upland and streambank erosion and the like. These activities are designed to maintain and/or restore watershed dynamic processes and improve overall watershed and stream conditions so they are more in harmony with the landform, climate, and biophysical characteristics of the landscapes. Stable watersheds are more resilient to disturbances, more predictable in response to change, and will provide a range of habitats needed by upland and aquatic wildlife species.

The process of choosing a restoration or conservation strategy begins with determining whether watershed components are functionally intact, or if damage has occurred through management activities and/or natural processes. Assessments have already been completed for subwatersheds and reported in the Inland West Water Initiative (IWWI), at the stream level using Properly Functioning Condition (PFC) analysis, and by the State of Idaho through its 303(d) waterbody assessments. The Forest will complete additional watershed assessments at the 5th HUC level within the next decade. These assessments will identify further needs at a finer scale. Assessments have already been completed for the Thomas Fork drainage and will be completed for the Soda-Montpelier Front and Montpelier Creek watersheds by 2003.

A formal process for prioritizing watersheds for restoration and/or conservation has been developed. The process uses the IWWI cumulative scores of the individual ratings for Watershed Vulnerability, Integrity, and Water Quality. Each of the individual rating scores (1, 2 or 3) are summed. A total score of 3 to 4 is rated as "good"; a total score of 5-7 is rated as "moderate"; and a total score of 8-9 is rated as "poor". For map display purposes, these three ratings are color-coded into: Green – "good" overall condition; Yellow – "moderate" overall condition; and Red – "deteriorated" or "poor" overall condition. "Red" watersheds receive the highest priority for "restoration." "Green" watersheds receive the highest priority for "preservation." "Yellow" watersheds are intermediate. For prioritizing watersheds for watershed assessments, "red" watersheds would be looked at first in an effort to determine where and how conditions can be improved, followed by "yellow" watersheds, then "green." The presence of other factors, such as 303(d) listed streams or sensitive wildlife species, will also be used to determine priorities. For example, if two watersheds have essentially the same rating, a watershed containing a 303(d) stream may have a higher priority than one that does not.

R.1 Watershed Integrity

Fire is a natural process that influences soil-hydrologic functions, watershed processes, vegetation, and aquatic species distribution and evolution. Historically, wildland fire created a mosaic of vegetative habitats and wildlife populations across the landscape. Short- and long-term effects of fire usually result from increased erosion associated with vegetation loss and climatic events that trigger surface erosion and alter runoff. This can affect the associated stream channel characteristics and water quality.

Fire can also remove soil-binding vegetation or change watershed moisture regimes sufficient enough to initiate landslides. The intensity and scale of these effects are directly related to the size and intensity of the fire, watershed vulnerability (a factor of soils and geology), size of the watershed and climatic events, both pre and post-burn. Water retention capacities of the soil, type and density of remaining vegetation and organic matter, and soil stability as affected by plant roots can all change immediately following fire and remain for many years following the event (Farnes, 1996). The extent and duration of potential changes are dependent on fire intensity. The effects of a "cool" burn that consumes only a portion of the fine fuels and leaves a protective duff and humus layer intact may last only weeks or months. Conversely, a "hot" fire that consumes most, if not all, woody stems and surface organics, and has sufficient heat to sterilize the soil and/or create a hydrophobic[5] condition, may have effects lasting for many years (Branson, *et al*, 1981; Key and Steward, 1994; Toendle and Bevenger, 1996; Tiedemann, *et al*, 1999; Farnes, 1996; and Tiedemann, 1978).

For the purposes of this analysis, the use of fire as a vegetation management tool in timbered areas will be considered to have similar watershed impacts as timber harvest. Similar ground disturbance and remaining ground cover will result from both operations, if fire remains in prescription windows. This is discounting the occurrence of constructed roads and skid trails. Obviously, if fire "escapes," greater detrimental affects can occur to the watershed; however, these events cannot be predicted, and all prescribed fire events are assumed to remain within proper windows. The application of prescribed fire will vary slightly by alternative and will be analyzed by alternative.

The potential for large, uncharacteristic wildland fires may vary slightly by alternative, as a result of potential timber harvest and vegetation management. Research is limited in this area, and opinions vary on whether the risk is greater from uncharacteristic wildland fire or from activities and methods used to reduce uncharacteristic wildland fire (Bisson, *et al*, 2002). The time, location, and extent of future wildland fires are impossible to predict. Therefore, the effects of potential wildland fires will not be further evaluated. If and when a wildland fire occurs, a Burned Area Emergency Response (BEAR) team will evaluate the fire's effect on the affected watershed resources at that time.

[5] **Hydrophobic** – water-repellent

Fire may not be appropriate for all areas. Some areas or situations exist where vegetation may be treated by simply cutting and let-lie, chaining or other mechanical methods, or chemical means. Some aspen stands, for example, may be hard to burn, and may be cut rather than burned. However, after felling and fuels have had a chance to dry out, some areas may be burned to reduce downed fuels or prepare the site for rehabilitation.

Similarly, chemical herbicides or insecticides may be used to reduce vegetative cover in some areas. Herbicides may be used, for example, in sagebrush-dominated sites where the canopy cover is to be reduced bur not necessarily eliminated. If chemicals are used, site-specific analysis will determine the impacts on watersheds and water quality. Chemical applications may be either ground-based or applied aerially. All applications will follow label instructions.

For evaluation purposes, all areas treated with fire, mechanical or chemical treatments are considered to have the same potential effects to watershed functions. There are some obvious differences in the treatment systems, but the outcomes are essentially the same. Each treatment will have to be evaluated on a site-specific basis through a separate NEPA process once they are identified. Specific elements such as fuel loadings, potential chemical contamination to waterbodies, etc. will be scrutinized at that time.

R.2, R.3 Riparian Condition and Water Quality

The most significant effects of fire on riparian areas, aquatic habitat and water quality are increases in total water yields, sediment, and debris delivered to stream and river systems. Studies have shown that maximum streamflows can be double the rate of flows that existed before the fires, massive debris torrents can occur, and increases in sediment and ash can adversely affect channel stability, water quality and aquatic habitat. Post-fire effects on riparian areas and water quality are directly influenced by the severity of the fire, geologic substrate, local landscape impacts of the fire to vegetation and soil, and precipitation patterns (Swanston 1991). Fire-related flood and sedimentation events may result in localized removal or burial of riparian vegetation, alteration of stream channels and floodplain surfaces and deposition of various substrates, which may re-set successional dynamics within the riparian communities (Dwire and Kauffman, in press).

Fire can affect nutrient availability and subsequent nutrient loading in streams in several ways. Nutrients incorporated in vegetation, litter and soil can be volatilized during combustion, or lost by ash convection. Following fire, nutrients can be redistributed by leaching of the ash layer and soil, and transported to the stream by surface erosion, soil mass movement, or solution transport. Studies have shown that levels of organic nitrogen within the first year following fire can be about twice those recorded before the fire. A cause is believed to be greater flows that displace organic detritus from areas adjacent to the streams. Elevated nitrate concentrations tend to subside as vegetation re-grows over the watershed and in the riparian area. Ammonium nitrogen can occur immediately after a fire but generally dissipates within the first few weeks. Small, temporary increases in phosphorus levels in stream water have also been reported. Concentrations of nutrients can be toxic to aquatic organisms, but dissipate rapidly with stream dilution and flushing. Some researchers have pointed out that the addition of nutrients can be beneficial in some situations, by supporting additional plant and animal life (Swanston 1991).

The use of mechanical or chemical treatments can affect riparian areas, stream channels, aquatic habitat and water quality as well. Mechanical treatments can alter vegetation layers and disturb the soil surface, increasing the risk of surface erosion. Displaced soils can be delivered to the channel system, increasing sediment loading. Dead and dying vegetation can also add to fuel loading, increasing the risk for fire, at least over the short term. Chemical treatments can contaminate surface waters if not applied appropriately. As with mechanical treatments, dead and dying vegetation can increase fuel loads. The use of fire and other tools to manipulate vegetation will vary by alternative therefore the effects will be disclosed by alternative.

Direct and Indirect Effects, which vary among alternatives

TIMBER HARVEST

R.1 WATERSHED INTEGRITY

Direct effects of timber harvesting on watershed values and the ability to provide favorable conditions for water flows and production of desirable vegetation are normally associated with ground-disturbing activities, such as road building, skidding, decking and slash treatments. These activities have the potential to expose soils to increased erosion from water and wind, or compact soils and reduce vegetative cover. These components can indirectly affect watershed values by altering water infiltration rates, redistributing snow and altering snowmelt rates, influencing streamflow hydrographs, and influencing surface water quality. (EPA 1973; Stottlemyer and Troendle; 1987; and IDEQ, 1988).

Access roads are normally constructed in association with timber harvesting. Since future timber harvesting units have not been specifically identified or located, potential road locations can only be evaluated by using total anticipated miles at the Forest level. Therefore, miles of roads needed for timber harvesting are pro-rated within the same watersheds in which potential harvesting may occur.

The overall impacts of timber harvesting in relation to the percentage of watersheds impacted are negligible in every alternative. Less than five percent of any watershed is expected to be impacted in any of the alternatives. Table 4.46 describes the overall potential to disturb the watersheds by timber harvest by relating each alternative to the other. A rating of "1" has the least potential to disturb watershed function and associated riparian, water quality, and aquatic habitat. A rating of "8" has the greatest potential. Potential disturbance is relative to each alternative. A ranking of "8" does not imply there is 8 times greater potential disturbance than a ranking of "1;" rather it is simply a relative ranking of one alternative to another. It is assumed there is a linear relationship between the total acres of timber harvested and associated road building and potential effects to watersheds. That is, the more timber harvested forest-wide, the greater the potential to degrade watershed values; even though potential effects will be mitigated through the use of Best Management Practices (BMPs) and other Forest Plan standards and guidelines. This also assumes that treatments are essentially the same and have the same relative impacts to watersheds. As with any other proposed activity, site-specific environmental analysis, which includes the application of mitigation measures and appropriate BMPs, must be completed prior to project initiation.

- *Table 4. 46 Potential of Watershed Disturbance by Timber Harvesting, by Alternative Annually.*

Timber Harvesting	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Number of Acres Treated (Annually)	1,680	1,670	2,190	710	650	490	730	1,110
Miles of Related Roads Constructed (Annually)	8.1	7.3	9.8	1.7	1.6	0.7	1.8	3.5
Relative Potential to Protect Watersheds	7	6	8	3	2	1	4	4

Alternative 6 has the least amount of proposed timber harvest, and therefore, has the least potential impacts to watersheds. Alternative 3 has the greatest amount of proposed timber harvest, about 4.5 times the amount proposed for harvest in Alternative 6, and about 1.3 times more than that proposed in Alternative 1. Alternative 7R proposes to harvest about 2.5 times the amount in Alternative 6 but is about 35 percent less than what is proposed in Alternative 1 (the No Action Alternative). Again, the potential impact to any watershed under any of the alternatives is negligible. Less than five percent of any watershed is expected to be impacted under any of the alternatives during the planning period (10 years).

R.2 RIPARIAN CONDITION

Timber harvesting, though not specifically restricted in the AIZ, must be conducted in a manner that meets the desired AIZ attributes within the area (see Revised Forest Plan Prescription 2.8.3). Commercial timber harvesting usually does not meet these conditions, therefore it will not normally be conducted within the AIZ. However, non-commercial harvesting may occur, if it can be demonstrated that riparian values will be maintained or improved. Harvested timber in an AIZ does not apply to the Allowable Sale Quantity (ASQ). (See Chapter 4, Issue 7: Timber Sale Program for more information)

Table 4.47 relates the relative differences among alternatives as to their potential adverse impacts to adjacent riparian areas. The linear relationship assumes the location and intensity of impacts is equal between watersheds. This relationship is not linear if impacts are adjacent to a riparian area on unstable soils in one watershed and on a ridge top containing relatively stable soils in another watershed. Since the specific locations of future timber sales are not known at this time, impacts are assumed to be equal between watersheds, thus the linear relationship between alternatives. As for all management activities, actual potential site-specific impacts must be assessed through a separate environmental analysis prior to project implementation. Specific mitigation measures and BMPs to protect watershed, riparian and aquatic resources, and expected effects or results, will be identified at that time.

- *Table 4. 47 Potential to Protect Riparian Areas and Water Quality from Timber Harvesting, by Alternative.*

Timber Harvesting	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Relative Potential to Protect Riparian Areas and Water Qual.[1]	7	6	8	3	2	1	4	5

1 A rating of "1" has the least potential to degrade watershed functions and associated riparian, water quality and aquatic habitat from timber harvesting. A rating of "8" has the greatest potential to degrade overall watershed values. These ratings are not an order of magnitude, rather a simple relationship of one alternative to another. For example, Alternative 6 has a greater potential to protect riparian and water quality values than Alternative 5, which is better than Alternative 3. For orders of magnitude between alternatives, refer to the Timber Harvest discussion in the Watershed section.

R.3 WATER QUALITY

Brown and Binkley (1994) investigated the effects of timber management on water quality. They analyzed changes in waterborne pathogens, dissolved oxygen, nutrients, dissolved solids, sediment, toxics (pesticides and herbicides), and temperature. They concluded that pathogens are not affected by timber harvesting. Only a few studies have documented depressed dissolved oxygen (DO) concentrations in streams affected by timber harvesting. These studies attributed reductions in DO to large accumulations of organic debris in small or slow-flowing streams. The remainder of the studies showed no significant effects of harvesting on dissolved oxygen. Assessing nutrients, they found that although forest practices may elevate the concentrations of many chemicals in streamwater, only phosphate and nitrate are of significant concern in forestry. However, they found that mean concentrations were very similar for both treatment and control watersheds and the differences were not statistically significant. The effects of forest management on concentrations of dissolved solids are slight. Sediment was found to be the greatest potential source of degradation. They found that concentrations of suspended sediments often increase after management activities, such as road construction, harvest and site preparation, with road construction having the greatest potential to elevate sediment levels. Potential increases vary greatly, depending on location, specific site characteristics, and the application of Best Management Practices (BMPs). Toxic chemical increases were directly related to the application of pesticides. Leaving buffers along streams, though cited in the literature as potentially significant, usually controlled water temperature. In most instances where buffers were left, minimal or no increases in temperatures were noted.

The National Council for Air and Stream Improvement (NCASI, 1999), investigated the influences of silvicultural activities on water quality, reviewing a quarter century of Clean Water Act progress. They found that nationwide, forestry activities contribute only a small fraction of the impairment to rivers and streams in the country. The trend found in EPA's 305(b) reports is that forestry activities have had a diminishing contribution to impairment of rivers and streams. Forest managers now use BMPs routinely to reduce water quality impacts, and BMPs have been shown to be effective in reducing management impacts to water quality. Forest managers have documented similar findings through reviews of timber harvesting activities over the past decade (Caribou National Forest IFPA BMP Reviews, 1990-2001). Table 4.49 shows the relative differences among the alternatives to protect water quality.

LIVESTOCK GRAZING

R.1 WATERSHED INTEGRITY

Livestock grazing can directly affect watershed values by removing ground cover through ingestion and trampling vegetation and soils. Removing protective ground cover can increase soil erosion rates and reduce water infiltration capacities (EPA, 1994). Soil compaction can also reduce water infiltration rates, thereby increasing runoff potentials. Soil compaction also retards the vigor of shallow-rooted vegetation by making root penetration through the soil more difficult and reducing the amount of available moisture in the plant rooting zone (Kohnke, 1968). Indirect effects include altered erosion, runoff and filtering potentials, which can influence downstream channels and riparian areas (McEldowney, 2002). Downstream effects can include modified flow hydrographs, increased sediment loads, changes in channel structure (widening, downcutting) and decreased water quality (EPA, 1994

The effects of livestock grazing on watershed values can be reduced or mitigated through the application of specific grazing practices and by implementing specific standards and guidelines that control vegetation use, location of watering sources and other factors. Each alternative, except Alternative 1 which has no specific standards, proposes specific grazing direction that is designed to maintain watershed impacts within acceptable levels to protect watershed health and function. Precise impacts from livestock grazing on specific watersheds cannot be analyzed at the programmatic level. Only relative ratings, as the alternatives relate to one-another, can be analyzed. Table 4.48 rates the effectiveness of each alternative in protecting watershed values. All alternatives, except Alternative 1, which has no specific grazing standards, address minimum criteria developed in the literature to protect watersheds and vegetation density and vigor.

There are essentially no hydrological differences in upland grazing standards between alternatives. Alternative 1 has the highest allowable herbaceous utilization of up to 60 percent. Alternative 2 has a set standard of 45 percent. Alternatives 3 through 7R all have standards that range from 35 percent to 55 percent, depending on overall upland conditions. All of these utilization standards are considered to be "moderate" (Gray, 1968; Holechek, 1994; and Lacy, 1988).

Table 4.xx reflects the relative ranking of the alternatives to protect watershed values from grazing impacts. The ratings do not reflect a magnitude of difference between alternatives; rather a simple relative ranking. It is assumed there is a linear relationship between the acres suitable for livestock and potential impacts to watersheds, given similar management and distribution patterns.

- *Table 4. 48 Potential for Watershed Protection from Livestock Grazing, by Alternative.*

Livestock Grazing	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Acres Suitable for Cattle	460,303	460,303	460,303	407,942	401,051	255,269	452,621	452,251
Acres Suitable for Sheep	701,942	701,942	701,942	630,160	621,256	403,149	694,066	693,115
Upland Forage Utilization	50-60%	45%	35-55%	35-55%	35-55%	35-55%	35-55%	35-55%
Relative Potential to Protect Watersheds[1]	7	6	8	3	2	1	4	4

1 A rating of "1" has the least potential to disturb watershed function. A rating of "7" has the greatest potential to disturb watershed values. Alternatives 4, 5, 6, and 7 incorporate essentially the same upland guidance.

Alternative 6 has the fewest number of suitable grazing acres, about 40 percent of the total Forest acres. Alternatives 1,2 and 3 all have the most suitable acres, about 65 percent of the total Forest acres. Alternatives 4, 6, 7 and 7R range from about 57 percent to about 63 percent of the Forest acres that are suitable. Differences in potential watershed disturbances are a reflection of range suitability and grazing standards. Alternative 3, for example, has a large amount of land base suitable for grazing and relatively lenient forage utilization standards, both on uplands and within the riparian area. This combination rates this alternative last in protecting overall watershed and second-to-last for protecting riparian values. Conversely, Alternative 6 has the least amount of land base suitable for grazing and the most stringent grazing utilization standards, both on uplands and riparian areas. This combination ranks this alternative first in the potential to protect overall watershed integrity.

R.2, R.3 Riparian Condition and Water Quality

Besides altering physical characteristics of riparian areas and stream channels, livestock can affect several water quality parameters. Most noted are sediment, bacteria and nutrients, primarily nitrates and phosphates (Buckhouse, 2000). Braun (1986) concluded that cattle can be the cause or source of several types of water pollution. Livestock can accelerate erosion potentials when they remove vegetation and trample soils. Eroded soils can be deposited into streams increasing sedimentation and turbidity. Sediment can deteriorate stream habitat in at least two ways. Suspended sediment reduces light penetration causing reduction in aquatic plant photosynthesis and dissolved oxygen levels. Sediment can clog gravels used by spawning fish for egg deposition and can entomb various aquatic life forms that are major sources of food for fish. In addition, cattle discharge urine and manure, which can generate chemical and biological pollution.

Potential impacts to riparian and aquatic resources by livestock vary somewhat by alternative. Some alternatives contain more comprehensive measures to protect or restore riparian areas than others. However, all alternatives, except Alternative 1 (No Action), have the potential to improve overall riparian and aquatic conditions over present conditions. Rates of improvement will vary by alternative and the actual condition of individual areas. Each individual area has a different potential rate of recovery that may range from months to decades that cannot be assessed at a programmatic level. Alternatives are rated relative to one another for their overall potential to protect and improve riparian and aquatic resources.

Table 4.49 summarizes the comparisons of Alternatives' abilities to protect and/or restore riparian areas and water quality. Actual rates of recovery will depend on site-specific conditions.

- *Table 4. 49. Ability of Alternatives to Protect and/or Restore Riparian Areas and Water Quality.*

Livestock Grazing	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Acres Suitable for Sheep	701,942	701,942	701,942	630,160	621,256	403,149	694,066	693,115
Acres Suitable for Cattle	460,303	460,303	460,303	407,942	401,051	255,269	452,621	452,251
Ability of S & G's to protect values	6	4	5	3	2	1	3	3
Overall Potential to Protect or Improve Riparian and Water Quality[1]	8	6	7	3	2	1	4	4

1 A rating of "1" has the greatest potential to protect riparian, water quality and aquatic habitat. A rating of "8" has the least potential to protect/improve overall riparian and water quality.

Alternative 6 has the fewest suitable acres and the most restrictive forage utilization standards. It is therefore rated as the best alternative to protect/restore riparian values. Conversely, Alternative 1 has more acres suitable for livestock, and the current Forest Plan does not contain any specific riparian forage utilization standards. Alternative 1 is therefore rated last. Alternatives 2 and 3 have the same number of suitable acres as Alternative 1 but since they have specific riparian forage utilization standards, they are rated better overall than Alternative 1. Alternatives 4, 7, and 7R have the same utilization standards, but Alternative 4 has fewer suitable acres, thus is rated "better" than Alternatives 7 and 7R.

ROAD DISTURBANCES

R.2, R.3 Riparian Condition and Water Quality

Roads can affect a variety of riparian and stream channel values and functions including water quality (primarily sediment),and the timing and intensity of runoff. Idaho (1988) stated "roads create a disproportionate share of the problem, probably greater than 90 percent in most instances." The magnitude of sediment contributions from roads will vary greatly, depending on the location, soil type, geology, topography and climate characterizing the area. Roads on gentle to moderate slopes and stable topography have a relatively low potential for contributing sediment when properly constructed and maintained. However, roads located adjacent to streams, on steep slopes, and/or unstable topography have a high potential to produce sediment for a long period of time if not properly located, planned, constructed and maintained (Idaho, 1988).

Roads in and adjacent to riparian areas have perhaps more potential to influence local riparian and aquatic values than any other activity other than mining. Roads constructed within and adjacent to riparian areas can directly remove protective vegetation, alter or restrict stream channel processes and deposit large amounts of eroded material directly into the channel system. This indirectly influences riparian habitat, channel stability, water quality, and aquatic habitat.

Across the Forest, approximately 460 miles of roads and trails exist within the AIZs. The impact of these roads varies between areas, but overall impacts to riparian stream channel and aquatic values are estimated to be relatively high. No new roads are proposed within the AIZ under any alternative; however, new roads are proposed in association with timber harvesting. Some of these roads may cross or impact riparian areas. The actual effect of roads on riparian areas will vary based on factors such as location and construction techniques. The Forest is required to apply specific mitigation measures and best management practices when constructing roads within AIZs (See Prescription 2.8.3 in the Revised Forest Plan). Further, water quality standards, both federal and state, must be met and maintained. Since site-specific location and construction techniques are not specifically known at this time, they cannot be evaluated at the programmatic level, the only real variable that shows differences among alternatives is the potential mileage of proposed new road construction.

Table 4.50 compares each alternative to another in respect to potential new roads constructed. It is assumed there is a linear relationship between the total miles of roads and potential effects to riparian areas and water quality. That is, the more roads existing forest-wide, the greater potential to degrade riparian and water quality values; even though potential effects will be mitigated through the use of BMPs and other standards and guidelines (see Prescription 2.8.3 in the Revised Forest Plan). This linear relationship also assumes the same design and construction techniques will be applied consistently in the alternatives.

- *Table 4. 50. Road and Motorized Vehicle Disturbance Potential by Alternative.*

Roads	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Miles of Potential New Road Construction (per decade)	81	73	98	17	16	7	18	35
Miles of Existing Roads Open to Motorized Travel	2,033	2,033	2,033	1,876	1,856	1,298	1,904	1,978
Relative Potential to Influence Riparian Values[1]	7	6	8	3	2	1	4	5

A value of "1" has the least potential to adversely impact to riparian areas. A value of "8" has the greatest potential to adversely impact riparian areas. The ratings are not an order of magnitude, rather a simple rating of one Alternative to another. That is, Alternative 6 has a greater potential to protect riparian values than Alternative 5, which is better than Alternative 4.

Alternative 6 has the least amount of roads open for motorized use and the fewest potential miles of new road construction. Open roads are about 35 percent less than Alternative 1 and potential new road construction is about 90 percent less than Alternative 1. Alternatives 7 and 7R are about in the middle of the range of alternatives. Alternative 7 has about 6 percent less miles of open roads than Alternative 1 and about 80 percent less miles of constructed roads than Alternative 1. Alternative 7R has about 3 percent fewer miles of open roads and 65 percent fewer miles constructed than Alternative 1. The actual effects of existing and new roads on riparian areas, stream channels, aquatic habitat and water quality varies between road segments and relative location to the AIZ.

RECREATION MANAGEMENT

R.1 WATERSHED INTEGRITY

As with timber and grazing, impacts are assessed at a Forest-wide level, with no specific details at the watershed level. The ratings primarily reflect motorized use and open trail densities and cross-country opportunities. Developed recreation will remain essentially constant between alternatives. It is assumed there is a linear relationship between miles of open roads and trails and available cross-country travel and potential watershed damage by motorized vehicles. Therefore, the potential to affect overall watershed values, as the alternatives relate to one another, is reflected in the following table.

- *Table 4. 51. Potential for Watershed Disturbance by Recreation Management, by Alternative.*

Recreation Management	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 7**	**Alt 7R**
Acres Open to Cross-Country Travel	420,215	420,215	420,215	0	25,500	0	22,900	29,400
Miles of Open Motorized Routes	2,033	2,033	2,033	1,876	1,876	1,298	1,904	1,993
Relative Potential to Protect Watersheds[1]	7	6	8	2	3	1	3	5

1 A rating of "1" has the least potential to disturb watershed function and associated riparian, water quality and aquatic habitat. A rating of "7" has the greatest potential. The ratings are not an order of magnitude between alternatives; rather a simple relative ranking of one alternative to another.

Alternatives 4 and 6 do not provide for any cross-country travel. Alternative 6 has the fewest amount of routes open to motorized travel and is therefore rated as having the least potential to disturb overall watershed values. Alternative 7, even though it has more miles of open motorized routes than Alternative 5, is rated as having less potential disturbance because fewer acres are open to cross-country travel than in Alternative 5. Alternatives 1, 2, and 3 are essentially the same and have the most acres and routes open to motorized travel. These alternatives are rated as having the greatest relative potential to disturb watershed values of the rated alternatives. Alternative 7R, though it has a relative ranking of "5," has 93 percent less acres available to cross-country travel than Alternatives 1, 2, and 3, and about 55 fewer miles of open routes than those alternatives.

R.2 RIPARIAN CONDITION

None of the alternatives specifically propose constructing any new recreation facilities within the AIZs. The occurrence/maintenance of existing facilities will not appreciably change between alternatives. Dispersed recreation, including camping and off-highway vehicle (OHVs) use, will probably continue to have the most wide-ranging effect on riparian areas and associated stream channels, water quality, and aquatic habitat. The alternatives that limit or restrict dispersed uses, particularly OHV use, would provide a greater opportunity to maintain or improve riparian values.

Table 4.52 relates recreation's potential to adversely affect riparian areas by Alternative. The table reflects differences in motorized use. Dispersed camping and other dispersed uses do not vary substantially between alternatives. Similarly, the development, expansion, and/or improvements of new and existing recreation facilities (campgrounds, trailheads, etc.) are relatively constant between alternatives, and are therefore not included in the table. As with other Forest management activities, any new ground-disturbing proposals must be analyzed through a site-specific environmental analysis process prior to project implementation.

- *Table 4. 52. Potential to Protect Riparian Areas by Recreation.*

Recreation	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Total Acres Open to Cross-Country Travel	420,215	420,215	420,215	0	27,800	0	22,900	29,400
Miles of Open Motorized Routes	2,033	2,033	2,033	1,876	1,856	1,298	1,904	1,993
Relative Potential to Protect Riparian Values[1]	6	6	6	2	4	1	3	5

1 A value of "1" has the least potential to adversely impact to riparian areas. A value of "6" has the greatest potential to adversely impact riparian areas. The ratings are not an order of magnitude, rather a simple relationship of one Alternative to another. For example, Alternative 6 has a greater potential to protect riparian values, than Alternative 4, which is better than Alternative 5, etc..

Alternatives 1, 2, and 3 are essentially the same, all having identical total acres open to cross-country travel and miles of open motorized routs. Alternatives 4 and 6 have no acres open to cross-country travel, and about 8 percent and 35 percent fewer miles open to motorized travel respectively. Alternatives 5, 7, and 7R are about in the middle of the range of alternatives. These Alternatives have about 95 percent fewer acres open to motorized travel than Alternatives 1, 2, and 3 and about 5 percent fewer miles of open motorized routs. Actual effects to riparian areas, aquatic habitat and water quality are site-specific. Reductions in open road mileage are relatively small between alternatives, with Alternative 6 having the greatest reduction, about 735 fewer miles than Alternatives 1, 2, and 3. However, even reducing total mileage by a few percent should have positive effects on overall watershed and riparian health and function.

R.3 Water Quality

Gosz (1982) researched non-point sources of water quality degradation by recreation. He subdivides contaminants into three major categories: physical characteristics, which includes suspended matter and water temperature; chemical characteristics, which includes organic compounds, nutrients and heavy metals; and biological characteristics, which includes microorganisms. He found conflicting literature indicating that recreational activity is, on one hand, a significant source of pollution, but found other sources that failed to show significant water quality degradation attributed to recreation. He did conclude, however, that recreational activities can cause changes in the flows of material and energy through watersheds that can be related to watershed health (See Watershed Cumulative Effects), which are normally regulated by topographic, meteorologic and edaphic variables. To what extent is unknown or contradictory and he recommended more research. Observations by

Forest personnel have indicated recreation is not having a measurable effect on water quality forest-wide, but localized impacts have been observed (Leffert, 2002). As such, there are no appreciable differences between alternatives that are not reflected in Tables 4.51 and 4.52.

MINERALS MANAGEMENT

R.1, R.2, R.3: WATERSHED INTEGRITY, RIPARIAN AND WATER QUALITY

Mining can affect a variety of watershed and riparian processes and functions. Issues related to mining range from alteration of watershed runoff patterns to aquatic and water quality degradation. Open-pit phosphate mining is the most prevalent kind of mining within southeastern Idaho. Phosphate mining occurs not only on National Forest System lands, but on State, BLM and private lands as well. Other mining in and around the Forest includes placer and hard-rock gold mining, and sand and gravel operations. Small opal and travertine mines occur on the Targhee portion of the Forest and perlite is mined on the Curlew National Grasslands.

Environmental Impact Statements have been, and will continue to be, prepared for each active mine that occurs within National Forest System lands. Within each of these EIS's, specific watershed and riparian area impacts are identified and effects to watershed and riparian resources, both during and after mining, are analyzed. For Example, the EIS for the Dry Valley Phosphate Mine – South Extension Project (2000), identifies and discusses numerous watershed and water resources issues. These include:

- Potential effects on groundwater and surface water, springs, seeps, wetlands, vegetation, and wildlife from heavy metal contamination, specifically selenium, and the effects to downstream beneficial uses
- Effects of the re-alignment of Dry Valley Creek on hydrologic processes and aquatic values
- Potential for contamination of water resources from accidental releases of hazardous materials
- Acid generating potentials of overburden, stockpiles and backfill; Site water balance, erosion and sediment impacts and control
- Monitoring programs with trigger levels and contingency actions
- Cumulative effects of the action on watershed, riparian, aquatic and water quality values

All alternatives must adhere to all existing rules, regulations and laws pertaining to mining processes and environmental protection, such as the Clean Water Act. As such, environmental impacts will be minimized in alternatives. All Alternatives, except Alternative 6 specify an "adaptive" approach to regulating phosphate mining impacts and rehabilitating disturbed lands. Alternative 6 prescribes specific direction the mines must follow. Though probably well intended, the direction contained in Alternative 6 has not been proven to be effective in adequately protecting watershed and riparian resources. If new information or knowledge is gained, this alternative is least flexible in implementing that knowledge. Therefore alternative 6 may have the least potential to adequately protect watershed and riparian resource values. The remainder of the alternatives would apply protective and mitigative measures that are research-driven. As new knowledge is gained, protection and mitigation measures would be applied accordingly. Alternatives 1-5 and 7-7R have the greatest flexibility to implement new knowledge and techniques, thus having the greatest potential to protect watershed and riparian resource values. For example, contamination of watershed vegetation, surface and groundwater by selenium is currently an issue. A team consisting of land managers, researchers and mining engineers is currently researching best methods of controlling selenium releases into the environment. As knowledge is gained, this knowledge can be readily applied to ongoing and future mining activities, reducing contamination potentials from selenium. Similar applications can be made to hydrological alterations, riparian and aquatic resources, and other water quality issues, such as sediment and acid drainage.

WATERSHED AND AQUATIC RESTORATION

R.1, R.2 WATERSHED INTEGRITY AND RIPARIAN CONDITION

Direct effects of watershed restoration would be primarily applied to soils and vegetation. Soil erosion potentials would be tentatively reduced through a variety of tools, including intensive actions, such as installing gully plugs, or more passive actions such as removing impacting sources, including recreation or livestock grazing. Indirect consequences would include improved streamflow regimes, reduced erosion and sediment potentials, and improved downstream water quality and aquatic habitat.

The following table rates the alternatives relative to one another for watershed restoration and/or preservation potentials. It is assumed there is a linear relationship between acres restored and/or preserved and improved watershed function or stability. The table does not include acres of riparian areas (Prescription 2.8.3), the acres contained in wild and scenic eligible rivers, municipal watersheds, or research natural areas (RNA), since they remain constant throughout the alternatives. Municipal watershed acres are a constant between all alternatives except 7R. In Alternative 7R, the watershed area serving the municipality of Grace was changed from a municipal watershed prescription to Elk and Deer winter range. This prescription still protects the integrity of the watershed to provide clean water to the city.

- *Table 4. 53. Potential to Restore/Protect Watersheds, by Alternative.*

Watersheds	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Acres of Restoration or Preservation Prescriptions	30,600	30,600	6,500	642,700	552,000	623,500	209,200	111,554
Relative Potential to Restore Watersheds[1]	6	6	7	1	3	2	4	5

A rating of "1" has the best potential to restore watershed function and associated riparian, water quality and aquatic habitat. A rating of "7" has the least potential. These ratings are not an order of magnitude; rather a simple ranking of one alternative to another. Alternatives 1 and 2 are rated the same, because they essentially have the identical number of acres with restoration or preservation prescriptions.

There may be short-term effects during the life of specific projects. The table ratings reflect the long-term effects over the planning period. Alternative 4 has the greatest potential to protect/improve watershed and riparian values because it has the most prescription acres allocated to restoration/preservation. It has about twenty times the amount of acres in reservation/preservation prescriptions than either Alternatives 1 or 2. Alternative 6 has slightly fewer acres allocated to reservation/preservation prescriptions than Alternative 4. Alternatives 7 and 7R have about seven and 3.5 times the number of restoration/preservation acres respectively than Alternatives 1 and 2. Alternative 3 has about 20 percent fewer acres allocated to restoration/preservation prescriptions than Alternatives 1 and 2 and is therefore rated last in the range of alternatives.

No restoration is specifically identified in any of the individual alternatives for riparian areas. However, the Forest maintains a Watershed Improvement Needs Inventory (WINI) which will be implemented regardless of which alternative is selected. Watershed assessments at the 5^{th} HUC level are scheduled throughout the Forest over the next decade. These assessments may identify additional sites or areas for restoration and/or protection. This will not change between alternatives.

Actual improvement depends on the influence watersheds have on any specific riparian area. Potentials for watershed improvement and/or protection does not vary by management prescription, even though the application of management prescriptions varies by alternative. Alternatives are rated one another on the differences of management prescriptions to improve and/or protect riparian and upland areas, which has the potential to indirectly affect water quality and aquatic habitat. Table 4.7, above, depicts the relative differences between alternatives to protect and restore riparian values.

R.3 Water Quality

TMDL Implementation Plans for water quality limited 303(d) streams in the Portneuf and Blackfoot River watersheds are scheduled for completion in 2002. Bear River, Salt River and other TMDLs and Implementation Plans are due to be completed over the next several years. Specific riparian areas, stream channels, and aquatic habitat improvement or restoration needs may be identified through this process and will not change between alternatives.

FIRE AND OTHER TREATMENTS

R.1, R.2, R.3: Watershed Integrity, Riparian and Water Quality

Various authors have described the effects of prescribed fire and other mechanical and chemical treatments on watershed values. Parameters directly influenced by fire include rainfall interception potentials (specifically raindrop splash), soil infiltration rates, soil moisture storage capacities, snow accumulation and snowmelt rates, overland flow, surface erosion potentials and mass erosion potentials (landslides). Indirect downstream effects include altered streamflow regimes and changes in water quality in the form of soil and ash sediments and released nutrients. Water temperature can also be affected, as well as water chemistry in the form of increased bicarbonates and basic concentrations of cations and anions (calcium, magnesium, etc.). The degree to which these parameters are impacted depends on the location, size, and intensity of the fire within the watershed, as well as geologic and post-burn climatologic factors. A fire that burns "cool" has less potential to impact watershed values than a "hot" fire (Branson, *et al*, 1981; Key and Stewart, 1994; Troendle and Bevenger, 1996; Tiedemann, *et al*, 1999; and Tiedemann, 1978).

Troendle and Bevenger (1996) assessed a wildfire that occurred in 1988. They found that soil infiltration potentials were diminished, sediment exports were substantially increased, and streamflows were increased. If a watershed is treated with a "cool" fire, the consequences are less.

The occurrence of wildland fire within a specific watershed or even forest-wide cannot be accurately predicted. Therefore the impacts of wildland fire on watershed values will not be assessed. The application of prescribed fire has been calculated on a forest-wide basis. It is assumed that these fires will be applied evenly throughout the Forest's watersheds, and effects will be essentially the same as timber harvesting.

Some areas may be treated with mechanical or chemical methods, instead of fire. Mechanical and chemical treatments are considered to have about the same potential physical affects to watershed function and health as prescribed burning. Chemical treatments have an inherent risk of contaminating surface and ground water. If chemical treatments occur, precautions will be taken to preclude water contamination. There are no specific proposals to apply herbicides at this time. Therefore, effects to water quality by chemicals are not considered to be a significant risk to be discussed further at the programmatic level. If specific chemical treatments are proposed in the future, site-detailed analysis, complete with risk assessments, will be conducted at that time.

The Bureau of Land Management proposes to treat vegetation by fire, chaining, chemical and other means within the Upper Snake River basin. Few of these treatments are within the affected Forest's watersheds and are not considered within this analysis.

The Forest has treated approximately 63,000 acres of rangeland since the mid 1940s (See Livestock Grazing section in Chapter 3). The vast majority of these acres either displayed no hydrologic effects or have recovered hydrologically and are not considered to be part of the current disturbance within each watershed. The remaining acres are considered in the current disturbed acreage and are included in the Cumulative Effects section.

No prescribed fire, mechanical, or chemical treatments are specifically identified to occur within riparian areas. The effects of upland treatments on riparian areas depend on numerous factors, such as timing, intensity, location within a watershed (i.e., ridgetop versus valley floor), and climatic events occurring prior to and after the treatment. The potential to affect riparian areas within the Forest lies in the acres of non-riparian treatments scheduled forest-wide in each alternative.

Table 4.54 describes the overall potential to disturb forested and non-forested watersheds by burning, mechanical, and chemical treatments by relating each alternative to the other. It is assumed there is a linear relationship between the acres treated and potential watershed disturbance. The potential effects to watersheds from any given treatment are dependent on the intensity of the treatment, location within the watershed, and post-treatment weather conditions. A general guideline is that no more than 30 percent of a watershed should be in a disturbed condition in order to maintain overall watershed stability (USFS, Targhee NF, 1997).

The overall impacts of treatments in relationship to the percentage of the Forest's watersheds impacted vary by alternative. Alternative 1 has the largest number of acres proposed for treatment, resulting in the greatest number of watersheds that have 10 percent or more acres disturbed and four watersheds that approach or exceed the 30 percent Forest Plan disturbance guideline. Alternative 7R has the fewest proposed treatment acres, resulting in the fewest watersheds exceeding 10 percent treatment disturbance, with only a single watershed exceeding the 30 percent disturbance guideline. The remainder of the alternatives range within Alternatives 1 and 7R.

- *Table 4. 54 Relative Potential to Affect Watersheds, Riparian Areas, and Water Quality, by alternative.*

Prescribed Burning, Chemical and Mechanical Treatments	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Total Acres Treated	130,000	94,900	119,900	127,400	90,000	80,800	106,800	78,000
Relative Potential to Protect Watersheds[1]	8	4	6	7	3	2	5	1

1 A rating of "1" has the least potential to disturb watershed function and associated riparian, water quality and aquatic habitat. A rating of "8" has the greatest potential. The rankings are not an order of magnitude; rather a simple relationship between alternatives.

In order to portray a worst-case scenario, the ratings reflect the potential to disturb the land during treatment. The more land treated, the greater the potential to adversely affect watershed, riparian, water quality and aquatic habitat values. However, following treatment, watershed conditions could be improved over pre-project conditions, which would effectively reverse the ratings.

Cumulative Effects

WATERSHED INTEGRITY

Determining the cumulative environmental consequences of an action requires delineating the cause-and-effect relationships between the multiple actions and the resources, ecosystems and human communities of concern. The significance of cumulative effects depends on how they compare with the environmental baseline and relevant resource thresholds. When determining environmental consequences, three principles must be addressed. These are: the additive, countervailing and synergistic effects; a look beyond the life of the action; and addressing the sustainability of resources, ecosystems and human communities (CEQ 1997).

The current "health" of watersheds is described in Chapter 3. It is a combination of the IWWI ratings, DEQ waterbody assessments, EPA/USGS Watershed Assessments and other assessments. These assessments and initiatives use a variety of parameters to describe present conditions. Watersheds at the 4th and 5th HUC scale include both private and public lands, including State of Idaho, Bureau of Land Management, U.S. Fish and Wildlife Service, and the Forest Service. The mix of these lands varies within watersheds. The effects of watershed impacts from these various lands is also mixed. The EPA/USGS assessments described in Chapter 3 paint a picture of overall watershed deterioration throughout southeastern Idaho, which includes all lands in public and private ownership (See list of past and present actions at the beginning of Chapter 4). The Forest has no influence over activities these other lands. Watershed impacts will continue to occur on other lands as warranted by the landowners (see Caribou Adjacency Analysis in the Project File).

The Forest coordinates with the Natural Resource Conservation Service (NRCS), Bureau of Land Management and other agencies, organizations, and individuals, but private landowners and other agency managers make the final decision on what, where, and how activities will occur on the lands they own and manage. Therefore, overall watershed ratings (described by EPA/USGS (1998) will probably remain essentially the same as the current situation regardless of which Forest Plan alternative is selected for implementation. Some alternatives improve or protect National Forest System lands better than other alternatives.

This cumulative effects analysis will be limited to the NFS portions of the watersheds.

In order to assess future impacts to watersheds and relate those impacts to cumulative effects of past, present and foreseeable actions on Forest watersheds, three phases of watershed health indicators can be used. These are: soil stability and watershed function; distribution of nutrients; and energy recovery mechanisms. The following table summarizes these phases and the associated health indicators.

- *Table 4. 55 Summary of Phases of Watershed Health.*

Phase	Healthy	At Risk	Unhealthy
Soil Stability and Watershed Function	No evidence of soil movement	Soil is moving, but remains on site	Soil is moving off site
Distribution of nutrients and energy	Plant and litter distribution unfragmented	Fragmented distribution developing	Fragmented distribution developed, with large barren areas between fragments
	Photosynthetic activity occurs throughout the period suitable for plant growth	Photosynthetic activity restricted during one or more seasons	Photosynthetic activity restricted to one season only
	Rooting throughout the available soil profile	Roots absent from portions of the available soil profile	Rooting in only one portion of the available soil profile
Recovery Mechanisms	Diverse age-class distribution. Plants are vigorous	Seedlings and young plants are missing. Plant vigor is reduced	Decadent plants predominate. Plant vigor is poor
	Germination microsites are present and well distributed	Developing crusts or soil movement degrade microsites	Soil movement or crusting inhibit most germination

From NRC, 1994

When determining past, present and future impacts on watershed health (as defined in the above table), the overall condition of the watershed must be evaluated. Within any given watershed, there may be localized sites were "unhealthy" conditions exist, including mine sites, roadways, recreation sites, and livestock congregation areas. On a watershed scale, the presence of these individual localized sites may not have a substantial or measurable effect on overall watershed health. However, these individual sites may combine cumulatively and the overall health of the watershed could be degraded to the point where deteriorated "at risk" or "unhealthy" conditions prevail.

The effects of timber harvesting, for example on watershed health, using the above criteria, can be mixed. Effects can, and should, be subdivided into short and long-term. Over the short-term, harvesting removes vegetation from a site. Soils could be displaced or compacted, nutrient and energy potentials reduced and recovery mechanisms deteriorated. This affected portion of the watershed could be reduced from a "healthy" condition to an "at-risk" condition or even to an "unhealthy" condition over the short-term. However, as the vegetation grows back, this effect can be reversed. Conditions can improve to, or even better than, pre-harvest conditions. For example, if a harvest unit was insect-infested, pre-harvesting watershed health may be determined to be "at-risk" using the phase criteria. Following harvesting, soils, watershed function, nutrient and energy conditions and recovery mechanisms may all improve to "healthy" over the long-term. This is a net long-term improvement in overall watershed condition at that site.

In order to maintain an overall healthy watershed condition, a general guideline is used. This advocates that no more than thirty percent of a watershed should be in a disturbed condition at any given time (USDA-FS, Targhee NF, 1997). Disturbance can be in the form of timber harvesting, roads, burned areas, mines, etc. This percentage is not an absolute threshold in that twenty-nine percent is totally acceptable where thirty-one percent initiates an unraveling of the watershed. Rather, it acts as an indicator: the closer cumulative watershed disturbance approaches the threshold indicator, the greater the warning of potential watershed degradation or impairment of overall watershed health. The actual extent of degradation or impairment, if it occurs, is dependent on effects to the phase elements described above. Phase element impacts can in turn be influenced by a number of factors, including the degree and location of disturbance, inherent watershed geology and topography, and climatological events.

The point or threshold at which a watershed hydrologically recovers from a past disturbance depends on the attributes of the watershed, the type of activity, and the intensity of disturbance. For example, the effects of timber harvesting on water yields, observed by Troendle (1983) and Troendle and King (1985), indicated localized yield increases can last more than twenty years following harvesting. However, the effects of increased erosion and sediment will generally only last a few years, coinciding with the recovery of vegetative ground cover (Ward, *et al*, 1990) and physical soil stabilization (Campbell and Stednick, 1983). The Targhee Forest Plan (1997) defines a hydrologically recovered condition as:

> *"Vegetative life form where natural canopy coverage is achieved and subsequent streamflow quantities and character (timing and amount) reflect more natural conditions. Within the forested ecosystem, this equates roughly with the sapling/early pole life form. This life form is achieved at approximately 20 to 30 years of age, depending upon cover type and inherent site productivity potentials."*

Past and present watershed disturbances remain constant within each alternative. Only foreseeable disturbances (timber harvesting, livestock grazing, road construction/ closures) will vary between alternatives. When determining the cumulative effects on watershed health, it is assumed that there is a linear relationship between potential disturbances and potential watershed deterioration. The more acres burned, for example, the greater potential to affect the components of watershed health phases described above. Since it is not specifically known when or where prescribed burning will occur, specific, localized predictions cannot be made. However, predictions can be generally made on a Forest-wide scale by relating potential disturbances to potential watershed impacts, which in turn can relate alternatives relatively.

Watersheds 9, 12, 13, and 16 have high percentages (from about 15 percent to about 65 percent) of the watershed that have been impacted by past timber harvesting, road construction, mining and fire activities (See Appendix B). These watersheds could be further impacted by proposed management activities in every alternative, which could bring cumulative disturbances above the 30 percent disturbance guideline. If this were to occur, watershed adjustment processes could be initiated, potentially adversely affecting downstream channels, water quality and aquatic habitat. Delaying, reducing, mitigating, or eliminating proposed activities within these watersheds over the next decade would serve to eliminate or reduce cumulative impacts within these watersheds, and thereby maintain or improve overall watershed stability and function.

Alternatives 1 and 2 have eight watersheds that could have cumulative impacts approach or exceed the 30 percent watershed disturbance guideline. Alternatives 3 and 4 have ten watersheds that could approach or exceed 30 percent cumulative disturbance. Alternatives 5, 6, and 7R have five watersheds that could approach or exceed 30 percent cumulative disturbance. Alternative 7 has seven watersheds that could exceed 30 percent cumulative disturbance (See Appendix B).

The following tables summarize the cumulative impacts to all the watersheds within the Forest relative to each other. These impacts are the components needed to assess the issue indicator "*Relative rates to improve watershed geomorphic integrity.*" "Rate" in this context is not specifically a time factor (weeks, months, years) but a relationship between alternatives to improve overall watershed values, including geomorphic integrity. The time required to improve a watershed varies greatly by the overall condition of the watershed, the geology, climate, etc.

- *Table 4. 56 Cumulative Impacts to All Watersheds Relative to One Another.*

Timber Harvesting	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 7**	**Alt 7R**
Relative potential to protect watersheds	7	6	8	3	2	1	4	5
Livestock Grazing								
Relative potential to protect/improve watersheds	7	6	8	3	2	1	4	4
Recreation Management								
Relative potential to protect/improve watersheds	6	6	6	2	4	1	3	5
Watershed Restoration								
Relative potential to restore watersheds	6	6	8	1	3	2	4	5
Prescribed burning and other treatments								
Relative potential to protect watersheds	8	4	6	7	3	2	5	1
Total Points	**34**	**28**	**36**	**16**	**14**	**7**	**20**	**20**
Cumulative	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 7**	**Alt 7R**
Relative potential to protect/improve watersheds*	7	6	8	3	2	1	4	4

A rating of "1" has the greatest potential to protect and/or improve watershed functions and associated riparian, water quality and aquatic habitat. A rating of "8" has the least potential to protect and/or improve overall watershed values. The ratings are not an order of magnitude (e.g. Alt 3 having 8 times more watershed disturbance than Alt 6), rather simple relative rankings of one Alternative to another. For orders of magnitude, see the individual section discussions regarding each of the activities.

Alternative 6 has the greatest potential to improve/protect overall watershed health. It has the least acres allocated to land-disturbing activities, such as timber harvesting and livestock grazing, but has the second highest acres allocated to fire, chemical and mechanical treatments. Alternative 5 is ranked number 2, but had double the cumulative points as

Alternative 6. Alternative 7 and 7R, even though they have slightly different mixes of prescriptions and outputs, had the same cumulative score and ranked in the middle of the alternatives. Alternative 1, the current situation, was the worst in improving/protecting overall watershed health, which validates the Need for Change discussed in *the Initial Analysis of the Management Situation* (AMS), which initiated the Revision process.

R.2, R.3 RIPARIAN CONDITION AND WATER QUALITY

The cumulative effects areas are the entire river basins where individual watersheds occur. The northern portion of the Forest drains into the Columbia River system. The southern portion of the Forest flows into the Great Basin. However, as flows progress downstream, localized effects become more and more diluted and eventually reach a point where effects become non-measurable. The point where this occurs varies between watersheds (spatial boundary), seasons, flow events (temporal boundary) and elements (e.g. sediment vs. dissolved oxygen). Spatial issues are particularly important in terms of the downstream delivery of elements. Typical annual transport distances are estimated to be approximately 10, 2, and 0.1 kilometers for suspended sediment, sand and coarse particles, respectively (Bunte and MacDonald, 1998). Further, sediment delivery ratios are not appropriate for routing different-sized particles through a sequence of varying stream types. The amount of sediment streams are carrying at the time of analysis is also a factor. Therefore, it makes no sense to extend a cumulative effects area hundreds or even tens of miles downstream and expect to measure or even detect an effect. IDL (1995) suggests that watershed areas greater than 20,000 acres in size have such diversity in the complexity of streams, soils, geology, slopes and land use that meaningful cumulative effects are difficult to detect. A 20,000-acre watershed is equivalent to a 6th HUC subwatershed.

There are approximately 150 subwatersheds (6th Code HUC) within the Caribou portion of the Forest. For programmatic-level analysis, 150 subwatersheds are too many to analyze, especially when some major activity locations, such as timber harvesting, are not presently known. However, analysis has been done at approximately the 5th code or watershed level (see watershed analysis above). This scale can also be used to assess cumulative effects on riparian/wetlands and water quality. It is assumed that there is a linear relationship between the acres and degree of watersheds and riparian/wetlands potentially disturbed and the potential condition of riparian/wetland areas and water quality.

As described in Chapter 3, the State of Idaho has assessed waterbodies throughout the State. Section 303(d) of the Clean Water Act requires those waterbodies not supporting designated beneficial uses to be listed. Listed waterbodies are discussed in Chapter 3. If a waterbody is within the Forest boundary, an Implementation Plan will be written to identify cumulative impacts and corrective actions to be taken to improve water quality. These Implementation Plans will be written regardless of the alternative selected and there will be no differences between alternatives in this regard. Therefore the following cumulative effects analysis will consider impacts and activities that are controllable by the Forest, even though other activities have and will continue to occur on lands outside the Forest boundary.

Streams and riparian areas are naturally dynamic. That is, they naturally adjust over time. However, goals common to all alternatives address maintaining riparian and stream channel characteristics that are considered "good" and improving or restoring those areas that are determined to be in less than desirable condition. Some alternatives address these goals better than others. The ability of each alternative to maintain healthy riparian conditions and improve less desirable conditions varies with the mix of proposed prescription areas and the goals, objectives, standards, and guidelines contained within each of those prescriptions. The actual rate of potential change for individual riparian areas cannot be determined at the programmatic scale. Each individual riparian area or stream reach will respond differently to various management practices, the type and degree of disturbance, corrective measures taken, natural physical processes, climate, or other actions.

Actual rates of movement of individual areas from one condition to another will be determined through monitoring (See the Monitoring Chapter in the Revised Forest Plan). In general, riparian vegetation improvement will be observed first, followed by improved channel conditions. The "number of streams/riparian areas in properly function condition" are assessed on a periodic basis. They are static in time, but dynamic in nature. That is, they reflect conditions at the time the inventory is taken but continue to change and adjust over time. Periodic inventories provide relative change or trends over time.

The cumulative effects of the combined past, present and reasonably foreseeable activities within the Forest that have the potential to have a measurable effect on riparian and water quality values are timber harvesting and associated road construction, livestock grazing, mining, recreation (including cross-country motorized travel) and prescribed burning. Of these, livestock grazing probably has the greatest impact on riparian areas Forest-wide. No timber harvesting is specifically identified to occur in any AIZs in any of the alternatives. Associated road construction may impact riparian areas, but no roads have been specifically identified for construction within riparian areas. Mining is a constant that will remain the same in all Alternatives. Prescribed burning is scheduled Forest-wide, but none is specifically scheduled in riparian areas. Likewise, no mechanical or chemical vegetation treatments are anticipated to occur within riparian areas. The potential for prescribed fire, mechanical or chemical treatments to impact riparian areas is directly dependent on the number of upland acres treated.

The following table reflects the ability of the alternatives to protect or improve riparian areas and water quality. The time required to improve a riparian area or water quality varies greatly by the overall condition of the watershed, riparian area, the geology and topography of the areas, channel type, vegetation types, climate. Recovery time could range from several months to decades, depending on the condition of the channel/riparian area and the adjustment processes that must occur to attain a desired or stable condition.

- *Table 4. 57 Relative Rates to Improve Riparian Condition and Improve or Protect Water Quality, by Alternative.*

Timber Harvesting	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 7**	**Alt 7R**
Relative Potential to Impact Riparian Areas	7	6	8	3	2	1	4	5
Livestock Grazing								
Relative Potential to Protect/Improve Riparian Values	8	6	7	3	2	1	4	4
Road Construction								
Relative Potential to Influence Riparian Values	7	6	8	3	2	1	4	5
Recreation								
Relative Potential to Influence Riparian Values	6	6	6	2	4	1	3	5
Watershed Restoration								
Relative Potential to Restore Watersheds	6	6	8	1	3	2	4	5
Prescribed Burning and Other Treatments								
Relative Potential to Protect Watersheds	8	4	6	7	3	2	5	1
Total Points	**42**	**34**	**43**	**19**	**16**	**8**	**24**	**25**
Cumulative	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**Alt 6**	**Alt 7**	**Alt 7R**
Relative potential to protect and or improve riparian areas*	7	6	8	3	2	1	4	5

* A value of "1" has the greatest potential to protect or improve riparian area values. A value of "8" has the least potential to protect or improve riparian areas. The values are not orders of magnitude, rather a simple relationship of one alternative to another.

Total point values indicate the relative relationship of each alternative to protect/improve riparian, water quality and aquatic habitat values. A lower point value means the alternative provides better protection or improvement of riparian and aquatic values. The total point values do not necessarily reflect true magnitudes between alternatives, but can be used to depict relative differences between alternatives. Alternative 6, for example, received eight total points. Alternative 1 received 42 total points, or about 5 times the points as Alternative 6. This doesn't necessarily mean that Alternative 1 is 5 times worse than Alternative 6, or, conversely, Alternative 6 is 5 times better than Alternative 1. It simply means that Alternative 6 is more aggressive in improving and/or protecting riparian resource values than Alternative 1, which reflects a better "rate" to improve overall conditions. In fact, all alternatives, except Alternative 3, offer better resource protection/improvement potentials than Alternative 1. This supports the Need for Change identified in the *Initial Analysis of the Management Situation* (AMS) that initiated the Forest Plan revision process. In the AMS, riparian areas were identified as being generally below potential and that management changes are needed to improve overall conditions. The range of alternatives offer varying methods and degrees to accomplish this. Alternative 6 offers the best array of prescriptions to accomplish the Goal. Alternatives 7 and 7R are about in the middle of the range of alternatives. Alternative 3 has only one point more than Alternative 1 and would have about the same potential effects as the current situation.

SUMMARY

As populations increase, demands on the available public lands will increase. Some will want increased commodity outputs, such as livestock grazing and timber harvesting. Some will demand preservation through protection, such as designated wilderness areas. Watersheds and the values they provide, have, and will continue to be, a focal point. Even today, there is a diverse, and even polarized, view on how the watersheds should be managed and what outputs should be provided. The primary watershed output, water, has, is, and will continue to be an issue over the next several decades. Some will want more water for domestic, agricultural and industrial purposes. Some will want cleaner water that will support designated beneficial uses including recreation and fish. Some will call for increased water yields, induced from removing vegetation from watersheds or even seeding clouds to produce more precipitation. Even though these different points of view may be well-intentioned by the sponsors, the key to proper and responsible land management is to provide a mix of outputs that will optimize commodities, such as timber harvesting, livestock grazing and water yields while providing healthy watersheds and clean water to support other uses and values.

The EIS assesses the consequences of various management options proposed in the range of alternatives. All proposed alternatives satisfy existing laws, rules and regulations that pertain to water, including the Clean Water Act. All will provide a mix of outputs. For example, Alternative 3 prescribes the greatest amount of vegetation treatment and would potentially generate the greatest amount of water. Conversely, Alternative 6 prescribes the most amount of preservation in the form of proposed wilderness and roadless areas, where management-disturbing activities are minimized. This would tentatively generate the cleanest water. Alternative 7R provides a mix of protection/restoration and vegetation treatment that will optimize both water yields and clean water that can be perpetuated beyond the life of the Plan.

The EIS looks at a full range of alternatives, from high commodity outputs to high amenity provisions. Within each of these alternatives are underlying goals and objectives that accentuate watershed protection. Some alternatives provide more stringent direction than others, but all, in one fashion or another, support the Clean Water Act and other Laws, Rules and Regulations that pertain to watershed protection and health. In this manner, the sustainability of watersheds and water resources are addressed. Alternative 3 would provide the greatest commodity outputs for timber harvesting and livestock grazing. Therefore this alternative has the greatest potential to impact overall watershed health from these sources. Alternative 6 provides the greatest areas of recommended wilderness and roadless areas. Within these areas, land-disturbing activities are minimized and watershed values and health would have a greater opportunity to move toward potential. Alternatives 7 and 7R provide a mix of commodity outputs for human use while protecting and sustaining watershed and ecosystem values and health over the life of the Plan.

Irreversible and Irretrievable Effects

TIMBER HARVEST

Generally speaking, no irreversible effects are associated with timber harvesting. Disturbed areas can heal over time, and watershed values can be restored. Irretrievable effects include soil compaction and the removal of vegetation from the site. These are generally temporary (short-term) in nature and watershed values can be restored to pre-harvesting conditions over time (long-term). The length of time required to reverse these effects depends on such things as the intensity of the disturbance, geology, and climatological factors. Treated areas generally are considered hydrologically recovered within twenty to thirty years following treatment (See Revised Forest Plan).

LIVESTOCK GRAZING

Channel characteristics mutually adjust to changes in independent discharges and sediment loads (Leopold, 1994). Grazing by livestock within the riparian area can change the composition and characteristics of vegetation communities and soil profiles. These changes can affect the timing, amount and duration of runoff and erosion as well accelerate bank erosion. If changes in discharges of water and/or sediment are sufficient, or if bank disturbance is severe, channels may adjust to accommodate these impacts. A channel may undergo an entire evolutionary adjustment process if needed to regain equilibrium (Rosgen, 1996). When this occurs, even though the channel will eventually stabilize at some point (years to decades), previous conditions may be irreversibly lost.

Irretrievable effects include soil compaction, stream bank alteration and the removal of vegetation from the site. These are normally temporary in nature and riparian values can usually be restored over time, unless the disturbance is severe enough to initiate channel adjustment processes. The length of time required to reverse adverse effects depends on such things as the intensity of the disturbance, channel morphology, geology and climatological factors. Recovery time can range from a few months to decades. In general, vegetation will recover first, followed by channel stabilization.

ROAD DISTURBANCES

Once a road is constructed and in-place, that site has been irreversibly lost. Roads can be obliterated, but soil compaction and loss of vegetation may persist within the road corridor for many years or even decades.

Irretrievable effects include soil compaction and the removal of vegetation from the site. The length of time required to reverse these effects depends on the intensity of the disturbance, the applied restoration measures, geology, topography, and climatological factors.

RECREATION MANAGEMENT

Generally speaking, no irreversible effects are associated with recreation management. Disturbed areas can heal over time and riparian values can be restored unless severely disturbed. Campgrounds and trailheads can be removed, and the area restored to near pre-existing conditions, unless the site is hardened. In this situation, it could be similar to a road. If severely disturbed, watershed and channel adjustments can occur, and although the watershed/channel system will eventually re-stabilize, previous conditions may be irreversibly lost.

Irretrievable effects include soil compaction and the removal of vegetation from the site, reduction in water quality, channel stability, and aquatic habitat. These generally are temporary (short-term) in nature, and riparian values normally can be restored over time. The length of time required to reverse these effects depends on such things as the location and intensity of the disturbance, geology, and climatological factors.

MINERALS MANAGEMENT

Mining, particularly large surface mining that is associated with the Forest's phosphate reserves, has both irreversible and irretrievable watershed consequences. Once a portion of the watershed is mined, pre-mining watershed functions and values generally are lost on the disturbed lands. Mined areas can be re-stabilized, but pre-mining watershed values may never be totally restored. (See Minerals section in this Chapter for more information.)

Water quality, particularly contamination by selenium and other hazardous substances by phosphate mining is a concern throughout southeastern Idaho. Concentrations of selenium and other hazardous substances have been found within and downstream of area phosphate mines. Contaminated waters are irretrievably lost until contamination sites are reclaimed and the source of pollution controlled. Even then, though the water column may be free of pollutants, residual contamination may remain in bottom sediments for many years. There is an ongoing effort to find contaminate sources and develop techniques to control pollutants. This will not differ between alternatives.

WATERSHED AND AQUATIC RESTORATION

Generally speaking, no irreversible effects are associated with watershed restoration activities. The intent of watershed restoration is to improve overall watershed values, which is a positive effect.

Irretrievable effects may include soil compaction and removal of vegetation from the site during the rehabilitation process. These are normally temporary (short-term) in nature, and watershed values can generally be restored within a relatively short time of months to several years. Mitigation measures, such as seeding and mulching, can serve to reduce erosion potentials and help restore watershed values almost immediately following application. The length of time required to reverse adverse effects depends on the location and intensity of the disturbance, restoration measures, geology, and climatological factors.

FIRE AND OTHER TREATMENTS

Generally speaking, no irreversible effects are associated with prescribed burning, mechanical, or chemical treatments, post-treatment, climatological factors, etc. Disturbed areas can heal over time, and watershed values can be restored. The amount of time required to restore watershed values is dependent on the magnitude and location of the treatment.

Irretrievable effects can include the modification of soil characteristics and the removal of vegetation from the site. These generally are temporary (lasting only a few months to several years) in nature, and watershed values can be restored to near, on in some cases better than, pretreatment conditions over time. The length of time required to reverse adverse effects depends on such things as the location and intensity of the disturbance, geology and climatological factors.

Aquatic Biota

Analysis Scale: Subbasin to Forest-wide

Indicator:

♦R.1 Fish population viability based on probability of persistence over the long-term[6]

This analysis will concentrate on the effects of Forest management activities on the potential long-term viability of metapopulations of selected native fish species. It is believed that if their habitat and areas that directly influence their habitat are protected and restored, other important biota that have evolved to similar habitat conditions will also benefit. This analysis is based on the Fish Populations Viability Evaluation in Appendix D.

Direct and Indirect Effects

EFFECTS FROM LIVESTOCK GRAZING

Impacts from excessive grazing may include bank trampling, trailing, and heavy utilization of vegetation in some locations. These impacts typically contribute sediment to streams, decrease stream bank stability, increase stream channel width, decrease stream channel depth, and decrease riparian vegetation and associated shading (Shaw and Clary, 1996; Fleischner, 1994; Whisenant, 1999; Neary and Median, 1996; Platts, 1981; Platts and Nelson, 1985). These impacts would likely affect Yellowstone cutthroat trout, Bonneville cutthroat trout, and leatherside chub population viability, because these species prefer cold, clear streams with low frequencies of fine sediment (See Native Fish Species Descriptions in Appendix D.) The alternatives in relation to livestock grazing address the concern regarding long-term viability of fish analysis species with different expected levels of effectiveness.

Under Alternative 1, aquatic and riparian habitat conditions would not change. Until site-specific analysis for each allotment is completed, improvement is unlikely. Allotments with season-long grazing or excessive utilization and/or low stubble heights will tend to remain in their current condition. Alternative 1 will have the least positive effect upon improving riparian vegetation in damaged condition. Under this alternative, the Bear River West and Deep Creek and Daniels Reservoirs Bonneville cutthroat trout metapopulations and the

[6] **Long term** is considered to be 15 to 100 years.

Angus and Tincup Creeks' leatherside chub populations continue to experience a high threat from grazing impacts. These populations are currently at an overall high risk of extirpation. For a definition of each of these populations and metapopulations, please refer to the FEIS Appendix, Fish Populations Viability Evaluation.

Alternative 2 is slightly better than Alternatives 1 and 3 in addressing the threat of grazing, because it establishes an herbaceous utilization standard of forty-five percent. A standard stubble height of four inches is established in stream segments at PFC and six inches in stream segments functioning at risk or not functioning. Nonfunctioning and functioning at risk streams are well distributed throughout the planning area and affect the well being of each fish evaluation species. These standards may provide for some recovery of impacted streams, but not at the rate of Alternatives 4, 5, 6, 7, and 7R.

Alternative 3 does a better job than Alternative 1 in addressing threats to evaluation fish, because it begins to include standards. However, this alternative is not as effective in addressing grazing threats when compared to all of the other alternatives. This alternative uses a browse utilization standard, but no herbaceous utilization limit. In riparian areas, reliance solely upon browse utilization could result in damage to riparian areas, if they are dominated by upland species, which were not addressed with stubble height standards. In addition, the stubble height standard is the least restrictive of all alternatives that use stubble height as a standard. If riparian and stream channel recovery occurs under this alternative, it will be slow, and it will likely not occur in some damaged stream segments. Under this alternative, the Bear River West and Deep Creek and Daniels Reservoirs Bonneville cutthroat trout metapopulations and the Angus and Tincup Creeks' leatherside chub populations continue to experience a high threat from grazing impacts. These populations are currently at an overall high risk of extirpation.

Alternatives 4, 7, and 7R address the threats associated with grazing better than Alternatives 1, 2, and 3. They prescribe herbaceous utilization, browse utilization, and stubble height standards on a site-specific basis (with a restrictive default until a site-specific prescription can be developed). Alternative 6 has similar standards as those in Alternatives 4, 7, and 7R but better addresses the threats associated with grazing, because it measures stubble height throughout the riparian area rather than on the greenline. This will avoid impacts to the entire floodplain of the stream, rather than just the stream bank.

Alternative 6 will best address the threat cattle impose upon evaluation fish species, because it has the most restrictive utilization and stubble height standards. In this alternative, native cutthroat stronghold watersheds are unsuitable for livestock grazing. In addition, grazing will not be allowed on non-functioning or 303(d) listed streams.

The best alternatives that address the threat of grazing upon evaluation fish and aquatic/riparian biota as a whole are Alternatives 5 and 6, then 4, 7, and 7R; then 1, 2, and 3. The Bear River West, Deep Creek Reservoir, and Daniels Reservoir Bonneville cutthroat trout metapopulations and the leatherside chub populations in Angus and Tincup creeks are experiencing a high threat from the effects of cattle and sheep grazing. These cutthroat trout metapopulations and chub populations also have a high risk of extinction.

EFFECTS FROM ROADS/TRAILS

The impacts upon aquatic and riparian habitat associated with roads and trails were evaluated through changes in road density, miles of road projected to be constructed during vegetation treatment projects, surface area proposed for wilderness, whether new road construction is allowed in roadless areas, and summer motorized recreation use restrictions.

Increasing road densities and their attendant effects are associated with declines in the status of native inland fish (USDA-FS and USDA-BLM, 1997). Roads can affect streams through increased erosion rates, increased mass soil movement, surface erosion, migration barriers at stream crossings, alterations in channel morphology, and decreasing riparian vegetation and large wood sources. Roads can affect fisheries by interrupting upstream-migrating fish, increasing fine sediment delivery to spawning and rearing habitat, and simplifying stream channels through constriction (Furniss, *et al*, 1991). An expanded road network augments peak flows since water traveling as concentrated surface flow reaches the channel faster than water traveling as subsurface flow (Wemple, *et al*, 1996). These impacts can affect analysis species and their habitat through sedimentation, stream bank instability, and stream channel simplification. In addition, roads and trails increase access for anglers that may increase fish mortality or illegal non-native fish introductions. The alternatives propose various frequencies of roads and trails and are addressed below.

Under **Alternative 1**, road and trail quality and quantity per year would remain the same. There would be no net gain in road density. Under current conditions, it is projected that eighty-one miles of road would be built per decade in vegetation treatment projects. Approximately 29,900 acres would be recommended for wilderness. Road construction would be allowed in roadless areas and summer motorized use would remain the same. Based on effects to fish and their habitat, there isn't much difference between this and Alternative 2.

Alternative 2 would construct seventy-three miles of road per decade in vegetation treatment projects and recommends 30,100 acres of wilderness. Although Alternatives 1 and 2 better address the threats that roads and trails have upon the evaluation species than Alternative 3, they are not as effective as Alternatives 6, 5, 4, 7, and 7R.

Alternative 3 would not address the threat that roads and trails have upon the evaluation species. In fact, there may be more of an impact upon fish and their habitat than the existing conditions due to an increase in road density, an increase in summer motorized use, and no proposed wilderness protection. In Alternative 3, ninety-eight miles of road would be built per decade in vegetation treatment projects. The selection of this alternative would likely accelerate the rate of extinction of Bonneville cutthroat trout populations in the planning area.

Alternative 4 is an improvement beyond existing conditions and better addresses road and trail related threats to evaluation species than Alternatives 1, 2, 3, 7, and 7R. In Alternative 4, a net decrease in road density is expected. Approximately seventeen miles of road would be built per decade in vegetation treatment projects. There are 72,300 acres of proposed wilderness. Generally, no road construction would occur in roadless areas and summer motorized use would be the same as current conditions. The 72,300 acres of proposed wilderness includes portions of McCoy, Jackknife, Tincup, and Stump Creeks. All of these streams are currently considered by the Forest as Yellowstone cutthroat trout stronghold streams. The designation of these wilderness areas will eliminate road- and motorized vehicle-related threats to these populations.

In **Alternative 5**, road densities may increase or decrease, depending upon prescription. Approximately sixteen miles of road would be built per decade in vegetation treatment projects. Approximately 94,300 acres would be proposed for wilderness. Generally, no road construction would occur in roadless areas, and summer motorized use would decrease from current condition. The 94,300 acres of proposed wilderness includes portions of McCoy, Jackknife, and Tincup Creeks. The Forest considers all of these streams as Yellowstone cutthroat trout stronghold streams. The designation of these wilderness areas will eliminate road- and motorized vehicle-related threats to these populations. Aside from Alternative 6, this alternative best addresses the threats posed upon evaluation fish by road and trail construction and use.

Alternative 6 would best address the impacts that roads and trails have upon fish and their habitat. In this Alternative, a decrease would be expected from current road densities. Only seven miles of road would be built per decade in vegetation treatment projects. This alternative proposes the most acres for recommended wilderness, about 341,900 acres. No road building would be proposed in roadless areas, and an overall decrease in summer motorized use would occur. The 341,900 acres of proposed wilderness includes portions of McCoy, Jackknife, Tincup, Stump, and Horse Creeks. The Forest considers all of these streams as Yellowstone cutthroat trout stronghold streams. The designation of these wilderness areas will eliminate road- and motorized vehicle-related threats to these populations.

In **Alternatives 7 and 7R**, road densities would increase or decrease, depending upon prescription. In Alternative 7, approximately eighteen miles of road are proposed for construction or reconstruction per decade in vegetation treatment areas and approximately 47,200 acres would be proposed for wilderness. No roads would be constructed in roadless areas and summer motorized use of those areas would remain unchanged. In Alternative 7R, approximately thirty-five miles of road are proposed for construction or reconstruction per decade in vegetation treatment areas and approximately 42,500 acres would be proposed for wilderness. There is a potential for roads to be constructed in Inventoried Roadless Areas in Alternative 7R. Recommended wilderness areas in both alternatives include portions of McCoy and Jackknife Creeks. The Forest considers both of these streams Yellowstone cutthroat trout stronghold streams. The recommendation of these areas for wilderness will eliminate road- and motorized vehicle-related threats to this population. These alternatives would better address the threats to the evaluation species than Alternatives 1, 2, and 3, but they do not address threats from roads and trails to the extent that Alternatives 4, 5, and 6 do.

The alternative that best addresses road and trail related threats to cutthroat trout metapopulations and leatherside chub populations and other aquatic and riparian biota as a whole is Alternative 6, followed by Alternatives 5, 4, 7, 7R, 1, 2 and 3 (in that order). Roads and trails currently pose a high threat to the Daniels Reservoir Bonneville cutthroat trout metapopulation and the Angus and Tincup Creeks' leatherside chub populations. These populations are currently at an overall high risk of extirpation.

EFFECTS FROM OFF TRAIL MOTORIZED VEHICLES

The effects of off trail motorized vehicles on aquatic and riparian habitat have been observed in Forest fish distribution surveys and documents in several survey reports for 2000 and 2001. They include increasing stream bank erosion and decreasing riparian vegetation. The result is an increase in the frequency of fine sediment in aquatic habitat. Increases of instream fine sediment have the potential to affect aquatic biota and their habitat, including native trout and leatherside chub. The alternatives address impacts from off-trail motorized vehicles to differing degrees.

Under Alternatives 1, 2, and 3, areas open to cross-country travel (approximately 420,200 acres) would remain open. These alternatives would not address the current threat that cross-country motorized use imposes upon metapopulations at risk. The Palisades/Salt, Blackfoot, and Portneuf/American Falls Yellowstone cutthroat trout metapopulations are under a moderate threat from off trail ATV use. Bear River East and Bear River West metapopulations are also under moderate threat from off trail ATV use. These two metapopulations are considered at high risk of extinction.

Alternatives 4 and 6 best address the impacts of off-trail ATV use upon evaluation species. These alternatives discontinue all cross-country motorized use.

Alternatives 5, 7,and 7R address off-trail motorized threats better than Alternatives 1, 2, and 3 but are not as effective as Alternatives 4 and 6. In Alternatives 5 and 7 approximately 35,400 acres are open to cross-country motorized use, with slightly less in Alternative 7R. This area is not fish-bearing, so populations will not be affected.

Alternatives 4 and 6 best address aquatic and riparian concerns, followed by Alternatives 5, 7, and 7R; then Alternatives 1, 2, and 3. While the off-trail motorized threats to Palisades/Salt, Blackfoot, Portneuf/American Falls, Bear River East, and Bear River West cutthroat trout metapopulations and the leatherside chub populations would be completely addressed through the selection of Alternatives 4 and 6, they would not be addressed at all under Alternatives 1, 2, and 3. Alternatives 5, 7, and 7R would partially, but not completely address the concern.

EFFECTS FROM MINING

Mining has the potential to affect aquatic biota, including native trout and leatherside chub, and their habitat through the introduction of mining-associated hazardous substances into streams, sedimentation from the mining activity itself and associated roads, and changes in hydrology (Nelson, *et al*, 1991). All alternatives, except Alternative 6, are similar in addressing mining impacts.

Under every alternative, but Alternative 6, the management of mines will be adaptive. The approach would require mining companies to meet established and well-defined desired future conditions without detailed Forest Plan direction. Mining will be consistent with state and federal laws.

In Alternative 6, a prescriptive management approach would require detailed directions for operation and reclamation in the Forest Plan.

In essence, there is no difference between these two approaches, since detailed directions for mine operation and reclamation can be included in the operation plan under all alternatives. The adaptive approach allows for changes and additions to these requirements as we learn more or on a site-specific basis.

The threats associated with mining were rated as high for the Angus Creek leatherside chub population. Based on what is known, this population has a high risk of extinction. Phosphate mining occurred in the headwaters of this stream. Moderate threats from mining occur in the Palisades/Salt and Blackfoot Yellowstone cutthroat trout metapopulations. These metapopulations are at a low risk of extinction. All alternatives would equally address these species and their requirements. The degree to which the mining related threat to these populations is addressed will be dependent on the specific situation.

EFFECTS FROM TIMBER HARVEST

Timber harvest could affect aquatic biota, including the viability evaluation species, and their habitat through the influencing hydrology, affecting soil structure, changing water quality/temperature/suspended sediment, and increasing mass movements and sedimentation (Chamberlain, *et al,* 1991). Changes in stream hydrology could result in scoured reproductive nests and decreases in available quality habitat. Peak flows may increase in magnitude, and low flows may be lower. Changes in soil structure may increase runoff and erosion. Increases in stream temperatures may decrease coldwater biota health and reproductive success. Increases in sediment delivery to aquatic habitat may decrease and simplify available habitat and decrease reproductive success and hiding habitat. The alternatives address these effects to varying degrees.

Only a low degree of threat exists on fish evaluation species as a result of vegetation management activities, because of Revised Forest Plan riparian and aquatic related standards and guidelines. The range of alternatives provides various levels of timber offered. The current suitable acres are 125,300 acres (60mmbf/decade). Alternative 3 proposes the most suitable acres at 150,400 acres (67mmbf/decade) while Alternative 6 proposes the fewest suitable acres at 38,700 acres (17mmbf/decade).

For the most part, the threat associated with these activities is low for all evaluation species populations. Current site-specific planning/mitigations and guidance from Revised Forest Plan riparian and aquatic related standards and guidelines protect these populations from logging and prescribed fire related impacts. All Forest Plan Revision alternatives will sustain these protection measures and are not expected to directly affect cutthroat trout or leatherside chub.

Depending on site-specific treatment areas, indirect effects may include sediment generation from haul routes and increases in stream flow extremes in treatment watersheds (higher peak flows and lower low flows). The extent of these short-term, indirect effects is expected to be proportional with the degree of harvest. In other words, more timber harvest roughly equates to more log hauling and potentially more road related sediment delivered to stream segments near haul routes. For this reason, the alternative that best addresses the timber-related threats to the evaluation species and aquatic/riparian biota as a whole is Alternative 6, followed by Alternatives 5, 4, 7, and 7R; then Alternatives 2, 1, and 3.

EFFECTS FROM RECREATIONAL FACILITIES

This discussion includes consideration of developed and dispersed recreation areas, primarily camping. Traditionally, camping areas have developed in riparian areas near water. Associated impacts to riparian areas may include a decrease in riparian vegetation from foot and vehicle traffic and resulting erosion. Because of the proximity to aquatic habitat, fine sediment from this erosion is often delivered into aquatic habitat. Fine sediment affects the quality of aquatic habitat, including that of the viability evaluation species, often resulting in less carrying capacity. In addition, recreation sites located in riparian areas may affect the frequency of downed wood located in the floodplain and stream due to firewood gathering and hazard tree treatment. Because recreation sites located in riparian areas typically do not cover large percentages of riparian surface areas, total impacts from recreation sites are usually minor at a watershed scale but could play more of a role when considering cumulative effects.

Under Alternative 1, the current level of developed and dispersed recreation sites would remain unchanged, continuing a low threat to evaluation species. Alternatives 2, 4, and 6 best address the impacts caused by riparian-located recreational facilities on aquatic and riparian habitat. Alternatives 2 and 4 maintain recreational sites at their current level and include riparian mitigations. Alternative 6 maintains current levels of developed sites but decreases the motorized opportunities in dispersed sites. Motorized access is the primary source of elimination of riparian vegetation at dispersed sites. Alternatives 3, 5, 7, and 7R increase developed and dispersed recreation sites beyond what currently exists. This would have a negative effect on aquatic and riparian habitat if these sites were located in riparian areas.

The best alternatives to address the low level threat to cutthroat trout and leatherside chub populations and aquatic biota as a whole are Alternatives 2, 4, and 6. Alternative 1 would maintain the current level of threat and Alternatives 3, 5, 7, and 7R would increase it if the new facilities were located in riparian areas.

EFFECTS FROM NON-NATIVE FISH

None of the alternatives directly addresses the threat that non-native species have upon cutthroat trout metapopulations and leatherside chub populations. Directly addressing this threat would mean working cooperatively with Idaho Department of Fish & Game and other agencies in an active non-native species reduction/eradication and native species reintroduction program in suitable drainages. To meet our responsibilities of maintaining viable populations of native fish, supporting and/or initiating these measures is warranted. Each alternative includes direction to work cooperatively with other fisheries conservation agencies and organizations to address these concerns.

However, the opportunity to indirectly address the threat from non-native fish can occur by protecting and restoring habitat. In the 1999-2001 fish distribution surveys show displacement or near displacement of native cutthroat trout populations in areas of degraded habitat and strong populations of cutthroat trout in areas of quality habitat. The selection of Forest Plan alternatives that facilitate the protection and accelerate the restoration of aquatic and riparian habitat will help address the viability of native cutthroat trout and leatherside chub populations.

Cumulative Effects

To determine cumulative effects upon aquatic resources, the effects of each Forest Plan alternative upon threats to fisheries resources were rated. The rating "1" is assigned to the alternative(s) that most directly addresses the threat. The higher the rating, the less the alternative addresses the threat. The ratings in each "Alternative" column were added to identify the cumulative rating. The lowest sums have the lowest associated indexed cumulative effects. The highest sums have the highest associated indexed cumulative effects.

- *Table 4. 58. Relative Cumulative Effects Ratings by Alternative.*

Threat	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Grazing	3	4	5	2	1	1	2	2
Roads/Trails	5	6	7	3	2	1	4	4
Off Trail ATV's	3	4	5	1	2	1	2	2
Mining	1	1	1	1	1	1	1	1
Timber Harvest	4	3	5	2	2	1	2	2
Recreation Facilities	2	1	3	1	4	1	5	5
Non-native Fish	6	5	7	2	3	1	4	4
Total	**24**	**24**	**33**	**12**	**15**	**7**	**20**	**20**

Alternative 6 has the fewest associated cumulative effects because there are the fewer land management activities occurring across the analysis area. Alternative 3 has the most associated cumulative effects upon fish and their habitat because it has the most intensive land management. The actual magnitude of difference is not that great. The table above shows a relative numerical ranking. Because Alternative 6 has a "point" total of 7 and Alternative 7R has a "point" total of 20 does not mean that Alternative 6 is three times as good as 7R.

The cumulative effects upon the Forest fisheries resource were considered. Analysis boundaries included any areas that had the potential of affecting the quality and quantity of aquatic and riparian habitat. Some of these fish species, such as the migratory life history patterns of cutthroat trout, may spend only a portion of their life on the Forest. They often spend part of their adult lives in larger river systems off the Forest. Because of that, the cumulative effects analysis boundary extends downstream to all habitats they use. Due to their migratory nature, the potential long-term viability of these fish populations may be affected by occurrences off of the Forest. Although these occurrences, such as grazing, development, road construction and maintenance, irrigation diversions, etc., affect these fish, they affect them the same under all Forest plan alternatives. However, when considered in combination with the cumulative effects associated with each Forest Plan alternative, there may be more of an additive effect when adding impacts off the Forest with higher cumulative effects associated with alternatives with more intensive land management activities (Alternatives 1, 2, and 3). See Appendix D – Fish Population Viability Evaluation for more information.

The risks of extinction to the viability of evaluation species (as discussed in Appendix D) was considered during the cumulative effects analysis. Consideration was given to the six viability evaluation parameters (temporal variability, population size, growth and survival, isolation, replacation[7], and synchrony[8]) used in the fisheries viability evaluation in Appendix D and Rieman, *et al*, 1993. Generally, as the index of the cumulative effects of the treats listed in the table above increase, the extinction risks increase.

Irretrievable/Irreversible Effects

IRRETRIEVABLE EFFECTS BY MANAGEMENT ACTIVITY

Irretrievable effects are those that can result in a loss of fish habitat or populations. A change in management activities has the potential to reverse this effect. An example would be the improper placement of a culvert in a stream crossing that becomes a migration barrier to upstream-migrating fish. The culvert is producing the irretrievable effect of eliminating the genetic interchange between the fish upstream and downstream.

[7] See Appendix D in section "Evaluation Species Metapopulation Risk Factors" for definition.
[8] See Appendix D in section "Evaluation Species Metapopulation Risk Factors" for definition.

Irretrievable effects can be reached from the intense use of a single Forest resource or several Forest resources affecting the same area.

GRAZING

The current grazing direction (Alternative 1) has been documented to have irretrievable effects upon some segments of streams within the planning area. Some stream segments have been trampled and their riparian vegetation grazed to the point they can no longer support fish. Although Alternatives 2 and 3 make improvements over existing Forest Plan guidance, they are not likely to appreciably accelerate the recovery of these problem stream segments. Alternatives 4, 5, 6, and 7 /7Rwill not likely cause irretrievable effects upon fish and their habitat.

ROADS AND TRAILS

Irretrievable effects from roads and trails upon fisheries resources are more likely in Alternatives 1, 2, and 3 because new road construction would be allowed in roadless areas in these alternatives. Alternatives 5, 7, and 7R adjust road densities up or down, based upon prescriptions. There is uncertainty associated with these alternatives until the site-specific projects are proposed, so the potential to cause an irretrievable effect is unknown. The potential for irretrievable effects caused by roads is less likely in Alternative 6 than Alternative 7 or 7R, because twice as much land will be recommended for wilderness, eliminating road-related effects. Irretrievable effects could come in the form of an improperly placed culvert, creating a passage barrier to upstream-migrating fish. In addition, a potential road-related impact such as sedimentation could work in concert with other effects such as stream bank trampling and riparian vegetation impacts from grazing to produce an irretrievable effect such as a wide, shallow, unshaded, sediment-laden stream reach that cannot support fish. Alternatives 4 and 6 propose a decrease in current road density by prescription and 72,300 and 341,900 acres (respectively) minimizing the potential for road-related irretrievable effects. Alternatives 4, 5, and 6 are least likely to produce irretrievable effects.

OFF-TRAIL MOTORIZED USE

Irretrievable effects from off-trail motorized use are possible in Alternatives 1, 2, and 3. Although the elimination of fish habitat (extensive widening and shallowing) in a stream segment is possible with extensive ATV use instream and within its riparian area, it is more likely this effect would occur in concert with other uses such as extensive grazing in the same stream reach. Irretrievable effects are less likely in Alternatives 5, 7, and 7R, due to a decrease in the area open to cross country and least likely in Alternatives 4 and 6 due to a closure to cross country use.

MINING

Irretrievable effects from mining may occur through the implementation of any alternative. An example is the diversion of a stream through a long culvert or into a ditchline. That reach of stream is no longer valuable to fish for habitat. However, the effect can still be reversed through returning the stream to its original channel.

Vegetation Management

No irretrievable effects are expected from vegetation management. All possible vegetation activities under all alternatives would incorporate direction as or more protective of riparian and aquatic habitat as INFISH direction.

Recreation Facilities

No irretrievable effects are expected from recreation facilities management. All possible recreation facilities activities under all alternatives would incorporate direction as or more protective of riparian and aquatic habitat as INFISH direction.

IRREVERSIBLE EFFECTS BY MANAGEMENT ACTIVITY

Irreversible effects are those that can result in a permanent loss of habitat or populations. Irreversible effects eliminate future management options. An irreversible effect is the loss of a fish population or metapopulation. No matter what management action is taken, we will never be able to reverse the loss of the special diversity that made that particular population unique.

Grazing

Grazing alone would not likely produce irreversible effects. However, the effects of over-grazing in combination with other impacts such as sedimentation and migration barriers from roads and competition with non-native fish, has the potential to produce irreversible effects upon native fish populations. A potential irreversible effect from grazing in concert with the effects from other uses could be the extirpation of a native fish population. Although we may be able to replace this population with native fish from another drainage, we would not likely replicate the uniqueness of the original population. Irreversible effects are less likely to occur in Alternatives 4, 5, 6, 7, and 7R.

Roads and Trails

No irreversible effects are anticipated from roads and trails under any alternative unless, effects working in concert with other effects leads to the extirpation of a population or metapopulation. A potential road-related impact such as sedimentation could work in concert with other effects such as stream bank trampling, riparian vegetation impacts from grazing, and non-native fish species to produce an irreversible effect such as the extirpation of a population of native fish. Some native fish populations have disappeared in some streams under the existing management strategy. This was probably due to several factors working in concert.

Irreversible effects from roads and trails in concert with other impacts upon fisheries resources are more likely in Alternatives 1, 2, and 3 because new road construction would be allowed in roadless areas in these alternatives. Alternatives 5, 7, and 7R adjust road densities up or down, based upon prescriptions. There is uncertainty associated with these alternatives until the site-specific project is proposed, so the potential to cause an irreversible effect is unknown. The potential for irreversible effects caused by road-related effects in concert with other effects is less likely in Alternative 5 than Alternative 7 or 7R, because twice as much land will be proposed as wilderness, eliminating road-related effects in those proposed wilderness areas. In addition, Alternatives 4 and 6 propose a decrease in current road density by prescription and 72,300 and 341,900 acres (respectively) minimizing the potential for road-related irreversible effects described above. Alternatives 4, 5, and 6 are least likely to produce irreversible effects

Off-Trail Motorized Use

No irreversible effects are anticipated from off-road motorized use under any alternative, unless effects, working in concert with other effects, lead to the extirpation of a population or metapopulation. Some native fish populations have disappeared in some streams under the existing management strategy. This was probably due to several factors working in concert. Irreversible effects are most likely to occur as a result of cross-country motorized use in combination with other effects in Alternatives 1, 2, and 3, where 420,200 acres are available. This is less likely to occur in Alternatives 5, 7, and 7R, where 30,000-40,000 acres are available to cross-country motorized use. Irreversible effects are least likely to occur in Alternatives 4 and 6 because no cross-country motorized use would occur.

Mining

Mining is one resource use in which an irreversible effect may occur in any alternative. Particularly in phosphate mining, entire upper watersheds can be disrupted through the excavation of mountaintops. Even with reclamation, the headwater streams and drainages associated with these mountaintops will likely never be returned to their original condition.

Vegetation Management

No irreversible effects are anticipated from vegetation management under any alternative. Riparian and aquatic dependent species will be sufficiently protected with the implementation of riparian management area direction (2.8.3)

Recreation Facilities

No irreversible effects are anticipated from these activities. Riparian and aquatic dependent species will be sufficiently protected with the implementation of riparian management area direction (2.8.3).

Issue 7

Timber Sale Program

Analysis Scale: Forest-wide

Issue Indicators

- ♦T.1 **Allowable Sale Quantity (ASQ)**
- ♦T.2 **Total Sale Program Quantity (TSPQ)**
- ♦T.3 **Acres harvested**
- ♦T.4 **Suitable acres of timber harvest**
- ♦T.5 **Suitable acres of timber in roadless areas**
- ♦T.6 **Estimated miles of road construction and reconstruction**

Analysis Methods

The National Forest Management Act directs the Forest Service to program timber harvest on a non-declining yield basis, which means the timber sales offered should not exceed the quantity which the Forest is capable of naturally producing on a sustained-yield basis.

Numerous laws, regulations, and policies govern the classification, use, and administration of timberland resources on National Forest system lands. Some of the more important ones are described in Appendix A of the Draft Revised Forest Plan. All timber management activities and the assessment of suitable timberlands must comply with these laws, regulations, and policies that are intended to provide general guidance for the implementation of vegetation management practices and protection of related resources.

Timber harvest levels were determined using the analysis units, pathways and probabilities process developed for forested vegetation, with the VDDT model as the primary analysis tool. However, only management prescription category 5 lands were considered "suitable" for timber management, providing for a sustainable level of outputs. Other management prescription categories either preclude mechanical treatment or focus on restoration without a sustainable level of timber outputs were labeled "unsuitable."

For each management alternative, successional stages along pathways in each cover class were treated with silvicultural prescriptions through disturbance probabilities within the model. Mechanical treatments on management prescription category 5 lands will accrue volume towards the Allowable Sale Quantity (ASQ). Mechanical treatments on other management prescription category lands will accrue volume towards the Total Sale Program Quantity (TSPQ). Volumes per acre were input to the model and applied against the acres harvested to determine total volume per time period.

In determining the ASQ, adhering to a non-declining yield constraint of timber harvest was a key determinant in setting harvest probabilities. For each alternative, harvest disturbance probabilities were adjusted and successive runs were made of the VDDT model until the resulting harvest volume varied by no more than 20 percent per decade over ten decades.

A Long Term Sustained Yield Capacity (LTSYC) attribute is included in the VDDT model which calculates long term sustained yield by alternative. This is the highest sustainable, uniform wood yield from lands being managed for timber production, consistent with multiple use objectives.

FORESTED LAND TENTATIVELY SUITABLE FOR TIMBER HARVEST

National Forest lands are periodically assessed to determine whether they are suitable for timber production. The analysis begins by identifying those lands that are not available and capable of being managed for timber production. This specifically results in the identification of:

1. National Forest lands that do not and cannot support forest vegetation.
2. Lands that have been formally withdrawn from timber production, such as designated Wilderness.
3. Forested lands where restocking of tree seedlings can not be assured within 5 years following timber harvest, and
4. Lands where timber production may result in irreversible resource damage to soil productivity or watershed conditions.

Lands that possess any one of the above conditions are classified as not suitable for timber production. The remaining lands are classified as tentatively suitable for timber production. These lands are legally **available** and biologically and physically **capable** of timber production. This classification is the same for all Alternatives; the tentatively suitable base does not vary by alternative (See Chapter 3). A total of 295,500 acres are considered tentatively suitable for timber harvest. Of these, approximately 184,600 acres are in Inventoried Roadless Areas.

Direct and Indirect Effects

T 4 SUITABLE ACRES OF TIMBER HARVEST

Lands considered appropriate for timber management, also referred to as suitable timberlands, are identified separately for each Alternative. Tentatively suitable timberlands are identified as appropriate for timber production where timber management is compatible with other land and resource goals and objectives.

Establishing goals and objectives was accomplished in part by assigning management prescription categories to forestland. These provide a range of resource protection consideration and management opportunities. Each category defines whether tentatively suitable timberlands will be identified as appropriate for timber management or identified as suitable timberland. **Only Management Prescription Category 5 defines tentatively suitable timberland as suitable timberland.** Timberlands in all other Management Prescription categories are not suitable. Table 4.59 displays suitable timberland acres by alternative.

- *Table 4. 59 Suitable Acres by Alternative.*

Alternative	1	2	3	4	5	6	7	7R
Suitable Acres	125,300	114,900	150,400	52,900	48,400	38,700	54,000	84,000

LONG-TERM SUSTAINED YIELD CAPACITY

The long-term sustained yield capacity (LTSYC) represents the highest uniform yield of wood that may be sustained under a specified management emphasis described in the particular alternative. It indicates the amount of volume that is produced annually from all the suitable acres shown for each alternative in the long-term. This includes growth from all trees and does not necessarily mean total merchantable volume that is available for harvest. Table 4.60 displays the annual long-term sustained yield capacity for the Caribou National Forest in million cubic feet.

- *Table 4. 60. Annual Long-Term Sustained Yield Capacity by Alternative in Million Cubic Feet (MMCF).*

LTSYC	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
MMCF	4.18	3.84	4.81	1.67	2.06	1.19	1.74	2.74

T 1 ALLOWABLE SALE QUANTITY (ASQ)

The Allowable Sale Quantity (ASQ) describes the maximum volume of conifer timber that may be harvested from suitable lands during a specified period, usually ten years. Aspen may also be harvested from suitable lands, but the volume is not part of the ASQ. The ASQ is different for each Alternative, because the area identified as suitable land varies, as does management emphasis. This volume cannot be exceeded during a given decade, and this maximum volume is **not** presented as a guaranteed harvest volume. The ASQ for a given alternative is dependent on the area identified as suitable timberland, current inventory of timber on those lands, and the management activities associated with each alternative. The actual ASQ volume offered is the aggregate of individual project proposals, and is dependent on a number of factors including administrative processes, environmental analyses, appeals, litigation, annual budgets and organizational capabilities.

The Vegetative Dynamics Development Tool (VDDT), a computer model that provides a framework for examining the role of various disturbance agents and management actions in vegetation change, was used to calculate decade-by-decade outcomes, including changes in vegetation growth stage, acres treated by type of treatment activity, and timber harvest volumes. Data provided to the model included the allocation of acres of land to a management prescription category; identification of suitable timberlands; current vegetation conditions from LANDSAT imagery and Forest inventory data; and the identification of vegetation disturbances, including treatments, and their probabilities of occurrence.

The ASQ for each Alternative is displayed in the following tables for the next five decades:

- *Table 4. 61 ASQ Acres - Vegetation Management Practices Annual Estimated Harvest Acres in 1st Decade from Suitable Lands*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt7R
REGENERATION HARVEST	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**
A. Clearcut								
With and without reserve leave trees	1,010	820	1,170	340	330	210	380	230
B. Shelterwood and Seed Tree								
Preparatory Cut	110	160	170	60	60	40	40	180
Seed Cut	370	360	470	170	140	180	170	40
Removal Cut								
Selection	10	10	10	30	20	10	20	50
INTERMEDIATE HARVEST								
Commercial Thinning	20	30	30	20	20	10	20	40
Salvage/Sanitation	50	50	50	40	40	40	50	70
TOTAL ASQ ACRES	**1,570**	**1,430**	**1,900**	**660**	**610**	**490**	**680**	**610**
TIMBER STAND IMPROVEMENT	310	280	370	130	120	100	130	360
REFORESTATION[1]	550	500	650	230	210	170	230	280

1 Includes natural and artificial.

- *Table 4. 62 ASQ Volume - Summary of ASQ Annual Estimated Harvest Volume (CCF) in 1st Decade.*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt7R
REGENERATION HARVEST	**CCF**	**CCF**	**CCF**	**CCF**	**CCF**	**CCF**	**CCF**	**CCF**
A. Clearcut								
With and without reserve leave trees	7,900	6,660	7,930	1,910	1,910	1,450	2,050	1,890
B. Shelterwood and Seed Tree								
Preparatory Cut	720	1,140	1,150	320	320	280	360	1,690
Seed Cut	1,580	1,580	2,300	1,030	1,030	1,100	1,100	310
Removal Cut								
Selection	30	30	40	80	80	40	80	480
INTERMEDIATE HARVEST								
Commercial Thinning	70	90	80	60	60	30	60	330
Salvage/Sanitation	300	300	300	100	100	100	300	500
TOTAL ASQ VOLUME	**10,600**	**9,800**	**11,800**	**3,500**	**3,500**	**3,000**	**3,700**	**5,200**

Approximately 100 CCF of the commercial thinning and salvage/sanitation ASQ volume will be non-sawtimber post/pole and commercial firewood harvest.

- *Table 4. 63 ASQ for the Next Five Decades by Alternative (Shown in Million Board Feet and Million Cubic Feet).*

Alternative	Decade 1		Decade 2		Decade 3		Decade 4		Decade 5	
	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF
Alt 1[1]	60	10.6	59	10.3	58	10.2	63	11.0	72	12.7
Alt 2	56	9.8	54	9.5	53	9.4	59	10.3	66	11.6
Alt 3	67	11.8	66	11.5	65	11.4	70	12.2	78	13.7
Alt 4	20	3.5	18	3.2	18	3.2	20	3.6	24	4.2
Alt 5	20	3.5	19	3.4	19	3.4	21	3.6	23	4.1
Alt 6	17	3.0	16	2.8	16	2.8	18	3.1	19	3.4
Alt 7	22	3.7	20	3.5	20	3.5	22	3.8	26	4.5
Alt 7R	27	5.2	30	5.3	29	5.2	25	4.4	24	4.2

[1] The ASQ for Alternative 1 is different than the 1985 Forest Plan due to the revised suitability analysis.

T 2 TOTAL SALE PROGRAM QUANTITY (TSPQ)

Total Sale Program Quantity is the total volume of timber anticipated for harvest. This volume includes the harvest of timber that constitutes the allowable sale quantity. TSPQ also includes additional timber volume that results from vegetation management practices as part of restoration activities to attain desired future conditions, such as aspen. It also includes all volume from firewood and other wood products convertible to cubic feet measure. Timber harvested from unsuitable timberlands also contributes volume toward the total sale program quantity but is not accounted for as part of the allowable sale quantity. Volume contributing to TSPQ may come from both suitable and not suitable timberlands

- *Table 4. 64 Summary of TSPQ Annual Estimated Harvest Acres from Suitable and Unsuitable Lands for 1st Decade.*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt7R
REGENERATION HARVEST	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**
A. Clearcut								
With and without reserve leave trees	1,010	820	1,170	340	330	210	380	460
B. Shelterwood and Seed Tree								
Preparatory Cut	200	370	430	80	70	40	40	450
Seed Cut	370	360	490	170	140	180	180	40
Removal Cut								
Selection	10	10	30	20	10	20	50	50
INTERMEDIATE HARVEST								
Commercial Thinning	20	30	30	20	20	10	20	40
Salvage/Sanitation	50	50	50	40	40	40	50	70
TOTAL TSPQ ACRES	**1,680**	**1,670**	**2,190**	**710**	**650**	**495**	**700**	**1,100**

- *Table 4. 65 Summary of Total Sale Program Quantity Annual Estimated Harvest Volume (CCF) for 1st Decade*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt7R
REGENERATION HARVEST	**CCF**	**CCF**	**CCF**	**CCF**	**CCF**	**CCF**	**CCF**	**CCF**
A. Clearcut								
With and without reserve leave trees	8,050	6,910	8,130	2,080	2,080	1,450	2,050	3,780
B. Shelterwood and Seed Tree								
Preparatory Cut	1,310	1,500	2,890	430	370	280	360	2,530
Seed Cut	370	360	470	170	140	180	170	310
Removal Cut								
Selection	10	10	10	30	20	10	20	480
INTERMEDIATE HARVEST								
Commercial Thinning	20	30	30	20	20	10	20	330
Salvage/Sanitation	4,840	4,890	4,570	1,870	1,970	1,930	2,280	2,270
TOTAL TSPQ VOLUME	**14,600**	**13,700**	**16,100**	**4,600**	**4,600**	**4,000**	**4,900**	**9,700**

TSPQ salvage volume includes estimated total sawtimber salvage and personal use firewood harvest from all lands.

In the first decade, Alternatives 1-3 emphasize clearcutting in the mixed conifer type and shelterwood seed step harvest in Douglas-fir, focusing primarily on ASQ volume on suitable lands, including roadless areas. Harvest on unsuitable lands, i.e., those with prescription emphasis other than timber harvest, is limited preparatory shelterwood harvests in conifer and a minor amount of clearcutting in aspen. Alternatives 4-7, with RACI constraints restricting harvest in roadless areas, have a similar but reduced harvest emphasis, with Alts 6 and 5 having the lowest harvest level. Unsuitable land harvest is minor with none in Alt. 6. Alt 7R has a reduced emphasis on clearcutting in mixed conifer types on suitable lands, but an increased emphasis on preparatory shelterwood harvests. In mixed conifer and Douglas fir, the prepartatory shelterwood treatments are designed to select and leave younger, healthy mature Douglas fir and lodgepole pine for future seed trees. Where aspen is an early seral species in conifer stands, these treatments are also designed to restore aspen. Alternative 7R also increases emphasis on selection harvest in the Englemann spruce/subalpine fir cover type over other alternatives. Unsuitable land harvest is greatest for Alternative 7R among all alternatives, emphasizing clearcutting in the aspen cover type and preparatory shelterwood harvests in conifer designed primarily to restore aspen.

- *Table 4. 66. TSPQ for the Next Five Decades By Alternative.*

Alternative	Decade 1		Decade 2		Decade 3		Decade 4		Decade 5	
	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF	MMBF	MMCF
Alt 1	83	14.6	82	14.4	81	14.2	85	14.9	95	16.7
Alt 2	78	13.7	77	13.6	75	13.1	81	14.2	89	15.6
Alt 3	92	16.1	92	16.1	91	15.9	95	16.7	104	18.3
Alt 4	26	4.6	24	4.2	24	4.2	26	4.6	31	5.4
Alt 5	26	4.6	26	4.6	26	4.6	27	4.7	29	5.1
Alt 6	23	4.0	23	4.6	24	4.2	27	4.7	26	4.6
Alt 7	28	4.9	26	4.6	26	4.6	28	4.9	32	5.6
Alt 7R	51	9.7	61	11.6	69	13.2	71	13.5	71	13.5

These acres were derived from the VDDT model, described previously. See Appendix B, Issue 7: Timber Sale Program for more information on how the model works.

- *Table 4. 67 Estimated Timber Harvest Acres from Suitable and Unsuitable Lands (Acres by Decade By Alternative).*

Harvest/Decade	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Suitable Lands	15,700	14,300	19,000	6,600	6,100	4,900	6,500	6,100
Unsuitable Lands	1,100	2,400	2,900	500	400	50	500	5,000

T.5: SUITABLE ACRES OF TIMBER IN ROADLESS AREAS

Table 4.68 displays the number of suitable acres by alternative that fall into the Non-Interchangeable Component (NIC.) NIC acres are ASQ acres associated with forested slopes between 45-65 percent and acres designated as roadless. ASQ volume programmed from a NIC need not be replaced from other areas, species types or other NICs should the volume fail to be sold and harvested.

- *Table 4. 68 Total Non-Interchangeable Component (NIC) Acres by Alternative*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Total Suitable Acres	125,300	114,900	150,400	52,900	48,400	38,700	54,000	84,000
Suitable Acres Roadless	62,900	58,900	84,100	0	0	0	0	30,700

Alternative 1

Alternative 1 provides direction from the current Forest Plan with adjustments for the new suitability determination. Management direction and desired future conditions in the 1985 Caribou National Forest Plan served as the basis for this Alternative. Suitable acres drop from 162,800 in the 1985 Caribou National Forest Plan to 125,300 in Alternative 1, resulting in a reduction of first decadal ASQ from 107.8 MMBF to 60 MMBF. Current levels of availability of other forest wood products and special forest products remain the same.

Approximately 62,900 acres of suitable timber are in IRAs.

Alternative 2

Alternative 2 is the proposed action. Suitable acres are 114,900 resulting in a first decade ASQ of 56 MMBF. Current levels of availability of other forest wood products and special forest products remain the same.

Approximately 58,900 acres of suitable timber are in IRAs.

Alternative 3

Alternative 3 emphasizes commodity production. Suitable acres are the highest of any Alternative at 150,400 acres, resulting in a first decade ASQ of 67 MMBF. Current levels of availability of other forest wood products and special forest products remain the same.

Approximately 84,100 acres of suitable timber are in IRAs.

Alternative 4

Alternative 4 emphasizes restoration and moving the Forest towards HRV. Suitable acres are constrained by the Roadless Area Conservation Initiative and total 52,900, with a first decade ASQ of 20 MMBF. No harvest or road construction would be allowed in this alternative. Volume from unsuitable lands is highest with this Alternative due to thinning treatments of dense conifer stands and aspen harvest to move towards PFC. This Alternative provides for reduced levels of availability of forest wood products and special forest products.

Alternative 5

Alternative 5 emphasizes recreational activities. Again, suitable acres are constrained primarily by the Roadless Area Conservation Initiative and management prescription activities, which favor recreation. No harvest or road construction would be allowed in this alternative. Suitable acres are 48,400, with a first decade ASQ of 20 MMBF. It provides for a reduced amount of non-industrial forest wood products and special forest products.

Alternative 6

Alternative 6 emphasizes Wilderness management and has the least suitable acreage at 38,700. No harvest or road construction would be allowed in this alternative. This Alternative also produces the least first decade ASQ volume at 17 MMBF.

This Alternative provides for reduced levels of availability of non-industrial forest wood products and special forest products and the least amount of harvest for PFC objectives from either suitable or unsuitable lands.

Alternative 7

Alternative 7 is a blend of several Alternatives constrained by the Roadless Area Conservation Initiative. It identifies the most suitable acres of these constrained Alternatives at 54,000 and produces a first decade ASQ of 22 MMBF. No harvest or road construction would be allowed in this alternative. It provides for current levels of non-industrial forest wood products and special forest wood products.

Alternative 7R

Alternative 7R is also a blend of several Alternatives, but it is not constrained by the Roadless Area Conservation Initiative. It identifies 84,000 suitable conifer acres and produces an ASQ of 27 MMBF the first decade. Approximately 35 percent of these lands are in Inventoried Roadless Areas. About 25 percent of the Forest's timber harvest program is planned in roadless areas in the first decade following the signing of the Record of Decision.

Table 4.69 displays how the suitable acres fall into a NIC. NIC acres are ASQ acres associated with 1) forested slopes between 45-65 percent and, 2) areas designated as roadless. ASQ volume programmed from a NIC need not be replaced from other areas, species types, or other NICs should the volume fail to be sold and harvested.

This alternative also proposes harvest on more lands that are capable of supporting timber harvest but with other than timber management prescriptions that primarily emphasize the need to restore aspen and advance these lands toward a desired future condition. Prescription emphasis, standards and guidelines will direct timber harvest on these lands to assure it meets the prescription goals and objectives.

Approximately 30,700 acres of suitable timber are in IRAs.

Tables 4.61, 4,62, 4.64 and 4.65 display allowable sale quantity and total sale program quantity, respectively, by vegetation management practice for Alternative 7R. This planned output is shown by acres and volume (CCF) harvested, as required by Forest Service Handbook 2409.13, Timber Resource Planning Handbook, Chapter 40.

- *Table 4. 69 Estimated acres in each of the NIC Categories.*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Total Suitable Acres	125,300	114,900	150,400	52,900	48,400	38,700	54,000	84,000
Acres Roadless	62,900	58,900	84,100	0	0	0	0	30,700
Acres 45-65% Slope	12,100	11,200	19,200	3,100	2,900	2,200	3,100	6,900
Acres both roadless and 45-65% Slope	8,200	7,700	14,800	0	0	0	0	3,700
Total NIC Acres	66,800	62,400	88,500	3,100	2,900	2,200	3,100	33,900

- *Table 4. 70 Estimated Potential Decadal Volume from NIC Categories shown in MMCF.*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Roadless Area Volume	4.5	4.3	5.6	0	0	0	0	1.3
45-65% Slope Volume	1.1	1.0	1.4	.2	.2	.2	.2	.5
NIC Volume (Total)	5.6	5.3	7.0	.2	.2	.2	.2	1.8
NIC % of total ASQ	53%	54%	59%	6%	6%	6%	6%	35%

T.6: ESTIMATED MILES OF ROAD CONSTRUCTION/RECONSTRUCTION

- *Table 4. 71. Estimated Miles of Road Constructed/Reconstructed (Miles per Decade for Timber Harvest by Alternative)*

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Constructed	56	55	73	8	7	3	9	22
Re-Constructed	25	18	25	9	9	4	9	13

Cumulative Effects

Tentatively suitable timberlands are determined from an assessment of National Forest System Lands. The assessment identifies those lands that are not available or capable of being managed for timber production. This results in the identification of National Forest lands that do not and cannot support forest vegetation, lands that have been formally withdrawn from timber production, such as designated Wilderness, forested lands where restocking of tree seedlings can not be assured within five years following timber harvest, and lands where timber production may result in irreversible resource damage to soils productivity or watershed condition. Of the items considered in this assessment, the identification of National Forest system lands and the lands formally withdrawn from timber production are the only items that may have a cumulative affect on the identification of tentatively suitable lands. The Forest Plan EIS Record of Decision does not result in the withdrawal of any areas from timber production but may recommend areas for formal designation.

Reference the cumulative effects section for Forested Vegetation for cumulative effects information relative to timber harvest treatments. These treatments may occur on lands with management prescriptions that emphasize a sustained production of wood products (suitable) or on lands that emphasize restoration and other objectives (unsuitable). Alternative 3 harvests the greatest acreage of lands classed as suitable followed by Alternatives 1 and 2. Alternative 7R harvests the greatest acreage of lands classed as unsuitable. This harvest on unsuitable lands is designed to assist in the restoration of aspen.

Road construction and reconstruction associated with the timber sale program opens up areas for wood product extraction, including sawtimber, firewood and special products. The Forest has seen a gradual decrease in firewood permit purchases due to partly to decreasing road construction over the last decade. Alternatives 1-3 plan the greatest amount of road construction in support of timber harvest of all alternatives, with Alternative 6 planning the least.

The Caribou National Forest's timber sale program is influenced by and has effects on the local and regional timber economy. Several factors, including wood product availability and mill closures serve to shape this economy. Sawtimber volume offered on the Forest has declined from a high of 20.3 million board feet (MMBF) in 1986 to a low of 2.2 MMBF in 2000. Similar decline in sawtimber volume offered occurred on adjacent Targhee and Bridger-Teton National Forests. During that same timeframe, three lumber mills closed (Idaho Forest Industries – St. Anthony, Idaho, Tricon Timber – Afton, Wyoming, and Louisiana-Pacific Corp. – Rexburg, Idaho). This situation has contributed to a gradual reduction in bid premiums and number of bidders on Caribou National Forest timber sales. Three mills are still in operation within the area and, along with several log buyers for more distant mills, are procuring logs from National Forest, State of Idaho, BLM and private lands. See the Cumulative Effects section of Issue 2 – Socioeconomics for more information on timber program.

Irretrievable/Irreversible Effects

The loss of wood fiber production after timber harvest and productivity along roadways would be irretrievably lost until these sites are reclaimed.

Road construction may irreversibly change the soil profile, even if these areas are reclaimed and the roads obliterated.

Issue 8

Roadless Area Management and Recommended Wilderness

Roadless Area Management

Analysis Scale: Forest-wide

Issue Indicators:

♦RA.1 Acres in management prescription categories 1, 2, and 3 (% of Forest)

Baseline Indicator: 58 percent of the Forest

♦RA.2 Predicted acres harvested in IRAs.

Baseline Indicator: 11,700 acres

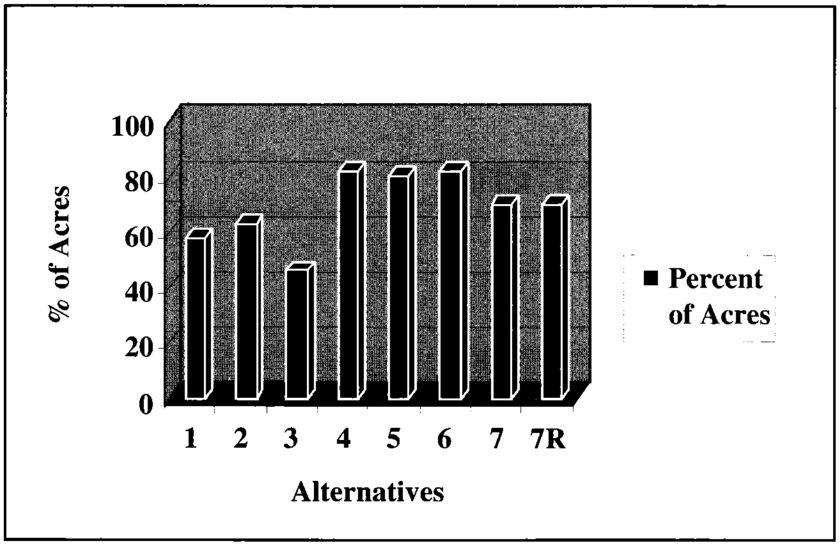
This section describes and evaluates the effects of each alternative on roadless area values. For more detail on individual inventoried roadless areas and further discussion on the evaluation process see Appendix R of the FEIS.

Direct and Indirect Effects, which vary by alternative

RD.1 ACRES IN MAC 1, 2, AND 3

Protection of roadless area values can be evaluated by prescription and by alternative theme. Management area categories, or MACs, 1, 2, and 3 include recommended wilderness, special management areas and semi-primitive recreation emphasis areas. These prescriptions generally manage for low development and resource protection and enhancement. Acres managed under these prescription categories are more likely to retain their roadless areas values. See Figure 4.1 below for a comparison of alternatives by the percentage of acres forest-wide in the prescription categories of 1, 2 and 3.

- *Figure 4. 1 Percent of Acres in Prescription Categories 1, 2, or 3, by alternative.*



RD.2 PREDICTED ACRES HARVESTED IN IRAS

In the Forest Plan revision analysis the Roadless Area Conservation Rule is applied in Alternatives 4, 5, 6, and 7. These alternatives do not allow road building or timber harvest in inventoried roadless areas, except for removing small diameter trees to improve roadless values, or to improve wildlife habitat, or to maintain or improve vegetation composition to reduce uncharacteristic wildfire. The preliminary implementation schedule predicted that alternatives 4 and 7 would have 500 acres of these "stewardship" harvest projects. Alternative 5 would have 400 acres of harvest and Alternative 6 would have 50 acres of stewardship harvest.

Alternatives 1, 2, and 3 allow some road building and timber harvest in most prescriptions. The preliminary implementation schedule for these alternatives predicted that 11,700 acres would be harvested in IRAs for alternatives 1 and 2. It is predicted that 15,300 acres of harvest would occur in Alternative 3. Alternative7R allows road building for timber harvest in some prescriptions, if allowed road densities are not exceeded. Approximately 1,525 acres would be harvested in IRAs. See also Issue 7: Timber Sale Program, Indicator T.5.

Roadless values that could be affected from timber management include potential effects from harvest and associated roads in primitive and semi-primitive recreation settings, watersheds, and fish and wildlife habitat. Alternative 6 has the lowest potential to affect roadless area values. Alternatives 4, 5, and 7 have the least potential to change roadless area values, as timber harvest and road building are restricted, with exceptions, in inventoried roadless areas. Undeveloped areas could be altered in Alternatives 1, 2, and 3, as timber harvest and road building can occur in roadless areas. Alternative 7R proposes 9 percent of inventoried roadless acres be managed under a timber prescription and predicts 1,525 acres of harvest. Road building on these acres would be limited by prescribed motorized route densities. This alternative could alter some roadless area values.

EFFECTS FROM OTHER RESOURCE PROGRAMS

MOTORIZED RECREATION

Motorized recreation use could affect the roadless values of semi-primitive recreation and fish and wildlife habitat if high use changed the semi-primitive experience or use was impacting water quality or vegetation. Alternatives 1, 2, and 3 do not limit motorized route densities and have large areas of cross-country motorized use within inventoried roadless areas. These alternatives have a higher potential to alter roadless area values. Alternative 6 manages most roadless acres as non-motorized in summer; this would help retain roadless area values. Alternatives 7 and 7R allow motorized use in most roadless areas, but would retain existing areas of semi-primitive non-motorized opportunity through ROS plan guidelines and prescribed motorized route densities.

PHOSPHATE EXPLORATION AND MINING

Approximately 8,820 acres of unleased "Known Phosphate Lease Areas", or KPLAs, are within six Inventoried Roadless Areas of the Forest (See Table 4.72). Alternatives 1, 2, 3, and 7R would manage these areas under a variety of prescriptions, and lease proposals would be considered. Alternative 4, 5, 6, and 7 would manage these tracts under various prescriptions, but future lease proposals would not be considered within the Inventoried Roadless Areas, or IRAs.

Under Alternative 7R these unleased KPLAs have a dual prescription. The tracts are managed under a variety of prescriptions based on resource condition and current uses. In addition to the current management prescription they also have the 8.2.1 prescription, which identifies these tracts as areas that have potential to be leased for phosphate exploration and possible mining. The 8.2.1 prescription areas include a ¼-mile buffer around the KPLA to accommodate support facilities or developments that could be needed for mine activities. If mining leases were approved, the project area would then be managed under the 8.2.2 prescription for active phosphate mines.

If these tracts were leased for exploration and/or mining, the roadless area values for six IRAs may be affected. Below is a general discussion of potential effects of phosphate activities on roadless values as defined in the May 2000 Draft Forest Service Roadless Area Conservation EIS. Effects of phosphate exploration and mining on roadless values are analyzed by individual IRAs and forest-wide. Appendix R describes each IRA's roadless values in more detail. Site-specific impacts of proposed exploration and mine operations would be analyzed in accordance with appropriate environmental analysis requirements.

See Issue 5, Phosphate Mining discussion in this chapter for the effects of phosphate mining on the forest as a whole.

Phosphate Exploration in IRAs

The degree of development needed for exploration activities varies. Many exploration activities do not require road building, but others will require constructed roads.

Phosphate exploration in Inventoried Roadless Areas may affect water quality, vegetation and soils with the construction of roads and drill pads. Often drill holes are accessed by tract-mounted drilling equipment and full road construction is not needed. Access routes and drill pads may be temporary and subject to reclamation. Generally, impacts to soil, water and vegetation are specific to the disturbed area and remain until reclamation vegetation is established.

During exploration activities the area would receive additional human and vehicular presence. This could temporarily displace wildlife and dispersed recreationists to other areas within the IRA. Exploration activities may affect recreation access to the Forest.

Ground disturbing activities increase the potential for establishing invasive or undesirable plant species. Mitigation would include preventive methods and integrated pest management during and after exploration activities.

Most exploration activities have minimal or short-term (one to five years) effects to the scenery resource of the IRA. Drill access routes and pads may be reclaimed to minimize their visibility and incidental use by recreational vehicles.

Phosphate Mining in IRAs

The degree of development needed for open-pit mining of phosphate would significantly affect the roadless character of the mined tracts of land and adjacent areas needed for ancillary facilities. Mine sites can remain active for twenty-five years. During and after mining activities, the resulting pit is "backfilled." Even with backfilling, a residual pit is left. Often, reclamation includes contouring the pit and remaining high wall to mimic surrounding topography. Native or desirable non-native vegetation is established on disturbed areas. Reclamation improves the natural appearance of the landscape, but the area does not appear undisturbed.

Open-pit mining of phosphate in Inventoried Roadless Areas may affect water quality, and would affect vegetation and soils. Mine development may include the construction of haul roads; conveyor belts, slurry pipelines, railroad lines and ancillary facilities needed to mine and transport phosphate ore.

Haul roads and mine areas are closed to public access during active mining operations. Mine sites can remain active for twenty-five years. This closure will affect the recreation use and patterns of people who use the IRA for hunting, trail use and dispersed camping. Mining activities displace dispersed recreationists to other areas of the forest. Mining activities may affect recreation access to the Forest. After mine operations, the haul roads may be reduced to narrow access routes or be obliterated. Limited vehicular access could be needed for long-term site monitoring.

Active mining operations and their transportation facilities could displace some wildlife species to other portions of the Forest or adjacent private lands. This displacement may last for the duration of the project. Site-specific impacts to wildlife, fisheries and their habitats would be further analyzed for individual lease proposals as required by NEPA.

Ground disturbing activities increase the potential for establishing invasive or undesirable plant species. Mitigation would include preventive methods and integrated pest management during and after mining activities.

Surface mining for phosphate creates large-scale and long-term changes to the characteristic landscape. During mining activities and before reclamation, the mine landscape appears extremely altered. Reclamation improves the natural appearance of the mined landscape, but the area does not appear undisturbed. The landscapes of reclaimed mine sites appear moderately to heavily altered, depending on the surrounding landscape and the scale and configuration of the final pit and high wall.

DRY RIDGE IRA

Dry Ridge IRA has approximately 480 acres of unleased KPLAs along the eastern edges. Dry Ridge IRA has adjacent mining activity on the eastern perimeter, private inholdings road intrusions. About 11 percent of the area's acres are currently under mine leases. The unleased KPLAs are approximately 2 percent of the Dry Ridge IRA acres. If these areas were leased and mined, they would no longer offer roadless values. Dry Ridge IRA's roadless values include:

- A core area that provides a semi-primitive non-motorized recreation setting during the snow–free season.
- A core area that provides wildlife security

The KPLAs occur along the IRA perimeter. If they were mined, the core area would still provide a summer semi-primitive non-motorized setting and wildlife security.

HUCKLEBERRY IRA

Huckleberry IRA has approximately 3,290 acres of unleased KPLAs along the northwest edge. Huckleberry IRA has adjacent timber sales and road intrusions. About 15 percent of its acres are under current mine leases. The unleased KPLAs are approximately 16 percent of the Huckleberry IRA acres. If these areas were leased and mined, they would no longer offer roadless values. Huckleberry IRA's roadless values include a core area that provides a semi-primitive motorized recreation setting. The KPLAs occur along the IRA perimeter. If they were mined the core area would still provide a semi-primitive motorized recreation setting.

MEADE PEAK IRA

Meade Peak IRA has approximately 2,580 acres of unleased KPLAs along the northeast edge. Meade Peak IRA has adjacent mining activity, private inholdings and road intrusions.

About 8 percent of the area's acres are under current mine leases. The unleased KPLAs are about 6 percent of the Meade Peak IRA acres. If these areas were leased and mined, they would no longer offer roadless values.

Meade Peak IRA's roadless values include:

- A core area that provides a semi-primitive non-motorized recreation setting during the snow-free season.
- A core area that provides wildlife security.

The KPLAs occur along the IRA perimeter and if they were mined, the core area would still provide a summer semi-primitive non-motorized setting and wildlife security.

SAGE CREEK IRA

Sage Creek IRA has approximately 2,290 acres of unleased KPLAs in the southern portion. Sage Creek IRA has adjacent timber sales and road intrusions. About 42 percent of its acres are under current mine leases. The unleased KPLAs are approximately 18 percent of Sage Creek IRA acres. If these areas were leased and mined, they would no longer offer roadless values. Sage Creek IRA's roadless values include areas that provide a semi-primitive motorized recreation setting. The KPLAs occur in the southern portion of the IRA and if they were mined the northern portion would still provide a semi-primitive motorized recreation setting.

SCHMID PEAK IRA

Schmid Peak IRA has approximately 70 acres of unleased KPLAs along the eastern perimeter. Schmid Peak IRA has adjacent timber sales and phosphate mines. About 9 percent of the IRA acres are under current mine leases. The unleased KPLAs are approximately 1 percent of the Schmid Peak IRA acres. If these areas were leased and mined, they would no longer offer roadless values. Schmid Peak IRA's roadless values include a core area that provides a semi-primitive motorized recreation setting. The KPLAs occur in along the perimeter of the IRA. If they were mined the core area would still provide a semi-primitive motorized recreation setting.

STUMP CREEK IRA

Stump Creek IRA has approximately 110 acres of unleased KPLAs along the southern edge. Stump Creek IRA has less than 1 percent of its acres under current mine leases; these tracts are also on the southern edge of the IRA. The unleased KPLAs are less than 1 percent of the Stump Creek IRA acres. If these areas were leased and mined, they would no longer offer roadless values. Stump Creek IRA's roadless values include core areas that provide semi-primitive motorized and non-motorized recreation, and large wildlife security areas. The KPLAs are small acreages and occur on the southern edge of the IRA. If they were mined the roadless values of Stump Creek IRA would be retained.

- *Table 4. 72 Summary of IRA Acres[1] Potentially Affected by Phosphate Mining Operations.*

Inventoried Roadless Area	KPLA Acres Under an Existing Lease	KPLA Acres with Potential to be Leased[2]	KPLA Location within IRA	Estimated % of IRA Acres Lost to Mining
Dry Ridge	2,623	483	Eastern edge of IRA	2%
Huckleberry	3,225	3,294	Northwest edge of IRA,	16%
Mead Peak	1,137	2,584	Northeast edge of IRA	6%
Sage Creek	3,021	2,287	Southern portion of IRA	18%
Schmid Peak	668	67	Eastern edge of IRA	1%
Stump Creek	166	107	Southern edge of IRA	Less than 1%
Totals	**10,840**	**8,822**		**1% of total IRA acres forest-wide**

1 All acre estimates are generated from 2001 GIS layers.
2 Estimated acres do not include ¼-mile buffer added to the mapped prescription to allow for additional facilities needed for exploration and/or mine operations if lease approved.

Approximately 8,822 acres of unleased KPLAs are within Inventoried Roadless Areas. Alternatives 1, 2, 3, and 7R would manage these areas under a variety of prescriptions, but lease proposals would be considered. Alternative 4, 5, 6 and 7 would manage these tracts under various prescriptions, but future lease proposals would not be considered within the IRAs.

Alternatives that would allow these tracts to be leased have the potential to reduce the Forest's roadless area inventory acres by 1.18 percent, or 8,822 acres out of 748,830 acres. Core areas within the IRAs that provide for summer semi-primitive non-motorized recreation and wildlife security would be retained, as most KPLAs occur along the perimeter of IRAs.

If no phosphate exploration and mining were allowed within IRAs, roadless values would not be affected. Alternatives that would not allow leasing of these tracts for mineral extraction could contribute to a greater reliance on mineral resources from abroad where foreign political and economic influences would factor into their price and availability.

A reduction in the potential for mineral development may reduce revenues to federal, state and local governments. In the realm of leasable mineral development, which generates production royalties to the federal treasury, a share of these receipts go to state and local governments. Thus, there is an opportunity cost to these alternatives, but the magnitude is unknown.

The phosphate industry contributes to the economy of Southeast Idaho. Reducing the supply of phosphate ore could affect local jobs and some communities' economic stability.

SUMMARY

Alternatives 4, 5, and 6 are most likely to retain the most inventoried roadless values. However Alternative 5 does not specifically emphasize protection of roadless area values. Alternatives 3 and 5 emphasize increasing motorized recreation facilities and opportunities, which would have more potential to change the character of the land. Alternatives 1, 2, 3, and 4 emphasize vegetation management, which could have potential for more roads, changing roadless area values. See Appendix R for additional information on each IRA and its roadless characteristics.

Cumulative Effects

The cumulative effects on inventoried roadless areas values would be similar to the cumulative effects noted for Recommended Wilderness. Other National Forests in the region are completing forest plans or are scheduled to complete them within five years. Alternatives presented in those plans could affect the Forest's adjacent roadless areas.

Statewide and regionally, there are five national forests revising their management plans and consequently, their roadless area management. If all of the plans restrict motorized recreation in IRAs, motorized recreation trends could be significantly affected. Since most of the areas "grandfather" in existing uses, this effect would not be seen immediately. None of the Caribou alternatives would contribute to these potential cumulative effects.

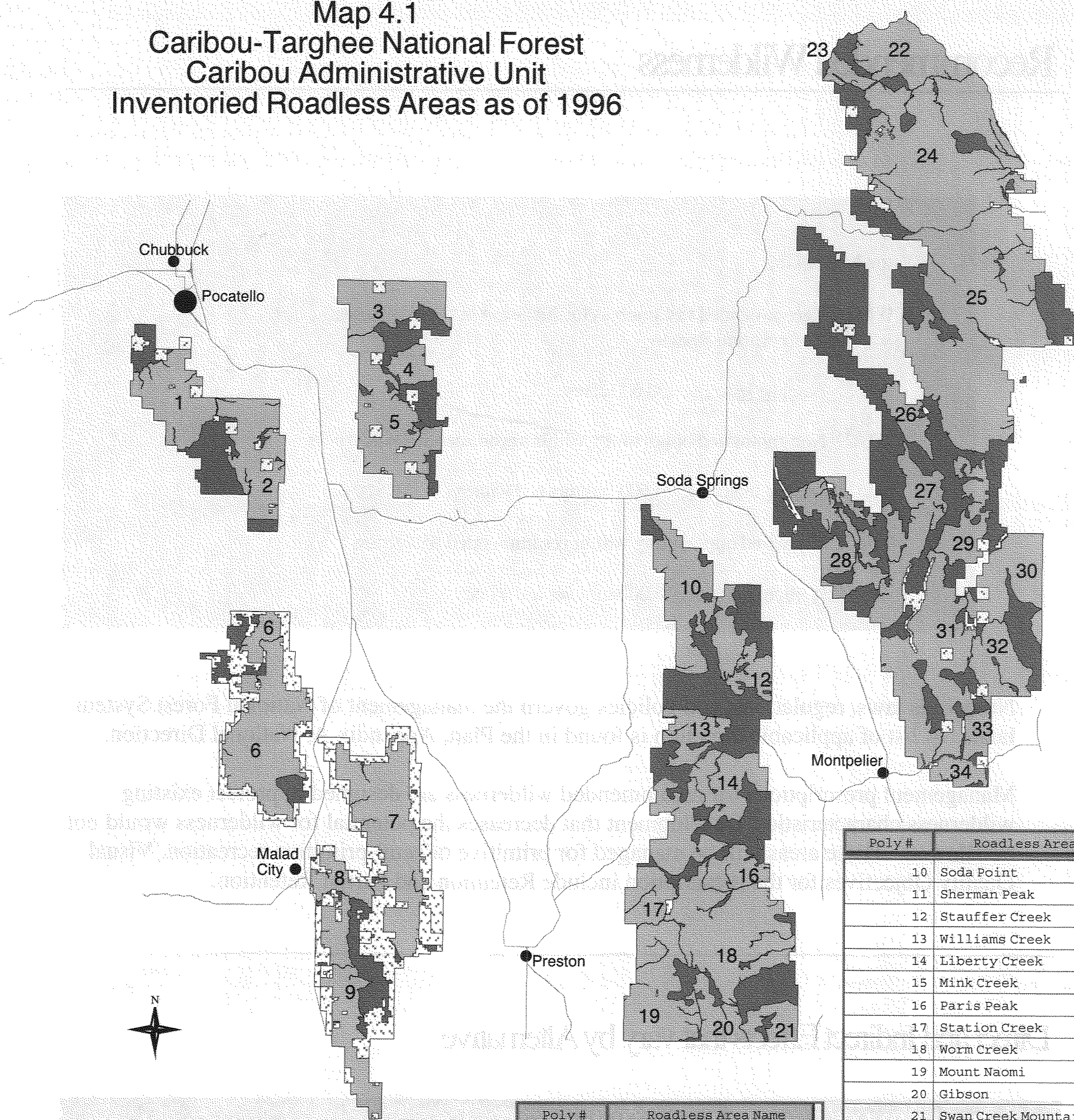
As area population and recreation uses grow and diversify, demand for primitive and semi-primitive opportunities on the forest will not be meet, displacing or changing use patterns. Under Alternatives 5, 7, and 7R these uses would be more accommodated while still strengthening standards, guidelines and monitoring to retain roadless area values.

Cumulative impacts from other resource programs (timber, recreation, and phosphate mining) are detailed above. The IDT determined that livestock grazing does not substantially affect the roadless characteristics and therefore will not be further discussed (Appendix R; RACR 2001).

Irretrievable/Irreversible Effects

There are no expected irretrievable or irreversible effects to recommended wilderness or Roadless Areas from the alternatives.

Map 4.1
Caribou-Targhee National Forest
Caribou Administrative Unit
Inventoried Roadless Areas as of 1996



Inventoried Roadless Areas

- Roadless as of 1996
- Not Roadless as of 1996
- Other Ownership

5 0 5 10 Miles

1:800000

Poly #	Roadless Area Name
1	West Mink
2	Scout Mountain
3	Toponce
4	North Pebble
5	Bonneville Peak
6	Elkhorn Mountain
7	Oxford Mountain
8	Deep Creek
9	Clarkston

Poly #	Roadless Area Name
10	Soda Point
11	Sherman Peak
12	Stauffer Creek
13	Williams Creek
14	Liberty Creek
15	Mink Creek
16	Paris Peak
17	Station Creek
18	Worm Creek
19	Mount Naomi
20	Gibson
21	Swan Creek Mountain
22	Bear Creek
23	Pole Creek
24	Caribou City
25	Stump Creek
26	Schmid Peak
27	Dry Ridge
28	Huckleberry Basin
29	Sage Creek
30	Gannett Spring
31	Meade Peak
32	Red Mountain
33	Telephone Draw
34	Hell Hole

Recommended Wilderness

Issue Indicators:

♦ **WD.1 Recommended to Congress for inclusion in the Wilderness Preservation System**

Baseline Indicator: 30,600 acres

♦ **WD.2 Non-motorized opportunity within recommended wilderness**

Baseline Indicator: 14,600 summer and winter

♦ **WD.3 Motorized opportunity within recommended wilderness**

Baseline Indicator: 16,000 summer and winter

Numerous laws, regulations, and policies govern the management of National Forest System lands. A list of applicable direction is found in the Plan, Appendix A, National Direction.

Management prescriptions for recommended wilderness are designed to protect existing wilderness characteristics. Development that decreases the potential for wilderness would not be allowed. These areas will be managed for primitive or semi-primitive recreation. Visual Quality Objectives for the prescription include Retention and Partial Retention.

Direct and Indirect Effects that vary by Alternative

WD.1 WILDERNESS RECOMMENDATION

As discussed in Chapter 3 and Appendix C, wilderness potential is measured by capability, availability, and need. Areas inventoried for wilderness potential with the highest capability include Caribou City, Mt. Naomi, Stump Creek, Worm Creek, and Mink Creek (in the Bear River Range) IRAs. The capability, availability, need, and manageability of these areas is discussed below. For information on other IRAs, see Appendices C and R.

Mt. Naomi IRA

Mt. Naomi roadless area has high capability that is enhanced by its adjacency to the Mt. Naomi Wilderness in Utah. All alternatives, with the exception of Alternative 3, recommend this area for wilderness designation and manage for non-motorized use in summer. Managing this area as recommended wilderness creates over 59,000 acres for primitive and semi-primitive non-motorized summer recreation. Much of the Mt. Naomi core area is inaccessible to non-motorized uses during the winter. Public comment included interest in opening up the Mt. Naomi area for snowmobile use. Alternatives 3, 7, and 7R manage Mt. Naomi for motorized winter use. Any motorized use in Idaho's portion of Mt. Naomi could create an enforcement problem with the adjacent Mt. Naomi Wilderness in Utah, as there are no landmarks or features to distinguish the state line.

Caribou City IRA

Appendix C identifies two areas of high capability that also have unique or special features. Portions of Caribou City roadless area have historic mining sites and the remains of two mining towns. High public interest has been expressed about this historic area. Portions of the Caribou City roadless area also offer a unique recreation opportunity for the region. The core area of Caribou City roadless area that is currently managed as non-motorized during the snow-free season also provides quality elk habitat. This core area offers the only ROS experience of "Primitive" on the Forest and is very popular with hunters who prefer a non-motorized experience.

Alternatives 4, 5, 7, and 7R propose to manage the core non-motorized area of Caribou City roadless area as recommended wilderness, non-motorized in summer, motorized in winter. Alternative 7R manages the historic portion of Caribou City roadless area under a special area prescription that emphasizes interpretation, research, and minimal facility development with summer motorized use on designated routes. A special area prescription on the historic portion of the roadless area would protect and interpret historic values while providing for recreation opportunities for both motorized and non-motorized visitors. Alternative 6 proposes to manage the entire roadless area as recommended wilderness, non-motorized in summer, motorized in winter.

Worm Creek IRA

Bloomington Lake, within the Worm Creek roadless area, is a popular recreation area in a unique landform setting with unique flora and fauna. Alternative 1, 2, 4, 5, and 6 manage a core portion of the Worm Creek roadless area under a recommended wilderness prescription. Alternative 1, 2, 3, 4, and 5 manage this area as a combination of semi-primitive non-motorized and motorized on designated routes in summer and motorized in winter. Alternatives 7 and 7R manage this area under a special area prescription that emphasizes interpretation, research, and minimal facility development in non-motorized and motorized areas. A special area prescription would protect the roadless area values while providing for established recreation opportunities both motorized and non-motorized.

Stump Creek IRA

Stump Creek has high capability and the unique feature of the historic Lander Trail. Many people visit portions of the historic wagon-road established in 1859 as an alternate route for the California-Oregon Trail migration. Portions of the Lander Trail route are managed as non-motorized in the snow-free season, protecting the remnants of the wagon-road and the extensive rockwork in Terrace Canyon. The rest of Stump Peak roadless area is managed for motorized use. Alternatives 1, 2, 3, 5, 7, and 7R do not recommend any portions of Stump Creek Roadless Area for wilderness. Alternative 4 recommends a core area of Stump Peak for wilderness designation, but not the Lander Trail corridor. Alternative 7R proposes to manage the Lander Trail Corridor as a combination of motorized and non-motorized recreation under a special emphasis prescription that manages for visitor interpretation and research.

Mink Creek IRA

Mink Creek Roadless Area in the Bear River Range has high capability, but it is small in size and would be difficult to manage as a wilderness. It was not recommended for wilderness in any alternatives.

Bear Creek, Elkhorn, Gannett-Spring Creek and Red Mountain IRAs do have the attributes that contribute to capability. Alternative 6 includes these areas for wilderness recommendation, however.

NEED

Need is addressed on a national basis and is evaluated in terms of the geographical distribution of areas, representation of landforms and ecosystems, and the presence of wildlife expected to be visible in wilderness. Assessment of need is divided into two categories: biological need (landform representation and biodiversity) and social need (outdoor recreation opportunities).

Biological Need

Regional landscapes and ecosystems are represented by six designated wilderness areas. The Mt. Naomi Wilderness in Northern Utah represents an alpine ecosystem with many lakes and streams, vegetation includes aspen and mixed conifer. The Bridger Wilderness has an elevation range of 13,804 to 8,000 feet above sea level and represents a variety of glacial landforms and habitat for moose, deer, elk and bighorn sheep. The Teton Wilderness has an elevation range of 7,500 to 12,165 feet above sea level and offers habitat for trumpeter swans, grizzly and black bears, and bighorn sheep. The Jedediah Smith Wilderness also represents a high elevation ecosystem at approximately 10,000 feet above sea level on the "backside" of the Tetons. The Winegar Hole Wilderness Area represents landforms of volcanic origin, elevations range from 6,020 to 6,985 feet above sea level, vegetation types include lodgepole pine, Douglas fir and subalpine fir. This area is prime habitat for grizzly bear and trumpeter swan.

Lower elevation vegetation types could be represented in the wilderness system, with the recommendation of the entire roadless areas Elkhorn Mountain (5,500 to 9,095 feet above sea level),Red Mountain (6,300 to 8,727 feet above sea level) and Caribou City (6,000 to 9,803 feet above sea level), in Alternative 6. Alternatives 4, 5, 7 and 7R recommend areas with an elevation range of 7,000 to 9,803 feet above sea level.

Social Need

Approximately 4,006,000 acres have been designated Wilderness in Idaho, over 760,000 acres have been designated Wilderness in Utah, and over 2,922,000 acres have been designated in Wyoming (Wilderness Preservation System, on-line data, USFS). Public comment included interest in having wilderness opportunities readily available to local populations. Other comments stated that the region has ample wilderness opportunities already available.

Alternative 3 does not offer any wilderness opportunity. Alternatives 1 and 2 offer potential wilderness opportunities concentrated within the Bear River Range. Alternative 4, 5, 6, 7, and 7R offer wilderness opportunities over a wider geographical area.

Alternative 4, 5, 6, 7, and 7R offer the unique recreation opportunity of non-motorized hunting experience in quality elk habitat. Maintaining this experience and habitat is more likely if this area is managed as recommended wilderness.

Manageability

Recommended wilderness boundaries are chosen for reasons of manageability and to exclude major road intrusions. Roadless areas with known phosphate potential or existing phosphate leases include Dry Ridge, Meade Peak, Sage Creek, Schmid Peak, and Stump Peak. Roadless areas that have a unique or outstanding feature where public access and development is needed include portions of Caribou City, Stump Creek and Worm Creek.

Alternatives 1, 2, 4, 5, 7, and 7R recommend core areas within the roadless areas, usually using a watershed as the boundary. Under Alternative 7R, in the Caribou City area, the boundary between the special area prescription and the recommended wilderness is based on including historic sites within the special area prescription. In Alternative 7R, the boundary of Mt. Naomi Recommended Wilderness was also adjusted to omit existing motorized routes from the area.

Alternative 6 recommends entire roadless areas for wilderness recommendation, making roads the definable boundary. This provides on-the ground boundaries, but includes many minor developments, unimproved roads and existing motorized trails within the recommended wilderness. It also excludes many system roads, which does not improve manageability.

- *Table 4. 73 Wilderness Recommendation by Alternative.*

Alternatives	Acres Recommended	Name of Area
Alternative 1	30,600 acres	Mt. Naomi, Worm Creek
Alternative 2	30,600 acres	Mt. Naomi, Worm Creek
Alternative 3	0 acres	Not applicable
Alternative 4	71,600 acres	Mt. Naomi, Caribou City, Stump Creek
Alternative 5	95,100 acres	Mt. Naomi, Worm Creek, Caribou City
Alternative 6	341,900 acres	Mt. Naomi, Worm Creek, Caribou City, Stump Creek, Red Mountain, Elkhorn, Bear Creek, Gannett-Spring Creek
Alternative 7	47,200 acres	Mt. Naomi, Caribou City
Alternative 7R	42,500 acres	Mt. Naomi, Caribou City

WD 2 NON-MOTORIZED RECREATION OPPORTUNITIES WITHIN RECOMMENDED WILDERNESS

Alternatives 1, 2, 4, 5, and 6, offer Mt. Naomi Recommended Wilderness as non-motorized year-round, as it is currently managed. The area receives non-motorized use during the summer and fall. Backcountry skiers and snowshoers do not use the area heavily due to its inaccessible terrain. Alternatives 7 and 7R allow winter motorized use.

Alternatives 4, 5, 6, 7, 7R recommend portions of Caribou City IRA for wilderness. This area is currently managed as non-motorized during the snow-free season. Alternatives 4, 5, 6, 7, and 7R would manage the area as snow-free non-motorized.

Alternative 6 offers the most acres of non-motorized opportunities during the snow-free season within recommended wilderness areas. It also offers the most acres of non-motorized winter use as snowmobiles are restricted to designated routes within all recommended wilderness in this Alternative.

WD.3 MOTORIZED OPPORTUNITY WITHIN RECOMMENDED WILDERNESS

All Alternatives allow some type of motorized use in areas recommended for wilderness, except Alternative 3, which has no recommendation. Alternatives 1, 2, 4, and 5 allow motorized use on designated routes during the summer season in recommended wilderness areas. Alternative 6 prohibits motorized use during the summer within recommended wilderness areas.

Alternatives 1, 2, 4, 5, 6, 7, and 7R allow snowmobile use in recommended wilderness, although Alternative 6 allows snowmobiles only on designated routes. The Mt. Naomi area and the Worm Creek area receive heavy snowmobile use, some of it illegal within the Mt. Naomi Recommended Wilderness.

Motorized use can decrease the opportunity for solitude and primitive recreation within the areas recommended for wilderness. These current on-going uses, which do not conform to designated wilderness management, could contribute to long-term establishment of motorized use. This may influence Congressional consideration for designation as wilderness.

Motorized recreation use could affect wilderness character by detracting from the solitude and lowering the natural appearance. Alternatives 1, 2 and 3 do not limit motorized route densities in inventoried roadless areas and have potential to lower solitude and natural appearance. Alternative 6 manages the most roadless acres as non-motorized in the summer. This would help retain solitude and natural appearance. Alternatives 7 and 7R allow motorized use in some roadless areas, but would retain existing areas of semi-primitive non-motorized opportunity through ROS plan guidelines and prescribed motorized route densities.

- *Table 4. 74 Acres of Motorized and Nonmotorized Opportunity within Recommended Wilderness by Alternative*

Travel Management Scenarios	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Summer Motorized	16,000	16,000	0	57,000	16,000	0	0	0
Summer Non-Motorized	14,600	14,600	0	14,600	79,100	341,900	47,200	42,500
Winter Motorized	16,000	16,000	0	57,000	80,500	327,300	47,200	42,500
Winter Non-Motorized	14,600	14,600	0	14,600	14,600	14,600	0	0

Cumulative Effects

STATE AND REGIONAL TRENDS

Other National Forests in the region are completing forest plans or are scheduled to complete them within the next five years. Alternatives presented in those plans could have some recommended wilderness adjacent to the Forest in the Mt. Naomi area. Other area Wilderness Areas are discussed in the “need” section, previously.

Generally, much of the roadless areas recommended for wilderness in all alternatives are typical of designated wildernesses within the region and nationally. Currently large tracts of lands administered by the Bureau of Land Management are being evaluated for wilderness. Additions of these lands could generally add more diversity to the Wilderness Preservation System.

Statewide and regionally, there are five national forests revising their management plans and consequently, their wilderness recommendations. If all of the plans include high amounts of recommended Wilderness, motorized recreation trends could be significantly affected. Since most of the areas "grandfather" in existing uses, this effect would not be seen immediately. If Congress determined that all of those areas should be designated Wilderness, then motorized uses would be curtailed. Alternative 6, which recommends about one third of the Caribou NF for wilderness designation, would contribute to this cumulative effect. The other alternatives would not since they recommend much fewer acres.

The State of Idaho has 4,006,000 acres of designated Wilderness within the National Forests; this is 7.5 percent of the National Forest System (NFS) lands in the State. In contrast, 1.5 percent and 4.9 percent of the NFS lands in Utah and Wyoming, respectively, are designated wilderness. Forest Plan Alternatives recommend between 30,600 and 341,900 acres for Wilderness designation. This would increase National Forest designated Wilderness within Idaho by one percent (1%) in Alternatives 1 and 2, or nine percent (9%) in Alternative 6.

IMPACTS FROM OTHER RESOURCE PROGRAMS

As area population and recreation uses grow and diversify, demand for primitive and semi-primitive opportunities on the forest will not be meet, displacing or changing use patterns. Under Alternatives 5, 7 and 7R these uses would be more accommodated while still strengthening standards, guidelines and monitoring to protect resources.

Timber management could affect wilderness character in inventoried roadless areas by detracting form a sense of solitude by altering the natural environment with tree removal and road construction. Alternatives 4, 5, 6, and 7 would have the fewest effects on wilderness character form timber harvest because there would be very little, if any, road construction or harvest in IRAs.

Viability Analysis

Scale of Analysis:

Direct, indirect, and cumulative effects were analyzed at the Caribou National Forest level. Where information was available from broader-scale analyses (Columbia River Basin), this information was incorporated into Forest-level analyses.

♦ **WL.1 Viability analysis based on wildlife habitat outcomes for each Alternative.**

Risk assessments for fine filter species (TES, MIS, and SAR)

Risk Assessment for coarse-filter species and habitats

Analysis Methods

The AMS (1999) reviewed National Direction and Policies, Regional Direction, Policy and Strategies, and monitoring results from the 1985 Forest Plan to identify needs for change. Wildlife concerns focused on vegetation communities, particularly those at high risk of uncharacteristic disturbance events and are moving out of proper functioning condition, and how wildlife species associated with those habitats would be affected.

First, Threatened, Endangered, and Region 4 Sensitive Species were evaluated. To identify other species potentially at risk, the Interior Columbia River Basin broad-scale scientific assessment was reviewed. In addition, the Conservation Data Center's Species of Special Concern for the State of Idaho was reviewed along with the Idaho Partners in Flight Bird Conservation Plan. Finally, additional species were added or others dropped based on the input of local specialists (See Wildlife section in Appendix D).

Revised Forest Plan direction for all alternatives is designed to maintain or improve conditions for habitats and species with identified concerns. Direction occurs at both the forest-wide and prescription area levels. Goals and objectives in the Revised Forest Plan have been designed to move towards, or achieve, desired future conditions to maintain or restore habitats and processes needed over the long-term by species. Standards and guidelines give additional direction to protect or restore conditions for habitat/species that could be adversely affected by other land management activities. Other resource programs also implement additional direction and guidance for resource protection.

The alternatives vary in the length of time it would take to achieve vegetation desired conditions. If management activities can produce conditions that are in proper functioning condition, then it is assumed that most of the species adapted to these conditions will have sufficient habitat to meet their needs. The potential to decrease biological diversity is high if existing or anticipated future conditions are not in proper functioning condition.

Project implementation under the Revised Forest Plan direction is further analyzed based on current and site-specific information in the area where the project is proposed. Because of the lack of detailed information at the broad Forest level, proposed projects require collection of more accurate resource information for the local area. A determination of effects for project proposals will be made on a site-specific level incorporating Forest Plan guidance.

VIABILITY ANALYSIS

National Forest Management Act (NFMA) regulations require National Forests to provide habitat in order "to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." The regulations define a viable population as "one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed throughout the planning area." The regulations (36 CFR 219.19) also direct that "habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning unit."

To assess the "continued existence" of a species, it may be best expressed through varying levels of risk. A Risk Assessment includes reviews of risks to species habitat or populations, a ranking of the level of that risk, and an overall Risk Rating, based on the results of the risks associated with those activities occurring on Forest Service lands. Three levels of risk have been used: low, medium, and high.

Low risk – A high likelihood exists that the populations would meet population viability criteria. Effects to individuals range from temporary displacement to short-term modification of habitat.

Moderate risk – An intermediate likelihood exists that populations would stabilize. Effects on individuals include reduced productivity and displacement from important seasonal habitats that are limited in distribution.

High risk – It is highly unlikely that species populations would be maintained. Effects on individuals include direct or indirect mortality of adults or young, elimination of habitat for a known population that has limited distribution, significant fragmentation of habitat where species dispersal is eliminated or significantly reduced.

Strategies that influence environmental use are often broad in scale and not focused on individual species. A community, or broad-scale approach, to the conservation of biological diversity is referred to as a coarse-filter approach. This approach includes (1) delineating the planning area, (2) comparing existing distribution of communities to pre-settlement patterns, (3) describing changes in disturbance regimes, (4) developing conservation measures to address community conditions and habitats for associated species and (5) comparing future community distribution after implementation. This approach suggests that viable populations will be maintained when the communities in question are functioning within a range of variability, including processes and structure.

The coarse-filter approach contrasts with the fine-filter approach of conserving individual species. The majority of strategies are developed for individual species, because the species is "at risk," or because it is a game species. Fine-filter or species-based assessments are used when species are not necessarily correlated with system processes or where habitat relationships are poorly understood.

PROCESS

An Inter-regional process (Forest Service Regions 1 and 4) was initially identified to assess viability for species (R1/4 Terrestrial Protocols, 1997). More recently, a national "White Paper on Managing Viable Populations" was prepared and evaluated through peer review. It is being revised to incorporate new information and issues raised during the review (UDSA, 2001).

The approach described in the White Paper on Managing Viable Populations incorporates several steps:

1. Description of the ecological context
2. Identification of species-at-risk and collection of information
3. Description of key conservation elements for those species
4. Development of Forest Plan Alternatives
5. Risk Assessment and Analysis of effects on viability of the Forest Plan Alternatives
6. Monitoring

For more information on how species-at-risk were selected, how they were grouped, conservation approaches for habitats, and details of effects analysis, refer to Appendix D.

General Effects by Management Activity

Following is a description of general effects to wildlife habitat or species from other resource activities. Although the amount and distribution of these activities may differ by alternative, the general types of effects from the activities would be the same for all alternatives.

TIMBER HARVEST

Timber harvest activities alter vegetation components that comprise habitat for associated wildlife species. Stand condition includes the presence of disease or insects, number of dead or dying trees, stand structure (canopy layers), stand size (tree height and diameter), and species composition. Stand conditions can be greatly influenced by regeneration techniques, treatment of shrubs and grasses, selection of tree species to be harvested, extent or intensity of thinning, and silvicultural system used (Hall and Thomas, 1979). Various forest stages or structures can be created and maintained through different harvest techniques.

Silvicultural methods applied to a treatment area depend on the forest type being treated and the objectives of the treatment (Hoover and Willis, 1994). Uneven-aged management produces almost a continuous forest canopy of various aged trees with a minimum of disturbance to the site. While it does not create horizontal diversity, vertical diversity is beneficial to many species. Mature and old growth trees and snags are more abundant. Even-aged management creates single-story canopies lacking vertical diversity but provide greater horizontal diversity. Even-aged management is more intensive and results in more ground disturbance. The effects of even-aged management depend on the species considered, and the size, shape, and location of openings created.

Harvesting can move successional trends toward or away from proper functioning condition. These changes in vegetation can have positive and negative effects, depending on the species analyzed. For example, selective harvest in higher-elevation mixed conifer forest types could reduce suitability for boreal owl use while benefiting other species, such as great gray owls that use more open stands. Post-fire salvage logging can reduce the amount of large trees used by cavity nesting species that have evolved with fires.

The mechanical processes involved in timber harvesting produce disturbances to some wildlife species, because of equipment use and/or noise or human presence. In areas where roads are built and maintained for long-term use, vehicle access can increase threats to some wildlife species. Snags are often removed adjacent to roads for safety reasons, and roads provide ease of access for people wanting firewood. This reduces the habitat for species that require snags/downed logs. The timing of project activities (season) can also have different effects.

Potential effects to wildlife habitat and species from timber harvesting and associated management activities will vary by alternative theme (commercial harvest versus restoration and different silvicultural methods and objectives used).

FIRE MANAGEMENT

Fire management activities change vegetation composition, density, size, amount and distribution, as well as successional trends. Use of prescribed fire, fire suppression, and wildfire all affect these vegetation components.

Historically, fire caused disturbances at different intervals and intensities. An analysis of fire history information for the Columbia River Basin looked at two study sites in the vicinity of the Forest (Barrett, *et al*, 1997). The studies found that in the 400-year period reviewed, sixteen fire periods were detected. Another study specific to the Forest found at least fifty-three fire years in a 500-year period (Barrett, 1994). A conservative mean fire interval of thirteen years was calculated, with about thirty-two years between major events, and the last occurring in 1934. The Forest is a complex mosaic of variable-aged stands, and most fires were patchy and rarely burned over extensive areas. Vegetation and wildlife have evolved with fire as a common occurrence.

Long-term fire exclusion causes changes in vegetation from historical conditions. Heavy livestock grazing and fire suppression have precluded three to four fire "thinning" treatments over the last 100 years (Barrett, 1994) and left an abundance of older stands with little aspen regeneration. In low-elevation mixed conifer forest an increase in understory conifers has increased tree density. In sagebrush habitats, fire exclusion has resulted in increases in Douglas-fir, juniper, and mountain mahogany. Aspen stand structure, composition, and distribution has also changed due to fire exclusion. Stands are older and are being replaced by conifers over time. Fire exclusion has also resulted in more fuels, so that when wildfires do burn, they burn as high-severity fires (Agee, 1998).

The major impacts on wildlife focus on changes in vegetation (McMahon and deCalesta, 1989). Direct effects are limited to mortality, and in terms of numbers of animals in the population, are insignificant. Small mammals are the most affected, and the degree of effects is related to the uniformity, severity, size, and duration of the burn. Indirect effects are related to changes in vegetation structure, composition, bare soil, potential for spread of invasive plant species, presence of downed woody debris, and effects on forage and cover. Fire may cause short-term increases in food for some species.

The extent of fire effects on animal communities generally depends on the extent of change in habitat structure and species composition caused by fire. Stand-replacing fires usually cause greater changes than non-lethal underburns. Animal species are adapted to survive the pattern of fire frequency, season, size, severity, and uniformity that characterized their habitats in pre-settlement times (Smith, 2000).

Alternatives vary in the trade-offs of vegetation changes, as a result of fire suppression or prescribed fire. Potential effects to wildlife habitat and species from fire management will vary by alternative theme.

LIVESTOCK GRAZING

Generally, livestock grazing is one of the most widespread activities occurring across the Forest. Domestic sheep and cattle are the most commonly permitted grazing animals. Effects of grazing include plant defoliation, mechanical changes to soil and plant material, and nutrient redistribution. These and other factors also influence successional trends. Succession is affected by grazing frequency/duration, intensity, and timing. Grazing can also alter vegetation composition.

Ohmart (1996) identified three phases of riparian degradation due to unmanaged livestock grazing. Each of these phases produces changes in associated wildlife use. Ohmart reviewed numerous studies, and some of these changes are summarized below. In phase I structural damage to streambanks and loss of vegetation begin impacting amphibians, some reptiles, and ground-nesting birds. Shrub-nesting bird species are displaced with more generalists that have no preference for nest placement. Over time, as riparian habitats become more fragmented and degraded, their value as stopover sites for migrants decreases, and insect production decreases.

Just the presence of livestock can affect wildlife species. For example, cattle attract cowbirds. Cowbirds are nest-parasites that lay their eggs in host species nests. Their young hatch earlier, are larger, and out-compete the host species nestlings. Cowbirds have expanded their range westward, following the spread of cattle, and are now in areas where native bird species have not evolved strategies to deal with their parasitism (Saab, *et al*, 1995). The presence of livestock may be giving cowbirds an ecological advantage over other bird species in the area. Breeding bird surveys in the Big Hole Mountains to the north of the Forest found brown-headed cowbirds to be one of the most common species observed (Kiene, 1996).

RECREATION

The effects of recreation on wildlife have been reviewed by Joslin and Youmans (1999). Human activities can impact wildlife through exploitation, disturbance, habitat modification, and pollution (Knight and Cole, 1995). Disturbance caused by recreational pursuits or other human activities may elicit behavioral and/or physiological responses in wildlife. An individual's behavioral response may vary according to season, age and sex, body size, motivational state, behavioral response of cohorts, and habitat security. Behavioral responses are also influenced by the disturbance itself, such as type of activity, distance away, direction of movement, speed, predictability, frequency and magnitude.

Wildlife behavior may take the form of avoidance, habituation, or attraction (Knight and Temple, 1995). Habituation reduces the physiological costs of dealing with disturbance, but does not eliminate it completely. Habituated animals may have chronically elevated heart rates (Cassirer and Ables, 1990). Behavioral responses may be of short duration, such as temporary displacement, or long-term, such as abandonment of preferred foraging areas.

Developed and dispersed camping can decrease habitat suitability for some species. Species that use snags are usually negatively affected by the removal of hazard trees and the use of snags for firewood. Long-term use of dispersed sites can modify the vegetation, decreasing or eliminating suitable habitat. Disturbance during breeding or nesting can also occur.

Winter recreation, such as cross-country skiing and snowmobiling, can stress wintering animals, especially during deep snow or extreme cold conditions. Over-the-snow trails may allow access to some animals (coyotes, bobcats) that were previously excluded due to deep snows.

Alternatives propose varying degrees of recreational emphasis. Effects on big game on winter ranges are discussed under the Big Game section.

ROAD AND TRAIL CONSTRUCTION AND USE

Roads and trails remove vegetation from the travel surface. This directly reduces the amount of habitat available and indirectly affects adjacent habitat. The effects of roads, motorized, and non-motorized trails on wildlife depend on the species, topography, vegetation type, season, and frequency and predictability of human use. Effects range from increased vulnerability from loss of snags and downed logs, disruption of movement patterns, fragmentation of habitat, and displacement and/or avoidance responses (Wisdom, *et al*, 2000). Access on roads and trails can be restricted to certain times of the year to reduce or eliminate the effects of access.

OFF-ROUTE MOTORIZED VEHICLE USE

Off-route motorized use removes vegetation, increases bare soil, and increases the potential for establishment of non-native species. Disturbance is less predictable, and habituation is less likely to occur. The alternatives vary in how many acres are open to off-route use.

MINERALS MANAGEMENT

Phosphate exploration, development, and past and ongoing activities have affected wildlife habitat on the Forest. Exploration effects are usually from disturbance related to project activities and are temporary in nature. Development effects include habitat alteration/loss over fairly large areas, as well as disturbance associated with mining. Past mineral development has resulted in fairly large areas devoid of vegetation and some areas where concentrations of selenium are of concern.

The effects to habitat and species will not vary among alternatives. The only variation is between prescriptive (Alternative 6) and adaptive (Alternatives 1 through 5, 7, and 7R) management methods to achieve reclamation. Both methods should have similar effects on wildlife habitat and species.

SELENIUM EFFECTS ON WILDLIFE

All of the alternatives include prescriptive or adaptive management for phosphate mining. Either of these management strategies would incorporate mitigation to reduce the amount of selenium available in the environment. Mitigation measures include construction of control ponds and silt fences around overburden dumps to reduce potential for runoff into surface water and the use of topsoil and suitable growth media (non-seleniferous) for reclamation activities. These types of mitigation measures would be common to all alternatives. All alternatives, except Alternative 6, allow for adaptive management that would incorporate new mitigation measures as they are developed.

The numbers used for management prescription categories, road and trail miles, acres of timber harvest, and fire treatments are best estimates, based on the latest available information. The analysis used here is intended and designed to indicate relative differences among alternatives, rather than predict absolute amounts of activities, outputs, or effects.

NON-NATIVE PLANTS

Over time, many non-native plants have become established on the Forest, intentionally or unintentionally. They may affect forage availability, alter fire regimes, out-compete native species, or decrease nesting success of some species.

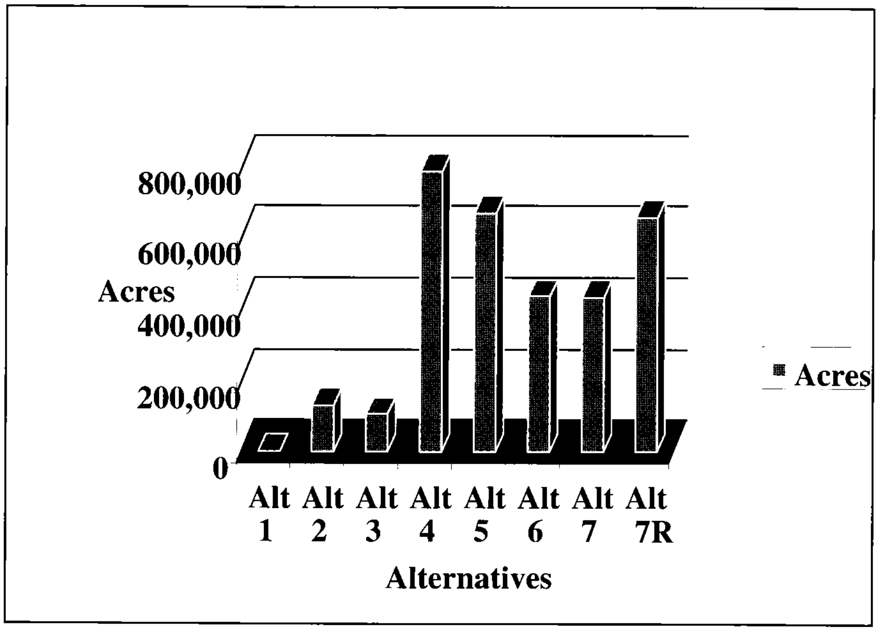
General Effects by Management Prescription

VEGETATION MANAGEMENT WITH EMPHASIS ON RESTORATION

MANAGEMENT PRESCRIPTIONS 2.7.X, 3.3, 5.2, 5.3, 6.2, AND 6.3

Wildlife habitats are expected to improve, because of the emphasis on restoration of habitats with these prescriptions. Habitats would improve through the use of prescribed fire and mechanical timber harvest, moving vegetation towards proper functioning condition.

- *Figure 4. 2 Acres Proposed for Restoration*

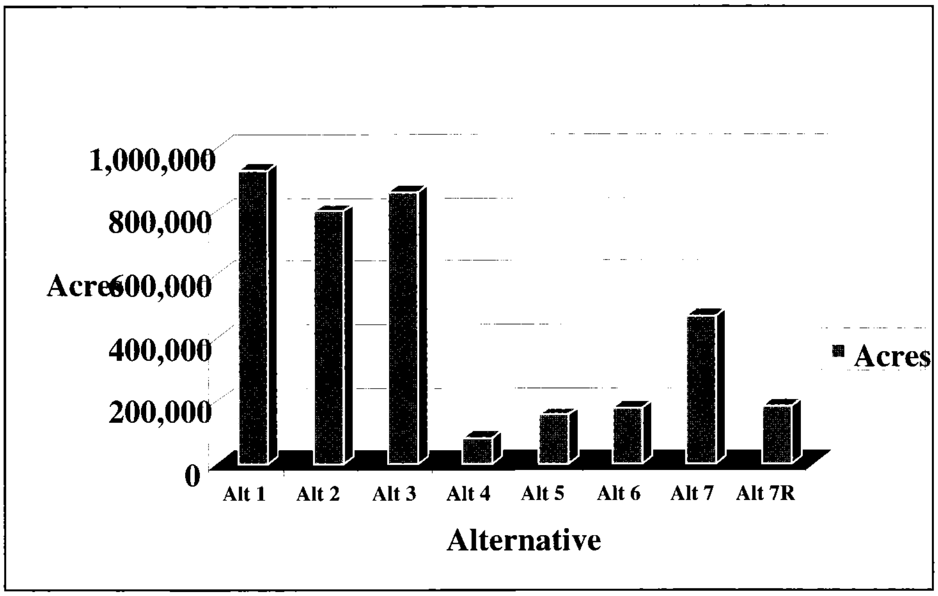


VEGETATION MANAGEMENT, COMMODITY PRODUCTION EMPHASIS

MANAGEMENT PRESCRIPTIONS 3.2, 4.2, 4.3, 5.1, 5.4, 6.1, 8.1, AND 8.2

Wildlife habitats are expected to improve, but some short-term decreases in habitat suitability may occur. The use of prescribed fire in forested habitats would be more limited. Snags, downed logs, and residual forage and browse (upland and riparian) would be lower and road construction would be higher. Mitigation measures are major elements of most project activities in these Prescription areas.

- *Figure 4. 3 Acres Emphasizing Commodity Production, by Alternative.*

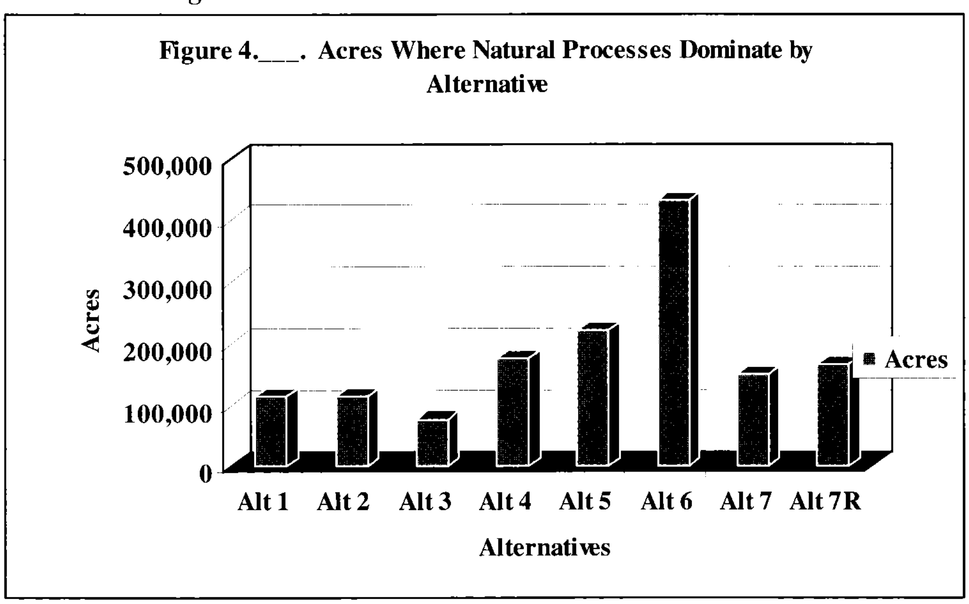


NATURAL PROCESSES DOMINATE

MANAGEMENT PRESCRIPTIONS 1.3, 2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.5, 2.1.6, 2.2, 2.5, 2.8.3 AND 3.1

Wildlife habitats are anticipated to improve by natural processes, with succession proceeding until a disturbance occurs. Restoration will occur over a longer-time period, because of the emphasis on unpredictable natural processes. Species that are most negatively affected by mechanical disturbance and other human activities would benefit from these prescriptions. IRAs were not used, because many of these areas actually have motorized trails in them.

- *Figure 4. 4 Acres Where Natural Processes Dominate*



Direct and Indirect Effects by Species and Alternative

THREATENED AND ENDANGERED SPECIES (FINE-FILTER ANALYSIS)

These species receive special consideration at the project level, and Biological Assessments are completed to identify possible effects to these species. These assessments address how the proposed management actions maintain or improve habitat conditions for these species. Potential effects at the forest-scale are described below for those species currently listed under the Endangered Species Act (ESA). More information on these species is found in the Biological Assessment and in Appendix D.

Appendix D discusses the risk factors for each species, based on current literature and research, followed by a risk assessment, based on identified risk factors. Revised Forest Plan direction for the species or its habitat is also analyzed. In addition, habitats on the Forest are described and discussed and how Forest habitat contributes toward the conservation of each species.

A summary of the findings in Appendix D is presented in the following section.

CANADA LYNX

The Lynx Conservation Assessment Strategy (LCAS) includes programmatic conservation measures for lynx movement and dispersal.

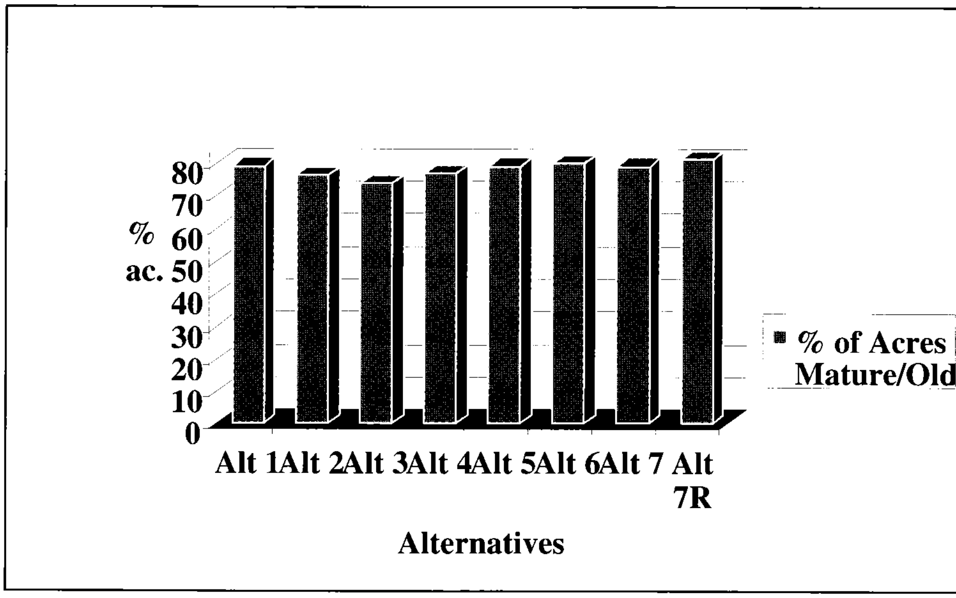
Potential lynx linkage habitat has been mapped (See Biological Assessment). Landscape level linkages have been identified that could allow movement of lynx from the Greater Yellowstone Ecosystem to the north, to adjacent Forests to the south. On the Forest areas that were considered as most important include 1) the south end of the Bear River Range that connects to the Wasatch-Cache National Forest to the south, 2) the Gannett Hills area that connects with the Bridger-Teton National Forest to the east and 3) the McCoy Creek area that connects with the Targhee National Forest on the north and the Bridger-Teton National Forest to the east.

An interagency meeting on January 25, 2002 identified and mapped possible lynx linkages for the State of Idaho. This mapping effort focused on highways as the major factor affecting lynx movements and dispersal, especially four-lane highways. Of special concern would be the conversion of two-lane to four-lane highways. As a result of the mapping, two areas on or adjacent to the Caribou National Forest were mapped as linkage areas across Highway 34 along Tincup Creek and Highway 34 between Manson and Georgetown.

Appropriate LCAS direction for lynx movement and dispersal has been incorporated, and all alternatives would meet the intent of the LCAS for recovery of the species. Similarly, all alternatives would provide management direction to protect the species and potential linkage habitat. The Biological Assessment includes an analysis of the LCAS guidance for lynx movement and dispersal and how this guidance has been incorporated into the Plan. A map of potential lynx linkage habitat is found in the Biological Assessment and in the Wildlife section of Appendix D.

Much of the forested vegetation is in a mature/old growth condition with few early seral stands evident. Snowshoe hare, the lynx primary prey, habitat may have declined over historical conditions. Forested vegetation treatments would alter forest structure and composition improving foraging habitats. Vegetation movement towards proper functioning condition would maintain potential linkage habitat.

- *Figure 4. 5 Distribution in the High-Elevation Mixed Conifer Typesat the End of Ten Years.*



Other factors contribute to potential lynx linkage habitat. The table below shows how the alternatives address these factors.

- *Table 4. 75. Risk Assessment For Canada Lynx by Factor.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Highways, Railroads and Utility Corridors	Low	Low	Low	Low	Low	Low	Low	Low
Land Ownership Patterns	Low	Low	Low	Low	Low	Low	Low	Low
Dispersal Across Shrub Steppe Habitats	Mod	Mod	Mod	Mod	Mod	Low	Mod	Low
Habitat Degradation from Noxious Weeds	Low	Low	Low	Low	Low	Low	Low	Low
Private Land Development	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod
Overall Risk	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**

Risks from highways, land ownership patterns, noxious weeds and private land development do not vary by alternative. Risks from the first three factors are "low" due to Forest Plan direction, while risks from the last factor are considered "moderate." Dispersal across shrub steppe habitat varies due to the amount of treatments and expected canopy cover changes in each alternative. It is expected that sagebrush habitats with the highest among of land in the greater than 15 percent canopy cover would provide the best conditions for dispersal (LCAS, pg 7-14). Since Alternatives 6 and 7R treat fewer acres, they would have a lower risk than the other alternatives.

Cumulative Effects

Most suitable habitat in southern Idaho is located on higher elevation forested lands, often on publicly managed lands. All public land managers will incorporate guidance from the LCAS. Other impacts include a decrease in suitability of habitat linkages due to development, construction of highways, or loss of cover due to agricultural conversions. None of these factors varies by alternative, and they are discussed in the direct and indirect effects section.

GRAY WOLF

Since wolves are habitat generalists that hunt and den over a wide variety of vegetation types, none of the alternatives would have a significant effect on the amount and distribution of habitats used by wolves for their prey species. Gray wolf populations are primarily limited by non-habitat factors, such as control due to livestock depredations and illegal killing (Bangs, 2000). The Revised Forest Plan includes standards that detail how livestock/wolf interactions will be managed.

Wolves are most vulnerable to disturbance during the denning season, and limiting human use around den sites is the main land use restriction recommended to enhance wolf recovery (U.S. Fish and Wildlife Service, 1994). This guidance applies if there are five or fewer breeding pairs in the recovery area. Currently there are more than six breeding pairs in both the Central Idaho and the Greater Yellowstone Recovery Areas. No observations pairs or packs of wolves have been reported on the Forest.

Wolf interaction with humans is most influenced by human accessibility. Most observations have been reported in the summer and fall when more people are using the Forest. Several different measures of accessibility are used and displayed in Table 4.76, below. Open motorized route density (OMRD) is shown for the three units on the northeastern part of the Forest. Wolves dispersing from the Yellowstone area may move into these areas first. Changes in OMRDs are shown for the three areas as an indication of how access could change across the Forest under the different alternatives.

- *Table 4. 76. Ranking of Alternatives[1] for Gray Wolf.*

Risk Factors	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Percent of Forest Open to off-route travel	2	2	2	1	1	1	1	1
Ranking of OMRD for Caribou/Diamond/Pruess[2]	4	4	4	3	2	1	3	4
Ranking Based on Acres where Natural Processes Dominate	3	3	4	2	2	1	3	2
Ranking on Winter Big Game Distribution[3]	3	2	2	1	1	2	1	1
Ranking Based on AUMs[4]	4	4	4	2	2	1	3	3
Overall Ranking	**4**	**4**	**4**	**2**	**2**	**1**	**3**	**3**
Overall Risk	**Mod**	**Mod**	**Mod**	**Low**	**Low**	**Low**	**Low**	**Low**

1 Rankings use "1" as best.
2 See Corridor Analysis in the Wildlife section in Appendix D.
3 Assumption that winter ranges in prescription 2.7 will be in better condition and receive more use from wintering big game.
4 Higher AUMs have a higher potential for livestock/wolf interactions; lower AUMS have a lower risk.

The overall ranking of the alternatives reflects the potential for interactions with humans, based on access (vulnerability to hunters) and the potential for depredations on livestock. Generally, Alternatives 4 through 7R decrease the potential for human/wolf interactions, while Alternatives 1, 2, and 3 may increase the potential for interactions if/when wolves become established on the Forest.

Cumulative Effects

Wolves are wide-ranging species, and the potential for conflicts with humans and livestock is greater on private lands where livestock is concentrated in smaller areas. All of these potential problems are addressed on a site-specific basis by the USDA-Wildlife Services. Other activities that have been identified as risk factors have been analyzed in the direct and indirect effects section.

BALD EAGLE

Bald eagles are found in the vicinity of the Forest with two nesting territory on or adjacent to the Forest. Human presence and activities have occurred and will continue to occur within and adjacent to bald eagle territories on the Forest.

Forest-wide direction has been specifically developed to protect bald eagle nesting areas, primary use areas, and home ranges from disturbance. Management direction includes standards and guidelines for vegetation treatment methods; timing; new structure constructions, such as power lines; wildfire; predator management; and herbicide use. This direction would help reduce disturbance and other effects on bald eagles during critical periods and therefore have beneficial effects to bald eagles over the short- and long-term. An objective has been included in the Revised Forest Plan for the development of a nest management plan for the Grays Range nest site.

Riparian area management direction is included in all the alternatives. Improved riparian area management should help maintain or restore fish population (prey) and retain or improve overstory tree (roosting) habitat forest-wide. Based on the riparian utilization standards in each of the alternatives, Table 4.77 shows the relative ranking of the Alternatives, with "1" being the best.

- *Table 4. 77. Ranking of Alternatives for Bald Eagle Based on Riparian Trends.*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Riparian Ranking[1]	8	6	7	2	3	1	4	5

1 Ranking uses "1" as best and "8" as worst.

- *Table 4. 78. Risk Assessment for Bald Eagle, by Alternative.*

Risk Assessment Factors	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Human Activities Around Nest[1]	Low	Low	Low	Low	Low	Low	Low	Low
Habitat Alteration Around NestStands[1]	Low	Low	Low	Low	Low	Low	Low	Low
Riparian Area Management	Mod	Mod	Mod	Low	Low	Low	Low	Low
Overall Risk	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**

1 All "low" due to forest-wide Plan direction and implementation of Nest Management Plans.

All alternatives have a "low" risk for bald eagles. This is due to the use of approved Nest Management Plans and incorporation of forest-wide Forest Plan direction.

Cumulative Effects

Most of the suitable habitat for bald eagles is found off-Forest along the major river corridors and around lakes and reservoirs. The risk factors identified above also relate to bald eagle habitat off-Forest. Currently bald eagle numbers are increasing, and current management appears to be compatible with bald eagle use.

YELLOW-BILLED CUCKOO

The National Wetlands Inventory (1980) only identified about fifty acres of deciduous forest riparian areas, with no differentiation between aspen or cottonwood. Conversations with District personnel confirmed that cottonwood/willow riparian habitat types are very limited on the Forest. If they do occur in small places, they are well below the fifty-acre minimum patch size to be considered suitable habitat.

WESTERN BIG-EARED BAT

Several studies have shown that this species is very sensitive to human disturbance. Summer roosts and hibernacula are particularly vulnerable to disturbance, which leads to abandonment and increased mortality. Bosworth (1994) looked at winter activity of Townsends big-eared bats in southeastern Idaho. Entering the hibernaculum and handling bats induced changes in normal activity patterns and induced premature arousal in bats near the end of a torpor bout. Lasting effects from this disturbance were not detected; however, alteration of normal behavior by human disturbance to hibernacula has been implicated in the decline of this species.

Abandoned mines, which have been closed for human safety, have been surveyed for use by bats. Where use has been documented, closures have been installed using grated openings or culverts that allow access to bats and permit airflow.

The Revised Forest Plan includes guidelines to address assessment of abandoned mines prior to closure and gating where disturbance is an issue.

- *Table 4. 79. Risk Assessment for Western Big-eared Bat, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Abandoned Mine Closure	Low	Low	Low	Low	Low	Low	Low	Low
Recreational Caving	Low	Low	Low	Low	Low	Low	Low	Low
Renewed Mining at Historic Sites	Low	Low	Low	Low	Low	Low	Low	Low
Use of Pesticides	Low	Low	Low	Low	Low	Low	Low	Low
Rangeland Conversion to Monotypic Grasses	Low	Low	Low	Low	Low	Low	Low	Low
Grazing Effects on Foraging Habitat	Mod	Mod	Mod	Low	Low	Low	Low	Low
Overall Risk	**Mod**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**

Because of Forest-wide guidance incorporated into the Forest Plan, all alternatives, except Alternative 1 (No Action), would have a "low" risk to this species.

Cumulative Effects

Because of the types of habitats used for roosting, maternity colonies, and hibernacula, most risks are associated with disturbances at these sites. Many known sites are on lands that are monitored by federal agencies, such as the Forest Service, BLM, and INEEL. Generally, access is restricted. Another unknown risk is the level of pesticide use in southeastern Idaho and the effects of pesticide use on insect prey and bats preying on these insects. The effects from Forest management on this potential risk factor would not change by alternative.

SPOTTED BAT

Roosting habitat for this species includes rock crevices on cliffs that are fairly secure. Disturbance at roosts is not expected to be an issue. Foraging habitat for this species typically includes open, arid country and associated riparian areas. It is assumed that shrublands and riparian habitats in proper functioning condition provide the best habitat for insect populations, providing prey.

- *Table 4. 80. Risk Assessment for Spotted Bat, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Shrublands in Relation to PFC	Low	Low	Low	Low	Low	Mod	Low	Mod
Riparian Ranking	Mod	Mod	Mod	Mod	Low	Low	Low	Low
Overall Risk	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**

Roosting habitat is secure in all alternatives. All alternatives have a low risk associated with this species, and all alternatives improve shrubland and/or riparian habitats to some degree. None of the alternatives should have an affect on suitability of habitat.

Cumulative Effects

One unknown risk is the level of pesticide use in southeastern Idaho, and the effects of pesticide use on insect prey, and bats preying on these insects. The effects from Forest management on this potential risk factor would not change by alternative.

WOLVERINE

Researchers have generally agreed that wolverine habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited areas, rather than in terms of topography or vegetation. Wolverine populations have generally been pushed into the least developed habitats, and the perception is that wolverines are high-elevation species. Home ranges are very large with male home ranges typically larger than those of females.

Wisdom, *et al*, (2000) places wolverine into the habitat generalist family, because they use subalpine forests, lower montane forests, and riparian woodlands as source habitats. Downed logs are a special habitat feature, because they serve as potential resting and denning sites. In addition, wolverines use talus slopes as denning sites, and talus is considered a special habitat component for this species.

Strategies for the wolverine include: (1) providing large areas with low road densities and minimal human disturbance; and (2) managing for wolverines in a metapopulation context, and providing adequate linkages among existing populations.

Witmer, *et al*, (1998) lists three major issues for wolverines in the Interior Columbia Basin. One is maintenance of large, remote areas. If populations become too fragmented, low reproductive potential could lead to local extinctions. Coarse, woody debris and rocky habitat are important in that they are fine-scale components for denning. Lesser issues include prey populations (big game) and incidental trapping.

Some of the higher peaks appeared to provide talus communities consistent with Central Idaho denning habitat, but potential denning sites within the survey area were not extensive. While adequate habitat may be available to support wolverine denning, it would likely occur in the absence of snowmachine disturbance. It is possible that the survey area may provide useful wolverine habitat outside of the denning period (Bissonette, 1997).

- *Table 4. 81. Risk Factors for Wolverine, by Alternative.*

Risk Assessment Factors	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Percent of Forest Open to Off-route Travel[1]	33%	38%	38%	0%	3%	0%	2%	2%
OMRD[2] Caribou/Webster Diamond Preuss	 0.6 1.4 1.2	 0.6 1.4 1.2	 0.6 1.4 1.2	 0.6 1.3 1.2	 0.5 1.4 1.1	 0.2 0.4 1.0	 0.6 1.3 1.2	 0.6 1.4 1.2
Acres in Rx 1.3 and 3.1, where Natural Processes Dominate[3]	9,302	9,302	0	88,207	94,477	200,000	57,019	80,000
Overall Ranking	4	4	4	2	2	1	3	2

1 In Alternatives 1-3, almost the entire middle subsection (Webster/Diamond) is open to off-route travel. In Alternatives 5-7R an area of the middle subsection would still be open to off-route travel.

2 These numbers were calculated on boundaries drawn for big game analysis and were not drawn based on subsection lines, but they give the overall picture for the same overall area.

3 These acres are approximate but give a picture for the Caribou/Webster/Preuss Ranges.

- *Table 4. 82. Risk Assessment for Wolverine, by Alternative.*

Risk Assessment	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Loss of Large, Remote Areas[1]	Mod	Mod	Mod	Low	Low	Low	Mod	Low
Connectivity	Mod	Mod	Mod	Low	Low	Low	Mod	Low
Denning Habitat Components	Low	Low	Low	Low	Low	Low	Low	Low
Overall Risk	Mod	Mod	Mod	Low	Low	Low	Mod	Low

1 Based on summary of the factors and overall ranking identified in the previous table.

The alternatives differ in the amount of large, undisturbed areas they provide and in the degree of connectivity/linkage. Alternatives 4 through 7R provide the best combination of secure areas and linkages, while the other alternatives provide less and present a moderate risk. Alternative 7R specifically identifies areas to be managed as non-motorized year-round for wildlife security (Rx 3.1). Two of these areas, Bear Creek and Meade Peak, are located in high elevation areas preferred by wolverine. Because this is a wide-ranging species, numbers are not expected to change, but distribution may change based on human activities occurring within territories.

Cumulative Effects

One of the biggest threats to wolverine is the loss of linkages to isolated populations. To move from some areas of the Forest, significant barriers must be crossed. Wide valley bottoms, with associated agricultural uses, towns and highways, are inhospitable habitat. The best strategy is to work with other agencies and groups to identify key linkages for large carnivores and work on providing more hospitable crossings. (See lynx analysis in Appendix D for more information on potential linkages.)

PEREGRINE FALCON

The Revised Forest Plan contains guidance to limit human activities and herbicide and pesticide use around peregrine falcon nests during the nesting period. Proposed management activities would do little, if anything, to affect nesting habitat, which consists typically of cliffs.

All alternatives could indirectly affect this species as a result of changes in habitat for small birds, which are prey for peregrines. Improved riparian conditions would improve habitat for birds, and foraging conditions should improve.

- *Table 4. 83. Relative Ranking of Improved Forested and Riparian Habitat for Peregrine Falcon, by Alternative.*

Foraging Habitat	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Improved Riparian Habitat Ranking[1]	7	6	8	3	2	1	4	5

1 A ranking of "1" indicates that the alternative rates best and an "8" ranks lowest. These numbers and rankings are from the Riparian/Watershed and Aquatic Habitat cumulative effects section.

Due to the low number of peregrines using the Forest, habitat and prey abundance changes would be insignificant and effects immeasurable. No risk has been associated with any of the proposed activities in any of the alternatives.

- *Table 4. 84. Risk Assessment for Peregrine Falcon, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Human Activities Around Nest[1]	Low	Low	Low	Low	Low	Low	Low	Low

1 All alternatives are ranked "low" due to forest-wide Revised Forest Plan direction.

Peregrine falcon use on the Forest could be expected to increase as numbers increase across the state, and historic cliffs are reoccupied.

Cumulative Effects

Much of the suitable foraging habitat for this species is found at lower elevations, over meadows, river bottoms, and openings where prey is available. Activities on or adjacent to cliff nesting sites have the greatest potential for disturbance. Currently, numbers have risen to the point where the species has been de-listed, and habitat suitability is assumed to be adequate (Caribou-Targhee National Forest Plan Monitoring and Evaluation reports, 1997-1999 and 2000-2001).

Important habitat components and conservation strategies for this species have been identified by Wisdom, *et al*, (2000). (See Wildlife section in Appendix D for more information.) These criteria are incorporated into the following analysis.

Snag and downed woody debris retention are both addressed through forest-wide standards and guidelines (See Wildlife section in Appendix D). Implementation of this Revised Forest Plan guidance addresses these components and should maintain foraging and nesting habitat where overstory conditions are suitable. The Revised Forest Plan also includes objectives and guidelines for boreal owls. This direction requires pre-project surveys and retention of mature forest structure around known nests, if any are found.

Vegetation types are very patchy on the Forest, generally viewed as a mosaic of small patches. To get an overall picture of actual patch sizes, a patch size analysis was completed. Six relatively undisturbed watersheds were selected for the analysis.

- *Table 4. 85. Average Patch Size in Acres, by Habitat Type.*

Watershed	Aspen	Douglas-fir	Mixed Conifer
Preuss	35	20	20
Weston	18	n/a	n/a
Toponce	35	10	14
Rock/Pine	56	48	8
St. Charles	29	27	27
Horse	23	28	16

Results from the analysis show the Forest has a naturally small patch size because of topography and past natural disturbances. The patch size analysis analyzed forested vegetation as a group rather than by individual forest type. Average patch sizes ranged from 29 to 248 acres, which is considered relatively small.

Over the short-term, conversion to early-aged stands will decrease habitat for this species; however, mature/old stands are found over a greater proportion of the Forest than what occurred historically. It is assumed that proposed treatments designed to move forest types toward a more properly functioning condition would be more beneficial to boreal owls over the long-term.

The risk assessment for this species focused on higher-elevation mixed conifer forests, since generally mesic forests are considered primary habitat.

- *Table 4. 86. Risk Assessment for Boreal Owl, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
PFC at 10 years[1]	Mod	Low	Low	Low	Mod	Mod	Mod	Mod
PFC at 100 years[1]	Low	Low	Low	Low	Mod	Mod	Low	Mod
Loss of Snags, Downed Woody Debris	Mod	Mod	Mod	Low	Low	Low	Low	Low
Fragmentation	Low	Low	Low	Low	Low	Low	Low	Low
Overall Risk	**Mod**	**Low**	**Low**	**Low**	**Mod**	**Mod**	**Low**	**Mod**

1 Emphasis on high-elevation mixed conifer as primary habitat.

Alternatives 2, 3, 4 and 7 provide the lowest risk for boreal owls, based on short-term and long-term habitat provided, as well as the predicted availability of snag nesting trees. The remaining alternatives, Alternatives 1, 5, 6 and 7R, all have a moderate risk. While the forested stands are farther from the historic range of variability (HRV), the preponderance of mature and old stands will provide nesting and foraging habitat. Population trends would stay the same or increase across the planning area until such time as a stand-replacing fire, insect or disease epidemic, or other natural event creates early seral stands.

Cumulative Effects

Most of the habitat for this species is found at higher-elevations in forested habitats, which often are found on public lands. Because the boreal owl is considered a Sensitive Species in Regions 1 and 4, every site-specific project is reviewed for effects. Actions affecting boreal owl habitats on the Forest have been analyzed under direct and indirect effects.

FLAMMULATED OWL

Important habitat components and conservation strategies for this species have been identified by Wisdom, *et al*, (2000). (See Appendix D for more information.) These criteria are incorporated into the following analysis.

All alternatives contain objectives and guidelines that apply to the flammulated owl. These include pre-project surveys and restrictions on timber or firewood harvest within a 30-acre area around known nests.

Snag and downed woody debris retention are addressed through forest-wide standards and guidelines (See Appendix D). Implementation of Revised Forest Plan guidance addresses these components and should maintain foraging and nesting habitat where overstory conditions are suitable.

Treatments that move Forest types toward the historical range of variability would be more beneficial to flammulated owls over the long-term and include the effects of regeneration and intermediate harvests. Stand conditions after intermediate treatments may be similar to conditions from historic fire patterns that result in a mature/old overstory with fairly open spacing and a grass/forbs/shrub understory.

The risk assessment focused on aspen and lower-elevation mixed conifer forests, because generally lower-elevation forests are considered primary habitat.

- *Table 4. 87. Risk Assessment for the Flammulated Owl, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
PFC at 10 years[1]	Mod	Mod	Low	Low	Mod	Mod	Mod	Low
PFC at 100 years[1]	Low	Low	Low	Low	Mod	Mod	Low	Low
Loss of Snags, Downed Woody Debris	Mod	Mod	Mod	Low	Low	Low	Low	Low
Overall Risk	**Mod**	**Mod**	**Mod**	**Low**	**Low**	**Mod**	**Low**	**Low**

1 Emphasis on aspen and low-elevation mixed conifer as primary habitat.

Alternatives 4, 5, 7, and 7R provide the least risk to flammulated owls and their habitat. While total nesting habitat may decrease over the short-term, with vegetation treatments the quality of some stands may improve through intermediate harvest and non-lethal fire regimes. Over the long-term, habitats closer to Properly Functioning Condition would be most suitable. Habitat and populations would be expected to be maintained or increase across the planning area.

Cumulative Effects

Some of the habitat for flammulated owls is found at lower-elevations with more suitable habitat found on privately owned lands. Many of these stands have been impacted by logging, fire-exclusion, and conversion to other uses. The major impact on habitat may be fire exclusion. As fire is excluded, understory vegetation and fuels build up. When fire events do occur, they often are stand-replacing fires, rather than underburns. The increase in understory also limits suitability for foraging.

Great Gray Owl

Important habitat components and conservation strategies for this species have been identified by Wisdom, *et al*, (2000). (See Appendix D for more information.) These criteria are incorporated into the following analysis.

All alternatives contain objectives and guidelines in the Revised Forest Plan that apply to the great gray owl. These include pre-project surveys and maintenance of mature/old forest around known nests. Snag and downed woody debris retention are addressed through forest-wide standards and guidelines (See Appendix D). Implementation of the Revised Forest Plan guidance for this species addresses these components and should maintain nesting habitat where overstory conditions are suitable.

Treatments that move forest types toward Properly Functioning Conditions would be more beneficial to great gray owl over the long-term. This includes the effects of regeneration and intermediate harvests. Stand conditions after intermediate treatments may be similar to effects from historic fire patterns that resulted in a mature/old overstory with fairly open spacing and a grass/forbs/shrub understory. Great gray owls forage in more open areas, and treatments may benefit this species by improving foraging habitat. The risk assessment focused on all forest types, because the great gray owl uses all types.

- *Table 4. 88. Risk Assessment for Great Gray Owl, by Alternative.*

Risk Assessment	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
PFC at 10 years[1]	Mod	Mod	Low	Low	Mod	Mod	Mod	Low
PFC at 100 years[1]	Low	Low	Low	Low	Mod	Mod	Low	Low
Loss of Snags, Downed Woody Debris	Mod	Mod	Mod	Low	Low	Low	Low	Low
Overall Risk[2]	L-M	L-M	L-M	Low	L-M	L-M	L-M	L-M

1 Emphasis on all types (aspen and conifer) as primary habitat.

2 These alternatives ranked low to moderate. While ranking leads more to a moderate rank, this species often uses goshawk nests for nesting, and all alternatives are rated low risk for goshawks based on wide variety of types used and Forest Plan S&G.

Alternative 4 and 7R have the lowest overall risk to great gray owls, based largely on vegetation treatments. Other alternatives have a slightly higher risk over the long-term, as the potential for stand-replacing fires increases as the percent of acres increases in the mature/old age class. All alternatives should maintain habitat and distribution of this species across the planning area.

Cumulative Effects

Portions of the habitat for great gray owls are found at lower-elevations, especially in the winter. Actions affecting habitat for the species are the same, but risks are higher at lower elevations. The great gray owl forages in open areas, because it needs more room to maneuver. This species has been observed foraging around meadows, fields, and highways. Collisions with vehicles have been noted as a concern (Joslin and Youmans, 1999). None of the alternatives would increase the risk to birds wintering at lower elevations.

TRUMPETER SWAN

Revised Forest Plan standards and guidelines provide for maintenance of potential habitats, such as Elk Valley Marsh. Alternatives 4 through 7R move riparian and non-riverine wetlands toward proper functioning condition at a faster rate than Alternatives 1 through 3 (See Issue 6: Watershed/Riparian Areas and Aquatic Biota). As a result, species distribution on the Forest is expected to improve during the planning period under Alternatives 4, 5, 6, 7, and 7R. Alternatives 1 and 3 may maintain habitats in their current condition.

- *Table 4. 89. Risk Assessment for Trumpeter Swan, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Movement out of PFC	Mod	Mod	Mod	Low	Low	Low	Low	Low

Cumulative Effects

Most of the primary habitat for this species occurs at lower elevations off the Forest. This species has a high public profile, is easily observed, and is of high interest. Many of the most suitable habitats are in public ownership, particularly on state and federal wildlife refuges. Management at these sites typically favors this species. None of the actions proposed in the alternatives would affect these lower elevation habitats.

HARLEQUIN DUCK

Alternative 7R includes an objective to complete surveys of McCoy Creek within five years to determine use. Alternative 7R also includes a guideline to avoid any new developments within 300 feet of any stream with breeding activity.

Because of the types of riparian habitats Harlequin ducks use, potential habitat generally is not affected by livestock grazing. With the incorporation of guidance outlined above, none of the alternatives will affect habitat suitability.

Risk Assessment

Because of the low potential for Harlequin ducks to be present on the Forest, implementation of any of the alternatives should result in low risk to this species.

Cumulative Effects

Past actions, such as road and trail locations, may have reduced suitability on many streams in the West. Because of the nature of breeding habitats used by this species, many of these areas have been developed; however, no historical data are available to provide a basis for any conclusions.

NORTHERN GOSHAWK (*ACCIPITER GENTILES*) (ALSO A MANAGEMENT INDICATOR SPECIES)

Problems and threats facing the goshawk were summarized in Idaho's Habitat Conservation Assessment and Strategy for the northern goshawk (*Accipiter gentiles*) (1995). Threats include modification of habitat at the local and landscape scales, over-utilization, disease, predation, and competition and absence of regulatory mechanisms to prevent degradation of habitat.

Patla, *et al*, (1995) also identified risk factors for goshawks, including over-utilization (commercial, recreational, scientific); disease, predation, and competition; and the absence of regulatory mechanisms to prevent the decline of species or habitat. The last risk factor has been addressed in the Revised Forest Plan, which includes Standards and Guidelines for goshawks. Specific standards have been developed for nest, post-fledging, and foraging areas.

- *Table 4. 90. Risk Assessment for Northern Goshawk, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Habitat Modification Around Nest	Mod	Low	Low	Low	Low	Low	Low	Low
Habitat Modification in Foraging Habitat	Mod	Low	Low	Low	Low	Low	Low	Low
Wildfire Suppression[1]	Mod	Low	Low	Low	Low	Low	Low	Low
Aspen outside of PFC	Mod	Mod	Mod	Low	Mod	Mod	Low	Low
Alteration of Riparian Habitats	Mod	Mod	Mod	Low	Low	Low	Low	Low
Overall Risk	**Mod**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**	**Low**

1 Based on whether the alternative allows wildland fire use.

Because of forest-wide direction for management around known goshawk nests and improvements in nesting and foraging habitats, all alternatives, except Alternative 1 (No Action), would have a "low" risk to goshawks. Habitat should be sufficient to maintain populations across the planning area.

Cumulative Effects

It is not known to what degree some of the other risk factors, such as shooting and predation, may be occurring off the Forest. Habitat modification is occurring, but based on the variety of habitats used, this may not be a high risk. Management activities and uses on the Forest should not contribute to actions on private lands, that, when combined, would increase this risk. The Targhee National Forest Plan to the north was revised in 1997 and now includes Reynolds, *et al* (1992) recommendations for goshawk habitat management. Forest Plans in Utah have recently been amended to include this direction also.

The Caribou-Targhee Monitoring and Evaluation Report (2000-2001) summarized data from goshawk nest territory monitoring. Nest occupancy rates were down in 1998, 1999 and 2000 compared to the early 1990s. Patla (2000) believes this trend is due to a variety of factors, including possible cyclic populations, weather patterns, monitoring methods, and management.

Three-toed Woodpecker

Important habitat components and conservation strategies for this species have been identified by Wisdom, *et al*, (2000). (See Appendix D for more information.) These criteria are incorporated into the following analysis.

Snag and downed woody debris retention are addressed through forest-wide standards and guidelines (See Appendix D). Implementation of Revised Forest Plan guidance for this species addresses these components and should maintain foraging and nesting habitat, where overstory conditions are suitable.

Because the three-toed woodpecker requires snags for feeding, perching, nesting, and roosting, the loss of standing dead trees through timber harvest or firewood gathering could pose a threat. Fire suppression also has decreased the availability of standing dead trees. Post-fire logging may be in conflict with the needs of the species (Hutto and Young, 1999).

Currently, pine beetle populations are at endemic levels. In the early to mid-1980s the Forest experienced epidemic levels of mountain pine beetle infestation; in the early to mid-1990s localized epidemics of Douglas-fir beetle occurred; and in the mid-1990s the subalpine fir Complex, which includes borers, drought, and disease, was present at higher levels. Past timber harvest has generally focused on these areas, but only about twenty to thirty percent of the harvest has included dead or dying trees (B. Padian, Forester, pers. comm.). Stands on the Forest are rated as being at "high risk" for insect epidemics, due to the number of mature/old stands on the Forest.

Treatments that move forest types toward Properly Functioning Condition would be more beneficial to three-toed woodpeckers over the long-term; however, the current situation of high risk to insect epidemics benefits this species over the short-term, because they can take advantage of concentrated foraging habitats.

No forest-wide direction applies to firewood harvest. Ranger Districts identify areas for firewood harvest. These areas may be exclusive or broad areas. Maps of these areas are distributed with firewood permits. Generally, few restrictions are placed on wood gathering activities. In areas open to off-route travel, snags are more vulnerable to harvest, while areas within 300 feet of open roads are available in restricted travel areas.

- *Table 4. 91. Risk Assessment for Three-toed Woodpecker, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Vegetation in relation to PFC[1]	Low	Low	Low	Low	Mod	Mod	Low	Mod
Percent of Forest Open to Off-route Travel, Snag Retention	Mod	Mod	Mod	Low	Low	Low	Low	Low
Retention of Fire, Insect, Disease Standing Dead[2]	Mod	Low	Mod	Low	Low	Low	Low	Low
Overall Risk	**Mod**	**Mod**	**Mod**	**Low**	**Low**	**Low**	**Low**	**Low**

1 Based on high-elevation mixed conifer forest and failure to meet PFC over the ling-term.
2 Based on guideline on dealing with salvage harvest.

Alternatives 4 through 7R are rated as being "low risk" to three-toed woodpeckers over the long-term. Over the short-term, all alternatives could improve habitat and abundance of this species across the planning area. Natural disturbance events, such as wildfire, insect outbreaks, and windthrow, would provide a three- to five-year increase in foraging habitat when beetles move into dead or stressed trees.

Cumulative Effects

Past timber harvest has generally focused on areas with insect or disease activity, but only twenty to thirty percent of the harvest has included dead or dying trees (B. Padian, Forester, pers. comm.). BLM and adjacent Forests have been harvesting areas of dead trees. BLM is currently working on a plan to remove Douglas-fir killed trees in the Samaria/Pleasantville

Mountains. The Wasatch-Cache National Forest plans to treat areas of spruce-beetle killed trees on the Bear River Range (Rine, 2001).

While concentrated areas of beetle-infestations vary in space and time, current stand ages favor endemic levels of insects across large areas. As a result, foraging habitat is spread over larger areas. From 1999 through 2001, bark beetles killed 26,486 trees on 5,749 acres of the Caribou National Forest (Hoffman and Mocettini, 2002, e-mail). In the future, epidemic levels of insects and stand-replacing fires will provide concentrated foraging habitats.

While concentrated areas of beetle-infestations vary in space and time, current stand ages favor endemic levels of insects across large areas. As a result, foraging habitat is spread over larger areas. In the future, epidemic levels of insects and stand-replacing fires will provide concentrated foraging habitats.

COLUMBIAN SHARP-TAILED GROUSE (ALSO A MANAGEMENT INDICATOR SPECIES)

According to Idaho Fish and Game data, only one lek is known to occur on the Forest and two leks have been identified on private lands within the Forest boundary (Idaho, 2000). About fifty leks are within two miles of the Forest.

- *Table 4. 92. Acres of Habitat by Type for Columbian Sharp-tailed Grouse,by Alternative.*

Vegetation Types	Caribou Forest	Within 2 miles of Lek	Percent of Habitat
Acres Grass/Shrub	365,215	18,304	5%
Acres Mountain Brush	39,324	5,492	14%

Each of the alternatives proposes treatments in sagebrush/mountain shrub cover types. Using the assumption that sagebrush and mountain brush acres treated are in proportion to their abundance on the Forest, and that the treatments occur evenly distributed across the Forest, Table 4.93 shows the predicted changes in sagebrush and mountain shrub structure within a two-mile radius of known leks at the end of ten years.

- *Table 4. 93. Predicted Changes in Sagebrush and Mountain Brush Structure in Year 10, by Alternative.*

Vegetation Structure	EC*	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Percent of Sagebrush Acres in less than 15% cc	50%	61%	48%	53%	48%	46%	43%	48%	39%
Percent of Sagebrush Acres in greater than 15% cc	50%	39%	52%	47%	52%	54%	57%	52%	61%
Percent Early Seral Mountain Brush Acres	3%	36%	23%	28%	23%	21%	18%	23%	13%
Percent Late Seral Mountain Brush Acres	97%	64%	77%	72%	77%	79%	82%	77%	87%

*Existing Condition.

Implementation of upland forage utilization standards on browse and herbaceous vegetation will improve habitat quality most in Alternatives 3 through 7R. Alternatives 1 and 2 would maintain current conditions. Where habitats occur in a big game winter range prescription, more residual vegetation would be retained after livestock grazing.

Because sharp-tailed grouse are habitat generalists, incorporation of guidelines into projects, and the overall conclusion that all alternatives maintain or improve habitat conditions, sharp-tailed grouse habitat use on the Forest should remain the same or increase. Most habitat for this species is located on private, State, or BLM lands. The Forest contributes only a small portion of potential habitat.

Cumulative Effects

Because this species is considered a habitat generalist and uses a wide variety of modified habitats, such as idled farmland, it is doing well in southeastern Idaho. In some cases, the bird is being transplanted to other parts of the State. None of the proposed alternatives would affect this trend.

MANAGEMENT INDICATOR SPECIES (FINE FILTER)

SAGE GROUSE

At the end of ten years, sagebrush canopy cover classes within ten miles of known leks would be distributed as shown in Table 4.94, below.

- *Table 4. 94. Percent of Acres in Sagebrush Canopy Cover Classes within Ten Miles of Known Leks, by Alternative.*

Sagebrush Canopy Cover	EC*	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Percent of Sagebrush Acres in less than 15% cc	50%	61%	48%	53%	48%	46%	43%	48%	39%
Percent of Sagebrush Acres in greater than15% cc	50%	39%	52%	47%	52%	54%	57%	52%	61%

**Existing Condition.*

Habitat management guidelines for nesting, brood-rearing, and winter habitat have recently been updated (Connelly, *et al*, 2000). In Alternative 6, the guidelines would be incorporated, but in Alternative 7R they would be considered for incorporation. While most leks, where populations are most easily monitored, are not found on the Forest, changes in populations could reflect changes in habitat conditions on the Forest.

Alternative 7R includes a guideline that focuses sagebrush treatments in stands with greater than 25 percent canopy cover that are moving out of suitable nesting habitat (15-25 percent canopy cover), due to decreases in grass and forb understories (as per current guidelines).

Implementation of upland forage utilization standards on browse and herbaceous vegetation will improve habitat quality most in Alternatives 2 through 7R. Alternative 1 would maintain current conditions. Where habitats occur in a big game winter range prescription, more residual vegetation would be retained after livestock grazing.

Sage grouse are habitat specialists and depend on dense canopy sagebrush, particularly the 15-25 percent canopy cover for nesting habitat. In the short-term, all alternatives, except Alternatives 1 and 3, maintain or improve habitat conditions. Sage grouse habitat use on the Forest should remain the same or increase under these alternatives. However, at some point, as canopy cover increases, understory grasses and forbs decrease, decreasing suitability of the stand. As a result, overall effects are based on short-term changes and longer-term departure from the historical range of variability.

Alternatives treating more acres of sagebrush would potentially result in smaller patch sizes without careful planning to maintain large patch sizes. Those alternatives treating fewer acres could potentially result in maintenance of larger patch sizes. This is because fewer mature stands of sagebrush will be treated. In alternative 7R there is a guideline to "maintain 30 to 50 percent of the sagebrush habitat in a 5th code HUC in contiguous blocks greater than 320 acres where physically possible." (RFP, Landbirds Guideline #2).

The potential for disturbance during nesting is greatest in areas where off-route travel is allowed. In areas where vehicles are restricted to roads and trails, sage grouse are able to adjust to the predictable disturbances. Table 4.95 shows the major areas of potential sage grouse habitat and how each of the alternatives addresses off-route travel.

- *Table 4. 95. Areas Open (O) or Closed (C) to Off-route Travel.*

Sage Grouse Habitat Area	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Portneuf	C	C	C	C	C	C	C	C
Malad District	C	C	C	C	C	C	C	C
Bear River Range	O/C	O/C	O/C	C	C	C	C	C
Preuss Range	O	O	O	C	C	C	C	C
Aspen/Grays/Webster	O	O	O	C	C/O	C	C/O	C/O

- *Table 4. 96. Risk Assessment for Sage Grouse, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Loss of Mature Sagebrush, 10-years	Mod	Low	Mod	Low	Low	Low	Low	Low
Departure from HRV	Low	Mod	Low	Mod	Mod	High	Mod	High
Loss in Grass/forbs Understory*	Mod	Low	Low	Low	Low	Mod	Low	Mod
Decline in Wet Sites	Mod	Mod	Mod	Low	Low	Low	Low	Low
Loss of Tall Sage Winter Habitats	Mod	Low	Mod	Low	Low	Low	Low	Low
Disturbance During Nesting	Mod	Mod	Mod	Low	Low	Low	Low	Low
Overall Risk	**Mod**	**Mod**	**Mod**	**Low**	**Low**	**Mod**	**Low**	**Mod**

*Based on a combination of forage utilization levels and sagebrush canopy cover.

Implementation of Alternatives 4, 5, and 7 would have a low risk to sage grouse. Alternatives 1, 2, 3, 6, and 7R rank "moderate" based on a combination of the risk factors. Over the short-term habitat and numbers would be expected to be maintained under all alternatives.

Cumulative Effects

Only one of the known sage grouse leks is located on the Forest. The majority of the land within ten miles of this lek is in other ownerships, and current sagebrush management is unknown. Other risk factors, such as predation, hunting, powerlines, and weather, vary widely by area and by year. These factors do not vary by alternative. Forest management activities would not change the effects to the population from these other risk factors.

BIG GAME

Big Game discussion has been analyzed in a separate section immediately following this viability analysis.

SPECIES AT RISK

PINE MARTEN

Interior Columbia Basin analysis (Wisdom, *et al*, 2000) put pine marten in Family 2, which are species using broad-elevation old forest. This species uses late-seral multi- and single-layered stages of the montane community. Important habitat components include snags for nesting and downed logs for foraging for prey species. Late-seral source habitats used by the pine marten may be negatively affected by increased fragmentation.

Conservation strategies for species in this group include: 1) disturbance processes that create/maintain these habitats are considered on sites where habitats are to be maintained. For example, in the Upper Snake and Snake Headwaters Ecological Reporting Units (ERUs) it may be necessary to identify mid-seral forests in lower montane communities that could be brought to late-seral condition; 2) maintenance of all large diameter (generally greater than 21 inches diameter at breast height, or dbh) snags and trees, preferably in clumps, and providing opportunities for snag recruitment; 3) maintenance of old forest attributes, such as coarse woody debris; 4) increasing connectivity; 5) minimizing or avoiding road construction in late-seral forests; and 6) evaluating wildfire and prescribed fire policies (Wisdom, *et al*, 2000).

- *Table 4. 97. Risk Assessment for Pine Marten, By Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Decrease in Old Forest[1]	Low	Mod	Low	Low	Low	Low	Low	Low
Departure from PFC	Mod	Low	Low	Low	Mod	Mod	Low	Mod
Loss of Links between Habitats[2]	Low	Low	Low	Low	Low	Low	Low	Low
Overall Risk	**Mod**	**Mod**	**Low**	**Low**	**Low-Mod**	**Low-Mod**	**Low**	**Low-Mod**

1 Based largely on high-elevation mixed conifer forest as primary habitat.
2 Based on the fact that they do use the Forest, which has a small patch size and that future harvests will be laid out to copy natural patch sizes and processes.

Alternatives 3, 4, and 7 have the lowest risk for pine marten, while Alternatives 1, 2, 5, 6, and 7R have a "moderate" risk to pine marten and habitat. While the forested stands are farther from sustainable conditions, the preponderance of mature and old stands will provide nesting and foraging habitat. Population trends would stay the same or increase across the planning area until such time as a stand-replacing fire, insect or disease epidemic, or other natural events create early seral stands. This would likely reduce the amount of potential pine marten habitat.

Cumulative Effects

Most of the suitable habitat for this species is found at higher elevations in forested lands, which are often under federal management. Increased emphasis on managing for forested species and forest carnivores should benefit this species over the long-term.

PYGMY RABBIT

Pygmy rabbits use dense stands of tall sagebrush with high amounts of woody cover in areas with deep soils. Sagebrush is the primary food, but grasses and forbs are also eaten in mid- to late-summer. Table 4.98 shows the percent of sagebrush in each canopy cover class remaining at the end of the decade.

- *Table 4. 98. Sagebrush Canopy Cover at End of Decade, by Alternative.*

Sagebrush Canopy Cover Classes	EC*	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Percent of Sagebrush Acres in less than 15% cc	50%	65%	52%	57%	52%	50%	47%	52%	43%
Percent of Sagebrush Acres in greater than 15% cc	50%	35%	48%	43%	48%	50%	53%	48%	57%

* Existing Condition.

Fragmentation of sagebrush shrublands may result in the loss of habitat for two or more decades or until canopy cover moves into the denser category. Large treatments in sagebrush would result in a decrease in habitat connectivity, which would act as a barrier to movement and/or increase vulnerability to predation due to a lack of cover.

Sagebrush vegetation is very patchy on the Forest. Because most of the sagebrush habitats are at lower elevations on and off the Forest and are mixed with other types as elevation increases, they naturally are more broken on the Forest. To get an idea of patch sizes in sagebrush stands, six relatively undisturbed watersheds were selected from across the Forest. The average sagebrush patch size in these six watersheds ranged from 35 acres up to 294 acres.

- *Table 4. 99. Average Sagebrush Patch Size in Selected Watersheds.*

Watershed Patch Areas	Average Sagebrush Patch Size
Preuss	229 acres
Weston	95 acres
Toponce	35 acres
Rock/Pine	294 acres
St. Charles	56 acres
Horse	94 acres

Alternatives treating more acres of sagebrush would potentially result in smaller patch sizes without careful planning to maintain large patch sizes. Those alternatives treating fewer acres could potentially result in maintenance of larger patch sizes. This is because fewer mature stands of sagebrush will be treated. In alternative 7R there is a guideline to "maintain 30 to 50 percent of the sagebrush habitat in a 5th code HUC in contiguous blocks greater than 320 acres where physically possible." (RFP, Landbirds Guideline #2).

- *Table 4. 100. Overall Risk to Pygmy Rabbits, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Loss of Mature Sage, ten-years	Mod	Low	Mod	Low	Low	Low	Low	Low
Departure from PFC	Low	Mod	Low	Mod	Mod	High	Mod	High
Loss in Grass/forbs Understory*	Mod	Low	Low	Low	Low	Mod	Low	Mod
Overall Risk	**Mod**	**Low**	**Mod**	**Low**	**Low**	**Mod**	**Low**	**Mod**

*Based on a combination of livestock forage utilization and sagebrush canopy cover.

Alternatives 2, 4, 5, and 7 would result in a "low" risk for pygmy rabbits, while the remaining alternatives would rate "moderate." All alternatives would maintain potential habitat for this species. The Revised Forest Plan includes an objective to work with the IDFG to re-survey historic pygmy rabbit habitat on or adjacent to the Forest.

Cumulative Effects

The historic records of pygmy rabbits in the vicinity of the Forest were mostly from off-Forest locations. It is unknown what the status of populations or habitats is currently.

NORTHERN LEOPARD FROG AND BOREAL TOAD

Based on the riparian utilization standards in each of the alternatives, Table 4.101shows the relative ranking of the alternatives, with "1" being the best. Alternatives 4 through 7R result in the lowest risk and should improve habitats the most. These alternatives should maintain habitat for maintenance of current known populations. Alternative 7R includes direction to conduct beaver inventories and identify drainages where beaver could be introduced, which would benefit northern leopard frogs. Alternative 7R also contains direction to assess the Tincup drainage for effects on boreal toad breeding ponds.

- *Table 4. 101. Ranking of Alternatives[1] for Northern Leopard Frog and Boreal Toad.*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Ranking	6	5	7	3	2	1	4	5

1 A ranking of "1" indicates that the alternative rates best and an "8" ranks lowest.

Cumulative Effects

More studies need to be done to identify the causes of declines of frog and toad populations, both on and off the Forest and across their entire range.

RIPARIAN AND NON-RIVERINE WETLAND ASSOCIATED SPECIES

The greatest impact to these habitats in the past has been from livestock grazing, beaver removal, recreational and road development, and fire suppression. The effects of these activities have altered vegetative composition and structure and created disturbance during nesting. Conservation approaches for riparian and non-riverine wetlands have been outlined in the Wildlife section of Appendix D.

All of the alternatives incorporate some form of riparian livestock utilization standards but vary in how long it would take to reach proper functioning condition.

- *Table 4. 102. Ranking of Alternatives for Riparian and Non-riverine Wetland Associated Species, by Alternative.*

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Riparian Ranking[1]	7	6	8	3	2	1	4	5

1 A ranking of "1" indicates that the alternative rates best and an "8" ranks lowest. These numbers and rankings are from the Riparian/Watershed and Aquatic Habitat cumulative effects section.

Alternatives 4 through 7R move riparian and non-riverine wetlands toward properly functioning condition at a faster rate than Alternatives 1, 2, or 3 (See Issue 6: Watershed/Riparian Areas and Aquatic Biota section). As a result, species distribution across the Forest is expected to improve in the planning period in Alternatives 4 through 7R. Alternatives 1, 2, and 3 may maintain the current distribution.

The following Risk Assessment is based on risk factors identified by Finch and Stoleson (2000). A few unknowns exist, such as parasites, disease, environmental toxins, and migratory and winter habitats for the migratory species.

- *Table 4. 103. Risk Assessment for Riparian and Non-riverine Wetland Associated Species, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Movement out of PFC	Mod	Mod	Mod	Low	Low	Low	Low	Low
Cowbird Parasitism[1]	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod
Recreation[2]	Mod	Mod	Mod	Low	Low	Low	Low	Low
Overall Risk	**Mod**	**Mod**	**Mod**	**Low**	**Low**	**Low**	**Low**	**Low**

1 Only applies to host birds for cowbird nest parasitism.
2 Recreation effects are a result of off-route travel and location of roads and trails (Revised Forest Plan guidance about location of future roads and trails is common to all alternatives).

Alternatives 4 through 7R have a "low" risk for associated species and habitats, while Alternatives 1-3 have a "moderate" risk.

SAGEBRUSH-ASSOCIATED SPECIES

The greatest impact to these habitats in the past has been from livestock grazing and fire suppression. The effects of these activities have altered vegetative composition and structure.

Generally, the conservation approaches outlined above are addressed through the incorporation of Revised Forest Plan guidance. The rate at which shrublands move into proper functioning condition varies by alternative, as well as off-route travel and the effects from these disturbances.

At the end of ten years, sagebrush canopy cover classes would be distributed as shown in Table 4.104 below.

- *Table 4. 104. Sagebrush Canopy Cover Classes in Year Ten, by Alternative.*

Sagebrush Canopy Cover In Year 10	EC*	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Percent of Sagebrush Acres in less than 15% cc	50%	65%	52%	57%	52%	50%	47%	52%	43%
Percent of Sagebrush Acres in greater than 15% cc	50%	35%	48%	43%	48%	50%	53%	48%	57%

* Existing Condition.

Over the short-term (ten-year period), species using more open stands of sagebrush would be favored by Alternatives 1 through 4 and 7. Alternative 5 maintains the current structure. Alternatives 6 and 7R would decrease habitat for species using more open stands and would favor species associated with denser stands of sagebrush. Alternative 5 would maintain the current structure distribution.

Recommendations for sagebrush-associated bird species suggest that habitat patches need to be at least 250 acres in size to be effective for species requiring “interior” habitats (Paige and Ritter, 2000). Vegetation is very patchy on the Forest. Because most of the sagebrush habitats are at lower elevations on and off the Forest and mixed with other vegetation types as elevation increases, they naturally are more fragmented on the Forest. To get an idea of patch sizes in sagebrush stands, six relatively undisturbed watersheds were selected from across the Forest. The average sizes of sagebrush patches in these six watersheds range from 35 acres up to 294 acres; however, these averages are misleading. Very few areas on the Forest have an extensive cover of pure sagebrush with only small inclusions of other vegetation types. These areas are found around the Preuss Range and Westside Ranger District.

Implementation of upland forage utilization standards on browse and herbaceous vegetation will improve habitat quality most in Alternatives 3 through 7R. Alternatives 1 and 2 would maintain current conditions. Where habitats occur in a big game winter range prescriptions, more residual vegetation would be retained after livestock grazing.

- *Table 4. 105. Ranking of Alternatives[1] for Sagebrush-Associated Species.*

Sagebrush Habitat	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Ranking of Degree of Departure from HRV[2]	1	2	1	2	2	3	2	3
Upland Utilization Ranking	3	2	1	1	1	1	1	1
Overall Ranking[3]	2	3	1	2	2	3	2	2

1 Rankings based on "1" being best.
2 Based on how long it would take Alternatives to reach HRV. See Vegetation section.
3 Due to its importance, departure from HRV was weighted twice the value of the other criteria during ranking.

The alternatives were ranked based on listed criteria. Alternative 3 results in the lowest degree of departure from HRV and provides one of the best upland utilization standards. This alternative would provide an increase in the distribution of sagebrush as areas currently occupied by juniper and mountain mahogany are treated and returned to sagebrush cover.

Alternatives 1, 4, 5, 7, and 7R all rank equally. These alternatives provide improved upland utilization standards, and as a result, understory grass and forbs composition and structure should improve. An improvement in understory composition should improve security for nesting and foraging birds. Alternative 2, which results in a low departure from HRV, results in the lowest upland utilization ranking, and no improvement in understory grass and forbs composition and structure would be expected in this alternative. Alternative 6 has a higher risk, because of the high departure from HRV in sagebrush habitats, but improvements in understory vegetation are expected.

Factors identified as risks for sagebrush-associated species include changes in sagebrush structural class distribution, livestock grazing utilization and residual cover; off-route travel and potential for nest destruction or disturbance to adults; connectivity of habitats for species with low dispersal potential; the size of patches for area-dependent species; loss of grass and forbs understory; degradation of adjacent riparian areas; and the potential for effects as a result of the use of pesticides (Paige and Ritter, 1999). A secondary risk factor is fragmentation, particularly where land is converted to annual grasses or croplands, or where mining and development occur. Development and land conversion are not issues on the Forest. The potential for habitat loss due to mining is the same for all alternatives.

- *Table 4. 106. Overall Risk for Sagebrush-associated Species, by Alternative.*

Risk Assessment Factor	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Departure from HRV	Low	Low	Low	Low	Low	Mod	Low	Mod
Livestock Utilization and Grass/forb Understories	Mod	Low	Low	Low	Low	Low	Low	Low
Off-route Travel	Mod	Mod	Mod	Low	Low	Low	Low	Low
Connectivity/Size[1]	Low	Low	Low	Low	Low	Low	Low	Low
Riparian Habitats	Mod	Mod	Low	Low	Low	Low	Low	Low
Pesticides[2]	Low	Low	Low	Low	Low	Low	Low	Low
Overall Risk	Low	Low	Low	Low	Low	Low	Low	Low

1 Revised Forest Plan guideline incorporates patch size criteria, common to all alternatives.
2 Common to all alternatives, very little use of insecticides on Forest.

JUNIPER/MOUNTAIN MAHOGANY-ASSOCIATED SPECIES

Because these habitats (primarily sagebrush) have expanded beyond their historic range, treatments will be focused on returning some of these sites to their historic structure, composition, and distribution. A forest-wide objective provides for the creation or maintenance of the diversity in vegetation structure, composition, and patterns to meet proper functioning condition criteria.

Juniper and mountain mahogany are minor vegetation types on the Forest, occupying 1 percent and 2 percent of the land base, respectively. Rangeland vegetation treatments, particularly in sagebrush and mountain shrub communities, may treat some of these types where they are adjacent to larger treatment areas. The number of acres treated depends on the location of other treatments and would be evaluated at the site-specific scale. However, incorporation of forest-wide direction should move these types historic distribution in all alternatives.

Species-at-risk associated with this type may see a decrease in available habitat, depending on where specific treatments are implemented. However, these habitat types have increased outside of their historical distribution. Any treatments proposed in these types would focus on areas where these species have moved outside of their historical (Revised Forest Plan Vegetation guideline). Risk for species associated with these habitats is "low."

ASPEN-ASSOCIATED SPECIES

Aspen is considered to be at "high departure" from historic conditions due to succession and heavy grazing. Most stands are older with little successful regeneration. All of the alternatives address this concern but to varying degrees. The effects of proposed harvest and fire treatments at the end of the decade are shown in Table 4.107 (See Appendix D for more information).

- *Table 4. 107. Ranking of Alternatives[1] Based on Risk Factors.*

Aspen Habitats	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Age Structure at end of Decade Ranking with "1" being best	2	2	3	1	2	2	2	1
Long-term Age Structure	4	4	4	1	2	4	3	1
Success of Aspen Regeneration[2]	3	2	1	1	1	1	1	1
Distribution Across Planning Area[3]	+	+	=	++	+	+	+	++
Overall Ranking	**4**	**3**	**5**	**1**	**2**	**2**	**2**	**1**

1 Rankings are based on "1" being best.

2 Based on upland browse and herbaceous utilization. It is assumed that less utilization will increase success of aspen regeneration.

3 Based on assumption that as stands are treated and age structure is improved, stands will sucker and expand into adjacent areas, increasing amount of aspen habitats available over the long-term.

Overall ranking of the alternatives considered all four factors. Alternatives 4 and 7R ranked highest due to the expected distribution of age classes, improved success of regeneration due to improved upland utilization standards, and an expected increase in distribution across the planning unit.

Alternatives 5, 6, and 7 rank at a "moderate" level due to the expected distribution of age classes, improved success of regeneration due to improved upland utilization standards, and an expected increase in distribution across the planning unit. Alternatives 1, 2, and 3 rank lowest due to a combination of changes in distribution/age classes and decreased success of regeneration.

Alternatives 4 through 7R result in a low risk. Aspen should increase across the planning area and improve habitat conditions for associated species over the long-term. Alternatives 1, 2, and 3 result in a "moderate" risk. Species associated with aspen would continue to see a decline in suitable habitats under these three alternatives.

LOW-ELEVATION MIXED CONIFER ASSOCIATED SPECIES

Snag retention is a key component for conservation in these types. This concern has been addressed through forest-wide objectives, standards, and guidelines and is common to all alternatives.

- *Table 4. 108. Low-elevation Mixed Conifer Stand Age Distribution at End of Decade.*

Low-elevation Mixed Conifer In Year 10	EC*	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Percent of Acres in Mature/Old	80-90%	85%	85%	83%	83%	85%	85%	85%	82%

*Existing Condition.

Over the short-term, Alternatives 3, 4, and 7R improve age class distribution the most, followed by Alternative 1. None of the alternatives would meet the desired range of future conditions over the long-term.

HIGH ELEVATION MIXED CONIFER-ASSOCIATED SPECIES

Two main conservation strategies have been identified and are addressed in each of the alternatives: 1) proposed vegetation treatments that affect forest structure; and 2) forest-wide objectives, standards, and guidelines that address stand components, such as snags and downed logs.

- *Table 4. 109. High-elevation Mixed Conifer Stand Age Distribution at End of Decade.*

High-elevation Mixed Conifer	EC*	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Percent of Acres in Mature/Old	70-80%	79%	76%	74%	77%	79%	80%	79%	81%

*Existing Condition.

Alternatives 2, 3, and 4 move closer to HRV than the other alternatives. It is expected that species associated with these forest types would benefit most from implementation of one of these alternatives. None of the alternatives would meet the desired range of future conditions over the long-term.

LANDBIRDS

Activities associated with the alternatives have the potential for unintentional take of nests or nestlings. Spring prescribed burning, off-route vehicle use, mining, timber harvest, concentrated recreational use, and livestock grazing can affect birds during the nesting season.

Forested vegetation treatments may affect understory and overstory nesting species. Prescribed burning may affect ground and shrub nesting species. Livestock grazing may affect ground, shrub, and riparian nesting species. Off-route vehicle use may impact ground-associated species. Mining and concentrated recreational use does not vary by alternative and is not displayed in the table below.

- *Table 4. 110 Risk Comparison of Alternatives for Landbirds, Based on Treatments, AUMs, and Percent of Forest Open to Cross-Country Motorized Travel.*

Management Activity	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Forested Acres Treated	16,800	34,100	41,800	57,000	25,700	225,700	43,100	49,000
Percent of Forested Acres Treated	3%	6%	7%	10%	4%	4%	6%	8%
Non-forested Acres Treated	130,000	77,500	100,000	77,500	70,800	60,000	79,750	40,000
Percent of Non-forested Acres Treated	28%	16%	21%	16%	15%	13%	17%	8%
Cattle AUM (Decrease)	-7%	-7%	-6%	-24 to -31%	-30 to -38%	-65 to -66%	-19 to -26%	-19 to -26%
Percent of Forest Open to Cross-Country Travel	33%	38%	38%	0%	3%	0%	2%	2%
Overall Risk	Mod	Mod	Mod	Low	Low	Low	Low	Low

Alternatives 1, 2, and 3 have a higher risk to breeding landbirds, due to a higher percent of non-forested vegetation treatments, more AUMs compared to other alternatives, and more of the Forest is open to cross-country motorized travel. Alternatives 4 through 7R have a "low" risk.

Big Game

Scale of Analysis

Direct, indirect and cumulative effects were analyzed at the Caribou National Forest level and at a finer scale (roughly subsection scale) where issues have been raised. See Map 4.2, big game analysis units and Appendix D, Big Game Analysis.

Indicators:

♦ **WL 1 Determine how habitats contribute toward state game population management goals and objectives using qualitative "poor, good, better, best" ratings**

Summer habitat effectiveness
Hunting season vulnerability
Acres managed for winter range

Baseline Indicators: Habitat contributes toward state population management goals in most areas.

Analysis Method

The Idaho Department of Fish and Game's (IDFG) "White-tailed Deer, Mule Deer and Elk Management Plan" (1999) provides statewide, regional and Game Management Unit (GMU) information. Overall, most areas of the Forest are meeting IDF&G objectives for maintaining huntable populations. It is assumed that if current management is meeting these objectives, all Alternatives will continue to meet these objectives. Generally, all action alternatives would be more beneficial than Alternative 1 (existing condition) through implementation of upland and riparian grazing standards, continuation of vegetation treatments, and some level of travel management.

During the Forest Planning process, IDFG identified four areas of special concern for mule deer and elk (See Chapter 3). For mule deer these include the Malad and Portneuf Ranges on the Westside Ranger District and the south end of the Bear River Range on the Montpelier

Ranger District. For elk, the Diamond Creek area of the Soda Springs Ranger District is of concern.

Key indicators for this analysis came from the publication "Elk Management in the Northern Region: Considerations in Forest Plan Updates or Revisions" by Christensen, Lyon, and Unsworth (1993). The assumption used is that habitat evaluation done for elk also addresses the needs of mule deer. Christensen, *et al*, (1993) identified three main habitat considerations. A brief summary of each of these is discussed below, and the existing condition is displayed for the four areas of concern.

1. Big game summer habitat effectiveness
2. Hunting season vulnerability
3. Big game winter range

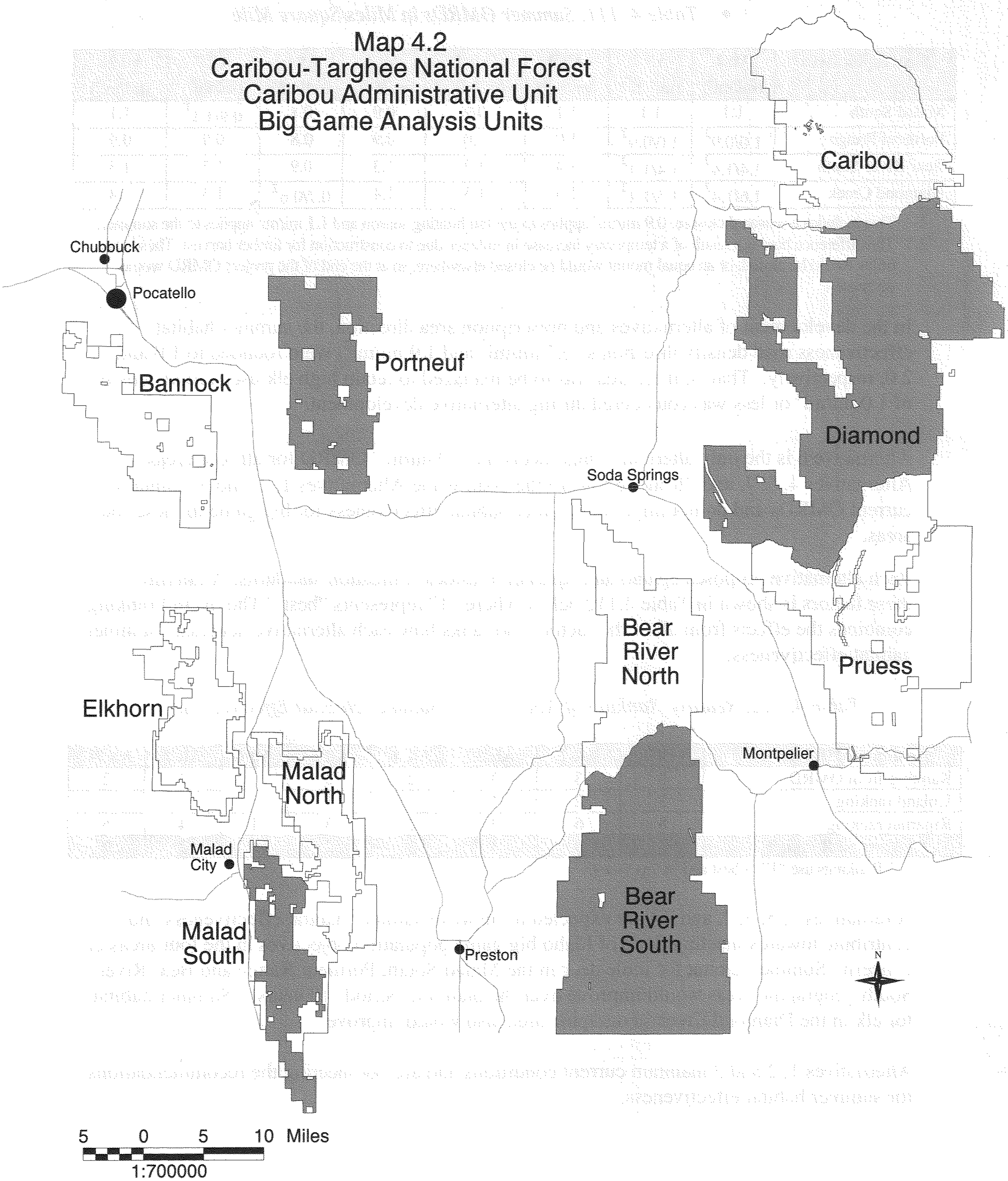
Direct and Indirect Effects

SUMMER HABITAT EFFECTIVENESS (HE)

The Forest Plan includes a guideline for retention of cover adjacent to harvest areas and around high use areas, such as mineral licks and willows. This guideline is common to all alternatives. The guideline provides for continued use of key habitat features. The Revised Forest Plan also includes a guideline that states, "Where summer of fall habitat conditions are identified as a factor in not meeting State population objectives, work with State wildlife management agencies to address the issue(s)."

In addition, the Revised Forest Plan also includes a DFC to provide "habitat that contributes to state wildlife management plans." Many of the wildlife objectives include identifying opportunities to improve the quality or quantity of habitat. The Revised Forest Plan also includes direction for riparian zone management.

Access varies by alternative. OMRD was calculated for the four areas of concern described in Chapter 3 and is shown below. This analysis included the construction of roads for timber harvest, construction of new motorized trails, and the number of miles of road that would be closed to move toward the goal. The alternatives address road construction for timber harvest in different ways. Where two numbers are listed in Alternatives 1, 2, and 6, the first number shows the short-term increase associated with new road construction, and the second number shows OMRD after completion of the projects. In Alternatives 7 and 7R two OMRDs are shown for Malad South geographic area due to hunting season closures. Assumptions used and analyses are found in the Project File.


Map 4.2
Caribou-Targhee National Forest
Caribou Administrative Unit
Big Game Analysis Units
Caribou
Chubbuck
Pocatello
Portneuf
Bannock
Diamond
Soda Springs
Bear
River
North
Pruess
Elkhorn
Malad
North
Montpelier
Malad
City
Malad
South
Bear
River
South
Preston
N
5
0
5
10
Miles
1:700000

- *Table 4. 111. Summer OMRDs in Miles/Square Mile*

Geographic Area	Alt 1 (mi/mi^2)	Alt 2 (mi/mi^2)	Alt 3 (mi/mi^2)	Alt 4 (mi/mi^2)	Alt 5 (mi/mi^2)	Alt 6 (mi/mi^2)	Alt 7 (mi/mi^2)	Alt 7R (mi/mi^2)
Malad South	1.1	1.1	1.1	0.9	0.9	0.8	0.9/1.1[1]	1.1
Portneuf Range	1.0/0.9[2]	1.0/0.9[2]	1.0	1.0	0.9	0.8	0.9	0.9
Bear River South	1.4/1.4[2]	1.4/1.4[2]	1.4	1.3	1.3	0.9	1.3	1.3
Diamond Creek	1.6/1.4[2]	1.5/1.4[2]	1.6	1.3	1.4	0.7/0.6[2]	1.3	1.4

1 This includes a seasonal closure: 0.9 mi/mi^2 applies to the fall hunting season and 1.1 mi/mi^2 applies to the summer.
2 The difference here is a result of a temporary increase in mileage due to construction for timber harvest. These road miles would be closed, or an equal mount would be closed elsewhere, so at the end of the project OMRD would decrease.

In the development of alternatives and prescription area direction, the summer habitat effectiveness road density thresholds (0.7 mi/mi^2 and 1.9 mi/mi^2) were rounded to 1.0 and 2.0, respectively. That is, if an area was to be managed to retain high elk use, a road density of 1.0 mi/mi^2 or less was considered during alternative development.

Alternative 6 is the only alternative that meets the 1.0 mi/mi^2 OMRD for all four areas. Alternatives 4, 5, 7, and 7R move toward the goal, while Alternatives 1, 2, and 3 maintain current OMRDs and do not improve summer habitat effectiveness for big game in these four areas.

Each alternative proposes upland and riparian livestock utilization standards. A ranking of these factors is shown in Table 4.112 below where "1" represents "best." The overall ranking combines the effects from all of the factors and ranks how each alternative addresses summer habitat effectiveness.

Table 4. 112. Relative Ranking of Alternatives[1] Summer Habitat Effectiveness.

Summer HE Factors	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Ranking from OMRD	3	3	3	2	2	1	2	2
Upland ranking	3	2	1	1	1	1	1	1
Riparian ranking	8	6	7	2	3	1	4	5
Overall Ranking	**3**	**3**	**3**	**2**	**2**	**1**	**2**	**2**

1 Rankings use "1" as best and "8" as worst.

Alternatives 4, 5, 6, 7, and 7R are expected to improve summer habitat effectiveness and contribute towards meeting State of Idaho big game population objectives in the four areas of concern. Summer habitat for mule deer in the Malad South, Portneuf Range and Bear River South geographic areas would improve over the planning period (10 years). Summer habitat for elk in the Diamond Creek geographic area also would improve.

Alternatives 1, 2 and 3 maintain current conditions and are not meeting the recommendations for summer habitat effectiveness.

HUNTING SEASON VULNERABILITY

The Forest Plan incorporates a guideline that states, "Where summer or fall habitat conditions are identified as a factor in not meeting State population objectives, work with Idaho Fish and Game to address the issue(s)."

Specific effects on security areas would need to be analyzed at the site-specific level. The assumptions used for this analysis are that more even-aged management and more lethal fire reduces cover, thereby increasing vulnerability, and that lower OMRDs will improve security and decrease vulnerability.

- *Table 4. 113. Relative Ranking of Alternatives[1] Summary of Vulnerability.*

Vulnerability Factors	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Ranking Based on Loss of Cover Acres	2	2	2	3	1	1	2	2
OMRD Ranking	3	3	3	2	2	1	2	2
Percent of Forest Open to Cross-country Travel	3	3	3	1	2	1	2	2
Overall Security Ranking	4	4	4	3	2	1	3	3

1 Rankings use "1" as best and "8" as worst.

The rankings of the alternatives in Table 4.113 are based on loss of cover acres forest-wide, since site-specific treatment areas have not been identified. Alternatives 1, 2, 3, 4, 7, and 7R use 85 percent regeneration harvest. Alternative 5 uses 70 percent, and Alternative 6 uses 50 percent regeneration harvest. Douglas-fir fire treatments should be non-lethal, and 20 percent of the treatments in other types are predicted to be non-lethal. Eighty percent of the non-Douglas-fir treatments are predicted to be lethal. Regeneration harvest and lethal fire acres contribute to cover acres lost.

Alternative 6 ranks the highest based on retention of cover, lower OMRDs, and elimination of off-route travel. Alternative 5 ranks second, while Alternatives 4, 7 and 7R rank third, based on overall effects of all three factors. Alternatives 1, 2, and 3 rank last, because of high OMRDs and a larger portion of the Forest is open to off-route travel.

The existing condition is not meeting the thirty percent (30%) security minimum for three of the four areas. Alternatives 1, 2 and 3, which do not address OMRDs, will not contribute to meeting the State's big game concerns. Alternatives 4 through 7R, which address off-route travel and OMRDs, will contribute towards meeting the State of Idaho's big game concerns.

Common measures used to address vulnerability are **bull:cow** or **buck:doe** ratios. As shown in the tables in Chapter 3, only one area, the Portneuf Range, is below the minimum buck:doe ratio. The Portneuf Range area has the lowest OMRD and the highest security of the four areas; it is assumed that other factors are contributing to the lower buck:doe ratios.

It is assumed that the Forest is providing suitable habitat to reduce vulnerability in these four areas and across the rest of the Forest.

BIG GAME WINTER RANGE

The Revised Forest Plan includes direction for vehicle access and prioritization of winter range treatments. These features are common to all alternatives. Based on the 2001 revised winter range map (See Wildlife section in Appendix D), the Forest contains approximately 241,359 acres of winter range.

Snowmobile trespass has been identified as a concern in the Bear River winter ranges by County and BLM managers (Rine, 2001). Because trespass and regular use are increasing, concerns are growing about the impact on wintering mule deer in this area.

Motorized access is restricted to designated routes in the winter in the 2.7 prescription. Alternatives with a greater percentage of acres in winter range in prescription 2.7 (Alternatives 4, 5, and 7) will result in less disturbance/displacement to wintering animals. In addition, in Alternative 6 more of the winter range is in a recommended Wilderness prescription 1.3(e), which only allows winter motorized use on designated routes.

- *Table 4. 114. Relative Ranking of Alternatives[1] Using a Comparison and Summary of Winter Range Factors.*

Winter Range	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Ranking based on Percent of Winter Range in Rx 2.7 or Rx 1.3	3	2	2	1	1	1	1	1
Ranking based on Percent of Winter Range Treated	1	3	2	3	4	4	3	4
Ranking based on Acres in Rx 2.7.1 and Increased Forage[2]	4	1	4	2	2	3	2	2
Overall Ranking	**3**	**1**	**3**	**1**	**2**	**3**	**1**	**2**

1 Rankings use "1" as best and "8" as worst.

2 Based on the assumption that treatments occur in proportion to quantity of sagebrush/mountain brush types on winter range compared to the whole Forest. It is assumed alternatives treating more acres will improve quantity and quality of forage on winter range.

Alternatives 2, 4, and 7 are ranked the highest for improving winter range conditions, because of the amount of winter range in the winter range prescription (winter motorized use on designated routes); the percent of winter range treated; improving forage quantity and quality; and the number of acres in Prescription 2.7.1, where livestock utilization levels are lower, and more residual vegetation is left for big game use in the winter. Alternatives 5 and 7R ranked second highest. These two alternatives improve winter range conditions and contribute to meeting the State's big game population objectives.

Alternatives 1, 3, and 6 ranked lowest, due to a combination of low percent of winter range actually in the 2.7 prescription, because all of these alternatives have a low proportion of winter range that would in the winter range prescription (Rx 2.7.1 or Rx 2.7.2). While more acres of winter range are in recommended wilderness in Alternative 6, these acres would not be managed using reduced livestock utilization standards. These three alternatives are not expected to improve winter range conditions or contribute towards meeting the State's big game population objectives.

- *Table 4. 115 Summary of Rankings by Alternative[1] for Summer Habitat Effectiveness, Hunting Season Vulnerability, and Winter Range.*

Component	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7R
Summer Habitat Effectiveness	3	3	3	2	2	1	2	2
Hunting Season Vulnerability	4	4	4	3	2	1	3	3
Winter Range	3	1	3	1	2	3	1	2
Overall Ranking	**5**	**4**	**5**	**2**	**2**	**1**	**2**	**3**

1 Rankings use "1" as best and "8" as worst.

Effects vary on seasonal habitats by alternative. It is expected that Alternatives 4 through 7R will improve overall habitat conditions for mule deer in the Malad South, Portneuf Range and Bear River South geographic areas. Habitat conditions for elk also are expected to improve in the Diamond Creek geographic area. Vulnerability of bulls is expected to decrease in this area, because of a reduction in OMRD (Miles are low and OMRD for the area as a whole does not show a decrease in Table 4.111.).

Cumulative Effects

Each geographic area varies by the amount of private land within the Forest boundary. Caribou, Diamond, Bear North, and Bear South all have more than ninety-eight percent (98%) of National Forest System lands within the Forest boundary. Portneuf, Bannock, and Preuss all have about ninety-three percent (93%) of National Forest System lands within the Forest boundary. Elkhorn, Malad North, and Malad South all have considerably more private/state lands within the Forest boundary, about sixty-one percent to sixty-nine percent (61-69%). Activities on these private lands have the potential to modify habitat, reduce the amount of available habitat due to land use conversions or residential use, and disturbance or displacement of wildlife due to recreational use.

SUMMER HABITAT EFFECTIVENESS

Past actions that have affected summer habitat include: changes in shrubland and forest structure as a result of fire suppression; past timber harvest, minerals development, and recreational use that has resulted in the current access situation; invasion of non-native or invasive species affecting forage production; and historic and current livestock grazing patterns and use that have contributed to current vegetation structure and composition in the rangelands. Other past and ongoing actions affecting summer habitat effectiveness include: subdivision development on lands adjacent to the Forest and loss of access to the Forest due to changes in private land management. These past actions have contributed to the existing condition.

Reasonably foreseeable actions that have the potential to affect summer habitat effectiveness in the future include: succession and changes in vegetation composition and structure; mineral exploration and development; an increase in structural range improvements and their effects on livestock distribution patterns and utilization; changes in recreational use and patterns as recreation increases in the future; increases in developed recreation; decreased access to public lands due to restrictions on adjacent private lands; continued residential and subdivision development along the Forest boundary; and an increase in the spread of noxious weeds in combination with these activities and uses.

Those actions that will act to improve summer habitat effectiveness include: a decrease in public access and possibly a reduction in livestock developments depending on site-specific conditions. Alternatives 4 through 7R, in combination with the above actions, would improve summer habitat effectiveness. The other action alternatives all trend to decreasing summer elk habitat effectiveness.

HUNTING SEASON VULNERABILITY

Past and ongoing actions that have affected security include: past timber harvest, minerals development, and recreational use that has resulted in the current access situation; subdivision development on lands adjacent to the Forest; and loss of access to the Forest due to changes in private land management. These past actions have contributed to the existing condition.

Reasonably foreseeable actions that have the potential to affect retention of security areas include: succession and changes in vegetation composition and structure (increasing cover); mineral exploration and development (loss of security acres); vegetation treatments or wildfire (decrease cover in security blocks); changes in recreational use and patterns as recreation increases in the future; and decreased access to public lands due to restrictions on adjacent private lands (increasing security on public lands).

Actions that would improve security and decrease vulnerability include: succession and increases in cover and a decrease in public access by adjacent landowners. Alternatives 4 through 7R, in combination with these actions, would decrease vulnerability. The other action alternatives would trend towards decreasing security and increasing vulnerability.

Vulnerability can also be affected by topography, weather, hunting seasons, hunter numbers and the ability of hunters to access the game. None of the alternatives would change topography or weather. Hunting seasons and overall hunter numbers are controlled by state Fish and Game agencies. The alternatives would not change these factors either. The alternatives do vary, however, in the ability of hunters to access big game. Alternatives 4 through 7R close most or all of the Forest to cross-country motorized travel. This will limit the amount of "territory" hunters can cover or access via the use of motorized vehicles in search of game. Thus, vulnerability would be less.

Past actions that have affected winter habitat include: changes in shrubland structure and composition as a result of fire suppression; minerals development and recreational use that has resulted in the current access situation; invasion of non-native or invasive species affecting forage production, and historic and current livestock grazing that has contributed to current vegetation structure and composition in the rangelands. Other past and ongoing actions affecting winter range include: subdivision development on lands adjacent to the Forest. As more private land winter range is developed, publicly owned winter range is increasing in importance. All of these past actions have reduced suitability for winter range.

However, public land winter ranges cannot compensate for the lower elevation privately owned winter range. This is because the lower elevation winter ranges generally have lower snow depths, higher forage production, etc. Forest management activities can improve conditions on Forest winter ranges but this will not compensate for losses of other, higher quality winter range.

Mule deer using the Caribou/Webster/Preuss Ranges migrate to winter ranges some distance from the Forest. Deer on the south end of the Forest migrate to Bear Lake Plateau, an area that is currently managed by BLM and private owners. Mortality of deer crossing Highway 89 in the vicinity of the Montpelier Wildlife Management Unit has been identified as a concern (Rine, 2001). Further north, deer migrate to Soda Hills (BLM and private lands), and BLM managers have expressed concerns about development in the vicinity of the Soda Hills winter range (Rine, 2001). To reach the Soda Hills winter range, mule deer must cross the highway west or north of Soda Springs, and mortality is an issue at several crossing areas. In low-snow winters, mule deer do not migrate as far and use transitional ranges like Bischoff Canyon. Further north, deer in the Tincup area migrate to the Willow Creek area.

Most elk in this area also migrate off-forest to winter range, except in low-snow winters. Elk on the north end of the Forest migrate to Tex Creek Wildlife Management Unit, while elk from the Diamond Creek area move east into the Thomas Fork Valley.

Managers of the Portneuf Wildlife Management Unit report that trespass cattle from the Forest are a problem and are working Forest managers to resolve the problem (Rine, 2001). Managers of the Georgetown Summit Wildlife Management Unit report that snowmobile use has been increasing and is causing disturbance/displacement to wintering animals (Rine, 2001). Both of these situations decrease suitability of State-owned winter range and have the potential to increase big game use on adjacent federal winter ranges.

Reasonably foreseeable actions that have the potential to affect winter range in the future include: succession and changes in vegetation composition and structure; mineral exploration and development; decreased access to public lands due to restrictions on adjacent private lands; continued residential and subdivision development along the Forest boundary; and an increase in the spread of noxious weeds. A decrease in public access to the Forest due to adjacent private land restrictions is the only action that may improve winter range conditions. This reduction in public access, in combination with management direction in

Alternatives 2, 4, 5, 7 and 7R should improve winter range conditions. The other action alternatives would decrease winter range conditions.

As noted previously (Table 4.73), winter ranges vary in their potential for development on adjacent lands. These potentials range from "high" at Bear Lake, "moderate" for Malad and "low" for Diamond Creek and Portneuf.

Irretrievable/Irreversible Effects:

SUMMER HABITAT EFFECTIVENESS

Most of the actions that affect summer habitat effectiveness proposed in the alternatives are irretrievable but not irreversible. Roads or trails could be closed or obliterated, and tree or shrub cover would become re-established over time after vegetation treatments. Vegetation in uplands and riparian areas used by livestock for forage will grow following use, generally during the same season or next season, depending on timing of grazing.

The main irreversible action is the development of phosphate mines and associated changes in habitat resulting in very long time frames to reestablish habitat quality. In addition, increased developed recreation sites would commit those sites to recreational use and would be irreversible.

HUNTING SEASON VULNERABILITY

All of the actions that affect vulnerability proposed in the alternatives are irretrievable but not irreversible. Roads or trails could be closed or obliterated, and tree or shrub cover will become reestablished in time after vegetation treatments.

BIG GAME WINTER RANGE

Most of the actions that affect winter range suitability proposed in the alternatives are irretrievable but not irreversible. Roads or trails could be closed or obliterated, and tree or shrub cover will become reestablished in time after vegetation treatments. Vegetation in uplands and riparian areas used by livestock for forage will grow following use, generally during the same season or next season, depending on timing of grazing.

The main irreversible action is the development of phosphate mines and associated changes in habitat, resulting in very long time frames to re-establish habitat quality. In addition, increased developed recreation sites would commit those sites to recreational use and would be irreversible.

Air Quality and Visibility

Analysis Scale:

This analysis considers the effects each Alternative may have on air quality/visibility Forest-wide within Airshed 20. It also takes into consideration the effects on neighboring communities and Class I Areas within 200 kilometers of the Forest boundaries.

Indicators:

♦ **Number of acres treated with fire annually.**

♦ **Tons of PM_{10} and $PM_{2.5}$ emitted on an annual basis.**

General Effects and Analysis Method

The principle law that governs air quality is the Clean Air Act of 1970 as amended in 1990 and 1999. Other laws including state laws, regulations, and policies affect air quality management on National Forest System lands. (See Appendix A in the Revised Forest Plan for listing). National laws and regulations have also been interpreted for implementation in Forest Service Manuals, Handbooks, and Regional Guides. Air quality goals, standards, and guidelines have been designed in the Revised Forest Plan to achieve desired air resource and visibility conditions over the short- and long-term. Standards and guidelines have also been designed to protect air quality, as well as other resources that could be adversely affected by air pollutants.

The Portneuf Valley area of Pocatello and Chubbuck, Idaho is a non-attainment area that may be affected by smoke produced from management activities. Other communities in Idaho near the Forest boundaries that may be affected by adverse air quality and visibility are Inkom, McCammon, Downey, Malad, Lava, Grace, Preston, Soda Springs, Georgetown and Montpelier. In Wyoming, Afton, Geneva, and Freedom may be affected.

In Utah, Logan and Tremonton are in proximity to the Forest. Meteorological conditions such as wind patterns are also considered in the analysis. Emissions estimates produced by a variety of fuels, vegetation types, and acres treated were calculated from First Order Fire Effects Model (FOFEM). An average of these emissions, based on the types of fuels, vegetation, and acres to be treated was calculated for each Alternative. $PM_{2.5}$ is considered part of the PM_{10} total and is not additional (Dennis Haddow personal communications, 2001).

Table 4.116 displays average emissions produced by various vegetation types. These calculations do not model the probability of wildfire effects, because predictability of wildfire events is not known. Any acres consumed by wildfire will be considered part of the treated acres and not additive to the treatments in all alternatives, except Alternative 7R.

Treatments using prescribed fire and wildland fire use have the potential to adversely affect air quality and visibility. Although the Forest operates under the Montana/Idaho Smoke Management Plan, which controls the timing and amount of burning within the Forest, pollutants produced by these management activities have the potential to affect human health and reduce visibility. The amount and duration of these effects vary in the amount of acres to be treated with fire by each Alternative. To meet new air quality requirements at the federal, state, and local levels, new direction will be provided in the Revised Forest Plan for all Alternatives.

- *Table 4. 116. Particulate Matter Emissions Produced (#/Acre) by Vegetation Type.*

Vegetation Type	PM_{10} Emissions Produced (lbs./ac)	PM_{25} Emissions Produced (lbs./ac)
Sagebrush	62.5	53.0
Spruce/Fir	822.0	697.5
Lodgepole Pine	503.0	427.0
Douglas-fir	488.0	414.0
Aspen	236.0	200.0

Source: FOFEM model

Modeling analysis information presented in this section is intended and designed to indicate relative difference between the Alternatives, rather than to predict absolute amounts of activities, output, and effects. The amount and timing of acres treated with prescribed fire and wildland fire use in each Alternative may affect air quality and visibility.

Direct and Indirect Effects

EFFECTS COMMON TO ALL ALTERNATIVES

All prescribed fire treatments in all Alternatives must follow an approved burn plan and meet specific conditions that will not adversely affect air quality. All prescribed fire treatments must follow the Montana/Idaho Smoke Management Plan, the EPA's Interim Air Quality Policy on Wildland and Prescribed Fires, the Idaho State Implementation Plan, and standards and guidelines of the Revised Forest Plan. Smoke generated by prescribed fire treatments has the potential to adversely affect visibility and public health. Smoke management techniques, such as timing and location of prescribed fires and favorable conditions for smoke dispersal, help to reduce these adverse effects. Information about fuel conditions, climatic conditions, air movement patterns, and timing and duration of prescribed fires will be used to reduce effects. All Alternatives are expected to meet air quality standards by following all federal, state and local regulations, and by applying the Revised Forest Plan standards and guidelines. Coordination requirements with the Montana/Idaho Airshed Group, should reduce impacts from smoke in all Alternatives.

The use of recreational vehicles can adversely affect air quality on forest airsheds from pollutants related to auto emissions. However, this type of use has not adversely affected air quality measurably in the past and is considered insignificant by the Idaho Department of Environmental Quality (DEQ) (Floyd, 2002). DEQ is the State agency responsible for monitoring and inventorying criteria air pollutants. PM_{10} is the primary air pollutant measured by the DEQ. Alternatives 4 and 6 restrict off-road vehicle use to designated roads and trails, but the use of this type of equipment on the Forest is expected to increase over time. Because the National Ambient Air Quality Standards have not been exceeded from the past use of recreational vehicles, air quality on the Forest is not expected to be affected by this type of future use.

Risks associated with prescribed fire treatments in all Alternatives include fire and smoke effects on ground crews involved in burning operations on site. Effects on workers may include eye irritation, coughing, and shortness of breath in moderate-to heavy smoke concentrations. Workers trapped in an area of heavy smoke may be asphyxiated. Heavy smoke may also endanger members of the public in adjacent populated areas. When these conditions exist, notification of public health advisories will be issued by the appropriate State agency. Visibility may be impaired on some roadways during burning operations and contribute to reducing visibility in immediate areas for short periods. All prescribed fire treatments at the project level are subject to the National Environmental Policy Act, including public involvement.

Alternative 1

Alternative 1 produces the least amount of smoke emissions of all the Alternatives because no fire treatments are proposed in forested vegetation. It proposes to treat 13,000 acres annually (See Table 4.117). All treatments would occur in non-forested vegetation and treat mainly sagebrush. Forest vegetation produces nearly ten-fold more emissions when burned, in terms of pounds per acre of particulate matter, than non-forested vegetation. Because prevailing winds come from the southwest, treated acres west of Pocatello on the Bannock Range may impact this non-attainment area. This Alternative has potential to produce as much as 460 tons of smoke emissions annually. All effects on air quality are expected to be short-term.

Alternative 2

Alternative 2 proposes to treat 9,490 acres of forested and non-forested vegetation annually (See Table 4.117) using prescribed fire and wildland fire use. Treatments would be mostly in conifer, aspen/conifer, and aspen types in the forested vegetation and in sagebrush in the non-forested vegetation. This Alternative has the potential to produce approximately 702 tons of particulate matter annually. Timing and location will be important factors in managing impacts from smoke emissions in this Alternative. All effects on air quality are expected to be short-term.

Alternatives 3, 7, and 7R

Alternatives 3, 7, and 7R propose to treat approximately 11,990, 10,655 acres, and 7,500 acres, respectively, with prescribed fire and wildland fire use (See Table 4.117). Treatments would occur in both non-forested and forested vegetation types. Alternatives 7 and 7R treat mainly conifer types, such as aspen/conifer and aspen types in the forested vegetation and sagebrush in the non-forested vegetation types. Alternative 3 treats mainly Douglas-fir, lodgepole pine, and mixed conifers in the forested vegetation and sagebrush in the non-forested vegetation. These Alternatives have the potential to produce similar effects in terms of smoke emissions. Potential particulate matter produced from these alternatives is approximately 913 annual tons for Alternative 3, 958 annual tons for Alternative 7, and 1,051 annual tons for Alternative 7R. Timing and location will be important factors in managing impacts from smoke emissions in these Alternatives. All effects on air quality are expected to be short-term.

Alternative 4

Alternative 4 has the potential to produce the greatest impact from smoke of all the Alternatives. This Alternative treats the greatest amount of forested vegetation of all the alternatives. Approximately 4,990 acres of mixed conifer, aspen/conifer, and aspen will be treated using prescribed fire and wildland fire use. Another 7,750 acres of non-forested vegetation types, mostly sagebrush, are proposed for treatment by burning. This Alternative has the potential to produce approximately 1,562 tons of particulate matter annually. Timing and location will be important factors in managing impacts from smoke emissions in this Alternative. All effects on air quality are expected to be short-term.

Alternatives 5 and 6

Alternatives 5 and 6 propose to treat approximately 9,000 and 8,080 acres, respectively, with prescribed fire and wildland fire use (See Table 4.117). Treatments would occur in both non-forested and forested vegetation types. Both Alternatives treat mostly conifer, aspen/conifer, and aspen types in the forested vegetation and sagebrush in the non-forested vegetation. These Alternatives have the potential to produce similar effects in terms of smoke emissions. Potential particulate matter produced from these Alternatives is approximately 729 annual tons for Alternative 5, and approximately 737 annual tons for Alternative 6. Timing and location will be important factors in managing impacts from smoke emissions in these alternatives. All effects on air quality are expected to be short-term.

- *Table 4. 117. Potential Annual Acres Proposed Treated Using Fire in Each Vegetation Type by Alternative.*

Vegetation Type	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt 7R
Non-forested Acres Treated	13,000	7,750	10,000	7,750	7,080	6,000	7,975	4,000
Forested Vegetation Acres Treated	0	1,740	1,990	4,990	1,920	2,080	2,680	3,500
Total Acres Treated	**13,000**	**9,490**	**11,990**	**12,740**	**9,000**	**8,080**	**10,655**	**7,500**

Table 4.118 displays the relative amounts of PM_{10} and $PM_{2.5}$ produced annually by burning treatments for each Alternative. Because the amount of emissions produced by burning varies with vegetation type, fuel moisture and other factors, the number of acres treated using fire has a poor correlation to smoke production. Sagebrush produces the least amount of particulate matter and spruce/fir produces the greatest amount.

- *Table 4. 118. Potential PM_{10} and $PM_{2.5}$ Emissions Produced in Tons Annually by Fire Treatments in Each Alternative.*

Vegetation Type	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt 7R
Non-forested Vegetation Tons of PM_{10}	406	242	312	242	221	187	249	125
Non-forested Vegetation Tons of $PM_{2.5}$	344	205	265	205	188	159	211	106
Forested Vegetation Tons of PM_{10}	0	460	601	1,320	508	550	709	926
Forested Vegetation Tons of $PM_{2.5}$	0	389	511	1,118	430	466	600	784
Total PM Produced (Tons)	**406**	**702**	**913**	**1,562**	**729**	**737**	**958**	**1,051**

Cumulative Effects

Cumulative effects to air quality and visibility from past, present, and foreseeable future management activities on the Forest have been analyzed. Past and present effects on air quality on the Caribou National Forest include smoke from prescribed fire, wildfires, dust from agricultural practices, and travel on native-surfaced roads. The Forest is currently unclassified for National Ambient Air Quality Standards but is considered a Class II area. Prescribed fire, wildfire and agricultural practices adjacent to the Forest are expected to continue into the foreseeable future. Production of PM_{10}, $PM_{2.5}$ and carbon monoxide created from forest treatments in each alternative are not expected to exceed National Ambient Air Quality Standards when complying with the Montana/Idaho Smoke Management Plan. Because smoke disperses rapidly in most cases, impacts from smoke produced from prescribed fires on air-quality are short-lived.

Coordination requirements with the Montana/Idaho Airshed Group and compliance with local, state, and federal air quality regulations should reduce impacts from smoke in all

Alternatives. Burning will be permitted only when management-caused smoke emissions combined with other residual pollutants does not create cumulative effects that could adversely affect air quality, human health and visibility.

Appropriate planning and authorization will be conducted prior to burning operations. Alternative 4 has the highest potential production of smoke emissions, yet analysis shows no violations of the PM_{10} standards when providing for a minimum of approximately 200 meters in plume rise or mixing height. All other alternatives were within standards using the same variables.

On occasion, smoke produced from wildfires added to existing emissions from industrial, agricultural, and automobile pollution could create cumulative effects that may result in non-attainment of the PM_{10} and $PM_{2.5}$ standards in impacted areas such as Pocatello and Chubbuck, Idaho and may result in adverse conditions for public health. No other cumulative effects have been identified from the proposed action and action alternatives.

The effects each alternative would have on global change were also considered in the cumulative effects analysis. Because no methods for analysis are available at this scale, conclusions on cumulative effects related to global change would be subjective and speculative; however, the effects from the release of greenhouse gasses by managed prescribed fires are expected to be less than effects from uncontrolled wildfires. Alternative 7R would sequester carbon, because of the reduced treatments in this alternative. Alternative 4 would have the greatest release of carbon into the atmosphere. Alternative 1 would release the least amount of carbon of all the alternatives.

Irretrievable/Irreversible Effects

Short-term, temporary reductions in air quality and visibility during burning operations would be considered an irretrievable effect. No irreversible effects or commitments of air resources have been identified in this analysis.

Heritage Resources

Because management direction will be consistent in all Alternatives for Heritage Resources, no indicator was developed.

Introduction

Numerous laws, regulations and policies govern the use and administration of heritage resources on the Forest. Maintenance and improvement of the heritage program will continue under all Plan alternatives regardless of which alternative is selected as the preferred alternative. All heritage resources will be mitigated and protected at the site-specific level.

No issues related directly to cultural resources were identified during public scoping or the Need for Change analysis process. However, Forest management activities have the potential to directly, indirectly, or cumulatively affect cultural resources. Management activities can influence site disturbance or discovery, improve or restrict access to sites, or provide opportunities and funding for conducting surveys and recording sites. These activities are related to many of the Need for Change topics, and could be implemented under any of the alternatives. Also, compliance with federal laws governing cultural resources is an important management concern. Therefore, potential effects on the cultural resources are analyzed in this section.

The Heritage Program is one program area needing strengthened management direction in the Forest Plan. Specifically, Heritage goals, objectives, standards and guidelines need to be revised to meet the intent of legislation and executive orders implemented in recent years. The revised plan also needs to acknowledge the agency's 1992 change from a "Cultural Resources Program" focused primarily on compliance to a "Heritage Program" that emphasizes a balance between protection of prehistoric and historic properties and public outreach for the enjoyment of American history. Significant differences in effects to cultural resources by alternative are not expected. As a result, general potential effects common to all alternatives are listed and analyzed in this section.

SCALE OF ANALYSIS

The affected areas for direct and indirect effects to cultural resources are the lands administered by the three districts that make up the Caribou National Forest. This area represents National Forests System lands where cultural resources could exist, and lands where those resources could receive impacts from both management activities and natural events. The affected area for cumulative effects includes the lands administered by the National Forest, and lands of other ownership both within and adjacent to these National Forest boundaries. Cumulative effects to resources on other land ownerships are addressed to lend a broader perspective to the importance of resources on the Forest.

Resource Protection Methods

Resource protection is integrated into cultural resource management at all levels, from national to site-specific. The cumulative positive effect of the management direction comprised by the laws and regulations described below is beneficial protection and mitigation for cultural resources potentially affected by management activities.

Laws, Regulations, and Policies

Numerous laws, regulations, policies, govern the use and administration of cultural resources on National Forest Administered lands. Some of the more commonly used regulations are described in Appendix A, Legal and Administrative Framework. National Laws and regulations are also interpreted in Forest Service Manuals, Handbooks, and Regional Guides. Management activities occurring on Forest administered lands comply with these laws, regulations, and policies intended to provide general guidance for the implementation of the Heritage Program and for protection of cultural resources.

Effects Common to All Alternatives

Maintenance or improvement of cultural resource conditions on the National Forest administered lands is emphasized in all alternatives. This management direction occurs at both Forest-wide and Management Area levels. Cultural Resource goals and objectives are designed to achieve desired future conditions and implement the Heritage Program over the long term. Standards and guidelines are designed to protect cultural resources.

A variety of methods are available to eliminate, minimize, or reduce direct effects on cultural resources at the project level. Archaeological excavation or structural inventory and recording can provide for recovery of heritage data. Activities and projects can be modified to avoid cultural resources. Scheduling projects when the ground is frozen can reduce or eliminate soil compaction and disturbance to avoid damage to resources. Relocating certain features or structures, increasing monitoring and law enforcement, providing interpretation activities and securing restrictive covenants in land transfer deeds and acquisitions are other protective measures. Developments in archaeological modeling have also improved the Forest Service's ability to identify areas of high risk to cultural resources.

Methods to eliminate, minimize, or reduce indirect affects include initiating public education programs, posting cultural resources with informational signs, monitoring sites, rerouting trails, stabilizing eroding sites, constructing barriers, hiding sites, and properly designing adjacent projects to minimize visual, auditory, or atmospheric intrusions, as wells as undertaking all the mitigation methods listed above for direct effects.

Methods that can be employed to eliminate or reduce cumulative effects are site recording, data recovery, site interpretation, incorporation of state-of-the-art research techniques, and stabilization or restoration.

Because cultural resource management is explicitly defined by law, regulation, and policy, management practices and effects would not differ substantially between the alternatives. In all the alternatives, the Heritage Program would provide support to all of the resource projects, as required under Section 106 of the National Historic Preservation Act (NHPA). The program would include inventory, analysis, protection, stabilization, and public interpretation of cultural resources under all alternatives. The levels of these individual activities and projects would vary to some degree by alternative, but the general neutralizing or positive effects of mitigation, protection, and education would remain the same.

In all alternatives, the potential exists for undiscovered sites, especially those that are buried, to be exposed and /or damaged by surface disturbance or other events. Natural erosion and depositional processes degrade cultural resources. Inadvertent damage during project implementation also occurs. These sites may or may not be noticed in time to allow mitigation. The risk of unavoidable damage is common to all alternatives.

Direct effects also could occur to cultural resources as a result of non-sanctioned activities, such as vandalism or illegal excavation. Efforts to control and monitor these activities are similar in all alternatives, and would result in an extremely low level of cumulative effects to cultural resources.

Damage to cultural resources can also occur from livestock grazing and range improvement construction or development. For planned range improvement developments, most of the potential direct effects can be eliminated or mitigated during project planning and implementation. Cultural resources most likely damaged by livestock grazing and rangeland management activities are those in areas of intensive livestock use such as near water tanks, salt blocks, or along fence lines. The potential for this damage in not expected to vary greatly between alternatives.

Landownership adjustments could potentially result in the loss of federal protection for cultural resources on lands transferred to other ownership. However, prior to landownership transfer, inventories are conducted and mitigation applied, if needed. In proposed standards and guidelines, heritage values are included among criteria for land acquisition prioritization, making lands acquisition another potential method of protecting and preserving valuable cultural resources. Since acquisitions are largely a function of budget, and the lands budgets are not expected to vary much by alternative, landownership adjustments are also unlikely to vary much by alternative.

Data collection through excavation, the most common mitigation for unavoidable impacts, also results in some loss of resources. Use of cultural sites and resources for public interpretation, education, and service may also result in some level of damage or loss of resources. However, beneficial indirect effects, that counterbalance the negative effects, are usually achieved through public education and increased sensitivity for cultural resources.

Direct effects on cultural resources can result from both natural events and from human activities that damage the resources or alter their settings. Ground disturbance occurs in a wide range of management activities including timber harvest, road and trail construction, reconstruction, relocation, maintenance, and decommissioning, prescribed burning and wildfire control, mineral and energy exploration, development, extraction and reclamation, facility construction, utility development, recreational vehicle use, and range, watershed and wildlife improvement construction. Other potentially damaging effects include soil compaction, erosion, flooding, soil slumping, heating and freezing, wildfire, prescribed burning, livestock trampling, recreational vehicle use, setting alterations (including introduction of atmospheric, visual, or audible intrusions), and loss of undiscovered cultural resources if land is transferred from federal to nonfederal ownership.

Recreation use can have a significant adverse effect due to the fact that use is mostly unregulated across the Forest. Some form of recreation use occurs on virtually every acre of National Forest. For planned recreational developments, most of the potential direct effects can be eliminated or mitigated during project planning implementation. However, indirect effects from dispersed use such as increased vandalism, trampling, loss of integrity, or erosion cannot be mitigated across the remaining expanses of the Forest because inventories are generally incomplete outside the limits of developed recreation sites and facilities.

Use of off-road vehicles (ATV's, motorcycles, 4-wheel drive vehicles) can have both direct and indirect effects. Driving over cultural sites can result in direct damage to cultural resources. Indirectly, the use of off-road vehicles can damage or destroy vegetation, inorganic surface crusts, and natural ground litter. Compaction of soils, alteration of soil stratigraphy, and reduced water infiltration rates can result. These effects would occur under any alternative, but to a lesser degree under alternatives, which prohibit off-road use in more areas of the Forest.

As recreational use of the Forest continues to rise due to the increased visitation, impacts to heritage resources are expected to increase. Unauthorized collecting, theft, excavations, and vandalism occur now and will continue.

Cumulative Effects

Cumulative effects over time can include loss of sites or resources prior to the development of better research techniques, loss of interpretive values, and incremental loss of the cultural resource base. Forest management projects may cause surface disturbance, bring additional people in contact with cultural resources, or affect the fabric of historic structures. Differences in cumulative effects to cultural resources under the different alternatives as a result of sanctioned management activities should be low because of the protection and mitigation measures that will be implemented.

Alternatives that result in more acres of planned and budgeted management activities could reduce adverse cumulative effects. This is because more inventory and evaluation required under these alternatives. The additional inventory and evaluation would lead to more cultural resources being located and a reduction of adverse effects caused by natural processes after cultural resources are brought under appropriate management.

Cumulative, cultural resources on federal lands may assume greater importance because such resources on lands of other ownership are not provided in the same degree of protection. Construction and development on private lands may destroy cultural sites without providing an opportunity for recovery of data or other mitigation unless the projects are the result of federal licensing, permitting, or funding. Cumulative risks to cultural resources on state and private lands are furthermore thought to be greater than on federally administered areas for several reasons:

- There is a higher likelihood that important cultural resources occur on these lands due to historic settlement patterns and more favorable environmental patterns;
- Little or no inventory or evaluation is being conducted;
- Implementation of protection or mitigation measures is extremely rare; and
- Local governments have few ordinances to protect cultural resources.

Irretrievable/Irreversible Effects

All alternatives would have some irreversible commitments of cultural resources. Examples are inadvertently damaged or destroyed sites, vandalized or looted sites, and sites that have not been inventoried and recorded and are undergoing loss from natural processes. Every alternative seeks to reduce those potential losses through inventory and evaluation, monitoring, and improved project implementation to ensure that these losses are kept to a minimum.

Noxious Weeds

Because Forest Plan noxious weed direction will be consistent in all Alternatives, no noxious weed indicator was developed.

Introduction

Forest Service authority to develop and follow a policy for noxious weed abatement comes from the Noxious Weed Act of 1974, the Hawaii Tropical Forest Recovery Act, and USDA Policy 9500-10 (Stemming the Invasive Tide). Implementing regulations are found at 36 CFR 222.8. Forest Service policy for noxious weeds is found in Forest Service Manual 2080, which gives direction to specifically establish Integrated Pest Management (IPM) as the preferred approach to noxious weed prevention, control, containment or eradication. It also emphasizes the importance of integrating noxious weed management in ecosystem analysis, assessment, and forest planning. It further emphasizes the importance of coordinated noxious weed management through cooperation with other agencies, State and local governments and private landowners.

Noxious weeds are specific to each state and identified and designated by the state legislature. The Idaho Legislature updated Idaho's list in 2001, and it currently lists thirty-six species. Only eleven of these listed species are found on the Forest, but an additional eleven are found in one or more counties in which the Forest is located. Forest personnel participate as full members in two Cooperative Weed Management Areas that cover the Forest.

Forest Plan noxious weed management direction and emphasis does not vary by Alternative. Forest-wide direction for all Alternatives is to prevent, contain, control, and eradicate noxious weed populations on National Forest lands. (Caribou-Targhee National Forest Noxious Weed Strategy, February 2001)

Implementing the Caribou National Forest Noxious Weed Strategy (the Strategy) will be a part of all Management Prescriptions and Alternatives. The purpose of the Strategic Plan is two fold: 1) to increase Forest emphasis on weed management; and 2) to improve the Forest's capability to deal with weed management issues.

The Strategy addresses eight Forest objectives necessary to implement a successful and integrated Forest noxious weed program. These are:

1) Develop/modify Forest weed management policy.
2) Promote Forest education and awareness of weed management problems.

3) Promote education and prevention activities and practices.
4) Integrate weed management with project planning and project implementation.
5) Integrate Forest weed management with State, counties, other landowners, and interested Forest users by developing Cooperative Weed Management Areas across the Forest.
6) Prioritize weed management activities.
7) Promote a consistent weed management program across the ecogroup
8) Prepare and compete for grant proposals.

Noxious weed establishment will continue to occur. The effects on public lands are many (Duncan, 1998; NRCS, 2002; CAST, 2002).

Effects Common to All Alternatives

Noxious weeds have had the greatest impact on livestock and agricultural interests. However, this is an indirect effect to the forest lands. Noxious weeds occurring near private lands can move back and forth between private and public lands, reducing forage availability (and thus capacity) for livestock, and agricultural values. This is important to hay growers trying to provide weed-free hay for use within the state.

Noxious weeds can out-compete and replace many native species, because they seldom have natural predators or diseases. This can occur more quickly if ecosystem conditions are such that bare soil has been exposed for invasion by new or early seral plant species. Knapweeds have been documented to reduce native plant production up to 80 percent (Bedunah, 1992). Ecosystem functions can be altered when the invading species differ in life form from the natives (i.e., grassy areas invaded by forbs). Another effect on ecosystems occurs in the loss of diversity. This has an effect on ecosystem processes (See Fire discussion below) and functions, and imperils habitat for rare or listed plant species.

Vegetation changes occurring within the ecosystem will change the desirability of an area to wildlife. It can change the amount of forage available, the kind of forage available, and the amount or kind of cover available to wildlife. Aquatic weeds reduce habitats for aquatic birds and furbearers, reduce cover for fish habitat, and can decrease availability of oxygen in the water. Large expanses of a weed can change the composition of birds and animals using an area.

Noxious weed invasions can alter the amount of bare ground exposed to runoff and erosion. Changes from perennial vegetation to annual vegetation are especially critical to watershed stability. Some plants invade the waterways choking streams, reducing forage for waterfowl and other aquatic life, and plugging up diversions. Converting native vegetation to annual invaders that quickly dry up in the spring can change fire regimes to ones that burn more frequently. This prevents perennial species from gaining a foothold again especially longer lived woody species.

Invasions of plants with thorns or burs on them (such as thistles) can ruin trails and areas used by hikers and campers. Knapweeds are known to have a chemical in their sap that when rubbed on eyes can cause problems.

Direct and Indirect Effects which vary by Alternative

SPREAD BY ACCESS

Infestations of weeds will continue to exist under all Alternatives. Access will be the biggest threat to the spread of new infestations of noxious weeds. Current weed expansion has been estimated at about five percent per year.

Alternatives 1, 2, and 3 retain existing motorized cross-country travel. Under these three alternatives, weeds could be spread throughout open areas. In Alternatives 4, 5, 7, and 7R only three percent of the Forest is open to motorized cross-country travel. The threat of noxious weeds spreading would be reduced in these four alternatives. Alternatives 4, 5, 6, 7, and 7R require motorize recreationists to stay on designated travel routes, so these alternatives would help confine the greatest potential for noxious weed spread to designated travel routes.

Alternatives 1, 2, 3, and 5 emphasize building additional motorized trails, which would allow more travelways on the Forest, increasing the potential for the spread of weeds. Under Alternatives 7 and 7R motorized route construction would be limited, because all motorized routes must meet the prescribed Open Motorized Road Density standards in the Management Prescriptions.

Alternative 6 would close the most motorized trails but would change the use to non-motorized activities, such as hiking, horse use and mountain biking. Alternatives 4, 5, 7, and 7R also close some trails to motorized use. Alternative 7R proposes to change use from motorized to non-motorized on fifty-five (55) miles, which is the least number of miles among these four alternatives.

SPREAD BY VEGETATION TREATMENTS

Each alternative has a range of acres that would be treated by fire, mechanical, chemical, and harvest. When the ecosystem is disturbed and bare soil is exposed, the threat of weed invasion increases. This potential threat is influenced by the proximity of weeds to the treated area, human influences that supply seed sources, the time needed for restoration after the disturbance or the amount of time the site will not be protected by a vegetative cover, and germination conditions after the disturbance.

The following table shows the range of acres proposed for treatment by alternative over the planning period (10 years). The alternatives treating the most acres and exposing the greatest amount of bare ground would have the highest potential for weed invasions, based solely on exposed soil. Threats from other activities would have to be analyzed on a site-specific basis, but even the potential threat from exposed soil can only be generalized without knowing surrounding vegetation, elevation, and climate.

- *Table 4. 119 Acres Proposed for Treatment Over the Decade, by Alternative.*

Alternative	Acres Proposed for Treatment Over the Decade
Alternative 1	4,000 to 7,000 acres
Alternative 2	4,000 to 9,000 acres
Alternative 3	5,000 to 9, 000 acres
Alternative 4	4,700 to 8,000 acres
Alternative 5	3,800 to 6,000 acres
Alternative 6	4,000 to 6,000 acres
Alternative 7	4,700 to 6,700 acres
Alternative 7R	6,000 to 10,000 acres

SPREAD BY GRAZING LIVESTOCK

The variation between the alternatives would be minimal. Although suitability varies by alternative, livestock do not have to be excluded from unsuitable ground, and in fact, they often cross unsuitable lands to get to suitable lands. Alternatives implementing the highest reductions in AUM's (Alternatives 4, 5, 6, 7, and 7R) would potentially lower the exposure of the land to infestations. The reductions also could come in numbers (fewer livestock on the landscape) or in the length of time livestock use the Forest (going on later in the spring or coming off earlier in the fall). Depending on local conditions and availability of weed sources, these may or may not have a significant effect.

Cumulative Effects

Increases in noxious weed invasion and spread can occur as a result of increased roads, ground disturbance, or fire. Changes in growth stage and the rate of forest development can affect other resources, such as wildlife, soils, and fuels. The restoration of vegetation conditions to reduce the levels of uncharacteristic disturbance would benefit riparian zones. Alteration of vegetative conditions, whether through forest management activities or successional processes, changes susceptibility to insects, disease, wind, and other endemic disturbance processes, with subsequent effects on forest composition and structure. Road construction and firewood cutting can have indirect effects on vegetative conditions and numbers of snags, depending on location, due to increased access and concentrated harvest of dead trees. These projects also have potential effects on riparian areas by increasing soil erosion.

Forest personnel have actively participated in the establishment of Cooperative Weed Management Areas (CWMA) to bring managers of various land ownerships together to coordinate the battle against noxious weeds. The Forest has also issued special orders restricting the use and transport of feed hay, straw, and mulch which has not been certified as "weed free" as provided for in 36 CFR 261.50(a) (AMS, 1999). Adjacent land managers, including the Bureau of Land Management, the State of Idaho, industry, and private land-owners (through the Natural Resource Conservation Service), are cooperators in the CWMAs. Lands throughout Idaho fall under the jurisdiction of the weed-free hay regulations established by the Idaho Department of Agriculture.

The Forest will continue to work through CWMAs to make sure weeds are treated across boundaries. The Forest will continue to be an active partner with the State of Idaho in implementing regulations and programs that will benefit public lands. To emphasize this relationship and the need to coordinate programs, a jointly funded position was established in 2001 between the Intermountain Region of the Forest Service and the Idaho Department of Agriculture. This position is responsible for coordination of education programs and promoting the development of CWMAs.

Maps available from the Idaho Department of Agriculture show the spread of Idaho's noxious weeds from 1991 through 1999 and the increase in acreage infested (See Project File). The increasing acreage across counties is obvious in this nine-year period. This trend is expected to continue based on the current rates of treatment with the tools that are available.

It is anticipated that new weeds will continue to invade public lands from various sources. Existing infestations will continue to be treated aggressively until they are controlled, contained and eradicated. None of the alternatives authorize activities that would accelerate the invasion of weeds.

Irretrievable/Irreversible Effects

Areas of the Forest that contain infestations of noxious weeds would be irretrievably loss to other uses until noxious weed abatement is successful on these infested areas. In some cases, these infestations, if left uncontrolled, could reduce biodiversity.
No irreversible effects have been identified for noxious weeds.

Research Natural Areas

Because Forest Plan Research Natural Area management direction will be consistent in all Alternatives, no indicator was developed.

Direct and Indirect Effects Common to All Alternatives

In all alternatives the goal of RNA management is to maintain ecological processes. In some areas fire may be needed to resume its natural role. This would be done if scientific research documents that fire is needed to maintain the specific communities for which the RNA was established. This feature of the alternatives does not vary by alternative. Any project proposing fire or other treatments would be analyzed at the site-specific level. This may require updating the Establishment Records for the specific RNA. This would be done according to procedures outlined in FSM 4063. All alternatives would maintain the RNAs for the purpose for which they were established.

Cumulative Effects

The alternatives do not differ in how RNAs are managed, but they do differ in how surrounding lands are managed. Alternatives with more development potential would have a greater risk of negatively impacting the RNAs. The potential impacts include adjacent disturbance and introduction of non-native invasive plants; changes in hydrology from management activities; isolating the RNA from fragmentation. Alternatives 4 through 7 implement the Roadless Area Conservation Rule. Because development would be less likely to occur adjacent to RNAs, these alternatives would make negative cumulative impacts less likely. Alternatives 1, 2, and 3 would have the highest risk of cumulative impacts. Alternative 7R would have a slightly greater risk than Alternatives 4 through 7, because timber management activities may be allowed near some of the RNAs (See Appendix R, Roadless Re-evaluation). The risk if low for all alternatives, however, because any project on lands adjacent to RNAs would consider and minimize these potential impacts.

Irretrievable and Irreversible Effects

There are no irretrievable or irreversible effects associated with any of the alternatives on Research Natural Areas.

Roads

Because management direction will be consistent in all Alternatives, no indicator was developed.

General Effects

Road construction and reconstruction are usually associated with development related to timber harvest, utility lines, mineral and energy development, recreation facilities, and public safety. Most of the backbone Forest road system needed for the current level of use is in place but will need maintenance and reconstruction to bring these roads up to standard. New road construction and reconstruction, maintenance, and decommissioning of existing roads are expected in all alternatives. Projections for new construction are much lower than was predicted for the previous planning period. This is due primarily to lower projections of timber harvest activities. Mineral activities will continue to require new and improved access similar to past projections.

Commercial use of the transportation system has declined in the 1990s and this trend is expected to continue in the coming decade. On the other hand, recreation traffic has increased substantially. This shift in traffic composition and user types is a driving force for development of new travel management philosophies and strategies. New standards and guidelines have been developed to mitigate the impacts on natural resources resulting from the current road system and its increased use.

The new road management policy approved by the Chief of the Forest Service in January 2001 requires the use of a science-based roads analysis process to analyze the Forest's transportation system. The analysis identifies the minimum transportation system needed for Forest management, yet minimizes or reverses the environmental impacts often caused by roads. The new policy is aimed at providing managers with tools to make better and more informed decisions about: where, when, and if new roads should be constructed; whether to upgrade, close, or decommission old, unneeded and unauthorized "ghost" roads; whether to upgrade Forest roads, as appropriate, to meet changing uses, local community access needs, and growing recreation demands; and to help identify sustainable funding sources for maintaining the Forest's road system. It relies on the Forest Service report entitled, "Roads Analysis: Informing Decisions about Managing the National Forest Transportation System (1999)." Roads analysis in an integrated ecological, social, and economic science-based approach to transportation planning that addresses existing and future road management options.

A Forest-wide Roads Analysis was completed as part of the Forest Plan Revision process. At the forest-wide scale, the analysis looked at the higher standard access roads that comprise the backbone road system. These are the Maintenance Level 3, 4, and 5 roads that are maintained for passenger type vehicles. The Forest-wide Roads Analysis identified maintenance and reconstruction activities that are needed to bring these roads up to standard to meet management objectives and reduce environmental effects. Further roads analysis at the watershed or project scale will identify additional road management activities on the remaining Forest road system, including construction, reconstruction, and obliteration.

Management objectives will be established for all roads. These objectives include construction and maintenance standards. Vehicle types, expected traffic volume, environmental constraints, and economics are considered when determining the appropriate standards to be applied.

Implementation of these road management activities will depend upon funding. Under current funding levels, the Forest will continue to perform minimum maintenance on Forest roads. Roads are usually maintained on a priority basis with criteria such as user safety, resource protection, and user comfort needs. Road maintenance will probably remain below full capacity, based on budgets; however, budgets may improve over the current level as more national attention focuses on environmental effects from roads and the maintenance needed to reduce or eliminate these effects. The proposed Public Forest Service Road (PFSR) program could significantly increase funding to maintain and improve the backbone road system. The Forest could then use annual appropriated funding to accomplish other management activities.

RECREATION

Access that is safe and convenient to the Forest Visitor is critical to ensure a positive recreation experience. Recreation use on forest roads will continue to increase as the population growth continues. This traffic will add to the maintenance necessary to keep the roads in a safe and structurally sound condition. Road operation and maintenance activities will continue to be essential in providing safe and convenient transportation facilities. An adequate budget to support road maintenance will continue to be a challenge. For most roads in the Forest, road damage occurs in the spring from to recreational driving and in the fall from hunting activities, when wet weather conditions often saturate road surfaces. New road construction for recreation purposes is expected to be very low and not vary much by alternative. It is anticipated that some reconstruction will occur. Some low standard road construction and reconstruction would occur under recreation special uses such as ski areas in association with their approved development. Access to these roads would be restricted and not open to the general public. Roads being considered for decommissioning in future travel planning decisions can be evaluated on a site-specific basis to determine if they could be converted to meet motorized and non-motorized trail needs.

TIMBER HARVEST

Alternatives with higher amounts of timber harvest would have greater amounts of new road construction. Using a rule of thumb of one mile of new road construction per million board feet, it is estimated that Alternative 1 would construct eighty-one (81) miles of road per decade; Alternatives 2 would construct seventy-three (73) miles of road per decade; Alternative 3 would construct ninety-eight (98) miles of road per decade; Alternative 4 would construct seventeen (17) miles of road per decade; Alternative 5 would construct sixteen (16) miles of road per decade; Alternative 6 would construct seven (7) miles of road per decade; Alternative 7 would construct eighteen (18) miles of road per decade; and Alternative 7R would construct thirty-five (35) miles of road per decade.

Watershed or project level roads analysis would be required prior to any construction or reconstruction of roads unless the roads analysis at the forest level was deemed adequate. This lower scale roads analysis could identify unneeded roads and recommend them for obliteration. Indirect effects of timber harvest include additional access provided for other Forest activities, such as recreation uses, management of livestock grazing, and fire suppression. Also funds generated through timber sales may be used to decommission unneeded roads within the sale area.

MINERAL ACTIVITIES

Road development is often associated with mineral exploration and development activities. Road development is anticipated for all the alternatives. Mineral exploration and development is largely driven by market forces and regulated by existing mining law. There would be no differences between alternatives in exploring or developing existing phosphate leases. There could be some differences between alternatives regarding future road construction, based mainly on which alternatives applied the Roadless Rule to future mineral leases. For alternatives where new road construction is required, indirect effects would be access provided for other Forest activities, such as fire suppression.

UTILITY SPECIAL USE AUTHORIZATIONS

Pipelines, overhead power lines, and communication developments can potentially require road construction or reconstruction for installation and maintenance. In some cases, helicopters can be used, effectively reducing new road construction needs. Little or no road construction and reconstruction associated with these sites is anticipated for all alternatives. A site-specific analysis would be needed prior to final approval of any utility or telecommunications site.

Cumulative Effects

The use of Forest roads will increase as populations grow, primarily for recreational purposes. This traffic adds to the maintenance work necessary to keep roads in a safe and structurally sound condition. Road use for non-recreational purposes is not expected to increase and should not add substantially to road use on the Caribou NF.

Maintenance and reconstruction of existing roads should have a positive effect. These road management activities would be designed to improve user safety and comfort. They would also be designed to reduce impacts of existing roads on the natural resources of the Forest.

Construction of new roads will be minimal. Most new construction for timber access would be short-term, single purpose roads that will be closed and/or decommissioned following post harvest activities. Construction of new roads for mineral activities will also increase the amount of roads, but most of these roads will be closed and decommissioned following mineral activity. The amount of open roads should not increase, if these newly constructed roads are closed following management activities. If existing roads are identified as unneeded and are closed and decommissioned, then the amount of open roads may actually decrease.

Irretrievable/Irreversible Effects

Roads can have long-term effects on the environment. Improperly designed and constructed roads and poor road maintenance can increase the risk of erosion, landslides, and slope failure that could endanger the health of watersheds. New roads remove land from production and create wildlife barriers. Road management activities can spread invasive plant species. These effects can be reduced through appropriate mitigation.

Some long-term effects, such as removing the land from production, would be considered an irreversible effect, if the road is intended for long-term use. If the road is short-term in nature, then it can be decommissioned, and the land returned to production.

Soil Quality and Long-term Productivity

Scale of Analysis: Forest-wide

Scale of Analysis:

The scope of the analysis of direct and indirect effects is the whole Caribou National Forest. In the analysis included throughout Chapter 4, the numbers for road and trail miles, acres of timber harvest, acres of prescribed fire, and other management activities, are all best estimates based on the latest available information. The modeling and analysis conducted for this EIS were intended and designed to indicate relative differences among the Alternatives, rather than to predict absolute amounts of activities, outputs, or effects.

While soils and long-term productivity are essential to forest management, this was not determined to be a planning issue. Soils, climate, and geology are discussed in the beginning of Chapter 3 since they set the stage for all of the other resources.

Soil resource management must be consistent with the Forest Service goal of maintaining or improving long-term soil productivity (NFMA, 1976) and soil hydrologic function. The Multiple-Use Sustained-Yield Act of 1960 states that management of the National Forests must provide "sustained yield in perpetuity without impairment of the productivity of the land." The Forest Service, Intermountain Region, has developed Soil Quality Standards (FSH 2509.18-95-1) to ensure these laws are met at the Forest level. The Caribou AMS (1999) lists the following Proposed Desired Future Conditions.

- Soil quality, productivity and hydrologic function are maintained and restored where needed.
- Soils have at least minimal protective cover, adequate levels of soil organic matter (litter) and coarse woody material. Physical, chemical, and biological processes in most soils function to sustain the site.
- Microbiotic crusts[9] and their importance to soil stability are recognized. Management practices are designed to retain and improve these soil components.

Effects Common to All Alternatives

National laws and regulations have been interpreted for implementation in Forest Service Manuals, Handbooks and Regional Guides. All land management activities occurring on National Forest system lands must comply with these laws, regulations, and policies, which are intended to provide general guidance for the management of soils.

[9] **Microbiotic crust** is a crust of soil particles bound together by organics from living organisms and their by-products.

Although the Revised Forest Plan management direction for soils would vary somewhat by Alternative, direction for all Alternatives has been developed to maintain or improve soil conditions on National Forest System lands. Direction occurs at both the Forest-wide and prescription levels.

Appropriate management and restoration of soil resources generally depend on current and site-specific information about existing conditions. These factors are not easily addressed at the programmatic level. Land management activities with the potential for disturbing or restoring soil resources will be assessed through a combination of watershed analyses, inventories and monitoring and site-specific NEPA analysis. Land capabilities as identified in the Soil Survey of the Caribou National Forest (USDA-FS, 1990) will be applied where appropriate.

Management actions with the greatest impacts to soils are those that remove vegetation or disturb the soil surface. These actions include construction and use of roads and trails, mining, timber harvest, livestock grazing, prescribed fire, and recreation. The potential impacts of concern to the soil resource are compaction, displacement, erosion, severe burning, nutrient losses, landslides and mass failures, and changes to microflora and long-term soil productivity. Soil compaction is the volume reduction of soil caused by the weighting of tractors, vehicles, livestock, and humans. Soil compaction increases bulk density[10] and decreases porosity[11]. It reduces water infiltration[12] and gaseous exchange. A reduction in infiltration can result in increased runoff and erosion. Root growth can also be physically limited with severe compaction. Displacement[13] reduces soil cover that affords protection from erosion. Displacement also disrupts soil biological processes important to nutrient cycling. Displacement of organic matter can adversely affect soil structure and organic matter. Severe erosion removes the most productive layer of soil and can have adverse effects on long-term soil productivity. High soil heating can cause accelerated erosion, dry ravel[14], reduced infiltration, nutrient loss, formation of water repellent layers[15], and changes in microbial populations (Intermountain Region Soil Interpretative Guide 1995). Monitoring the effects of land management on the soil resource has been conducted over the last fifteen years by evaluating erosion from timber harvest and range management activities. Mass failures are evaluated and monitored as they occur to determine the cause and effect. Road locations are also monitored for effects on slope stability and erosion. Most data indicate that erosion rates are within soil loss tolerance levels under the current Forest Plan.

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10 **Bulk density** is a unit weight of soil.

11 **Porosity** is defined as air void spaces in soil.

12 **Water infiltration** is water movement into soil

13 **Displacement** is the movement of soil from one place to another by mechanical forces such as a blade, wheel slippage, and dragging logs.

14 **Dry ravel** is the crumbling and sloughing of soil on moderate or steeper slopes

15 **Repellant layer** is a water-repellent layer is sometimes created when volatiles from burning organic materials are driven downward and condense on soil particles.

Direct and Indirect Effects by Alternative

CONSTRUCTION AND USE OF ROADS AND TRAILS

The Forest contains approximately 1,125 miles of open roads, 300 miles of closed roads open to motorized trail traffic, and 608 miles of open motorized trails, for a total of 3,820 acres (Acres were determined by using an average disturbance width of twenty feet for roads and five feet for motorized trails).

The building and reconstruction of roads and trails requires vegetation removal, soil disturbance, and slope re-contouring. These actions loosen soils and can lead to substantial contributions of sediment to stream systems (Ketcheson and Megahan, 1996). Roads built across landscapes and soils with a high risk for mass movement[16] are especially problematical. Moll (1996) summarizes some slope stability investigations: "Road fills increase steepness and place added burdens on slopes, creating stability problems, or elevating moderate risks to higher risks. 'Risk' in the context used here is a function of probability and consequence. Road cuts undermine upper slopes, increasing the probability of soil movement and mass failure." Following Best Management Practices that establish effective road and trail drainage systems and stabilize cut and fill slopes would effectively reduce erosion in as little as several years (Seyedbagheri, 1996; Heffner, 1999; Idaho Department of Lands, 1992).

Established road surfaces are essentially eliminated from the productive soil base. Soil erosion and sedimentation from established roads occurs because roads lack vegetative cover and the running surface is compacted. Increased use, especially by heavier vehicles such as logging trucks, damages road drainage (Seyedbagheri, 1996). Poor road drainage accelerates erosion rates by allowing runoff to accumulate on the roads, often collecting water from upslope. Seyedbagheri (1996) found two studies using simulated rainfall that showed sediment yields from rutted road sections were greater than from unrutted sections. First, in northern Idaho, Burroughs and others measured a 108 percent increase in sediment associated with ruts on new road prism surfaces versus an unrutted surface. The second study was from Tin Cup Creek on the Caribou National Forest. Sediment yields were 1.0 to 2.1 times yields on unrutted roads, depending on moisture levels before the simulated rainfall.

Surfacing roads with gravel or crushed rock is effective in reducing erosion. Seyedbagheri (1996) reported a simulated rainfall study by Burroughs and others in 1982 that showed a road tread with gravel surfacing produced only 23 percent of the sediment yield of an unsurfaced travel way. A second simulated rainfall study reported by Burroughs and King (1989) on the Nez Perce National Forest showed a sediment reduction of seventy-nine percent by surfacing with a four-inch lift of crushed rock. Applying Best Management

16 **Mass movement** is the down-slope movement of a portion of the land surface, as in creep, landslide, or slip.

Practices that maintain road drainage systems, minimize use when the sub base is wet, stabilize cuts and fills, and utilize slash filter windrows below roads would reduce soil impacts (Seyedbagheri 1996; Megahan, *et al*, 1992; Heffner, 1999; and Idaho Department of Lands, 1992). A well-designed and constructed road system can prevent resource damage by reducing the likelihood of off-road use. Extensive off-road travel can seriously degrade soils over a large area.

The Forest's Roads Analysis Report contains an assessment of the effects the key roads have on erosion and mass stability (USDA-FS, 2002). Alternative 6 proposes the least amount of road and trail construction and would have the least impacts on the soil resource. Alternatives 1, 2, and 3 would have the greatest amount of road and trail construction resulting in the greatest impact on the soil resource. Alternatives 4, 7, and 7R have intermediate effects, similar to Alternative 5, with approximately sixteen to eighteen miles of new road construction and ten to twenty miles of new trail construction.

RECREATION

Approximately 1,770 acres of developed recreation sites exist on the Forest (Tiller, 2001). An additional 1,100-acre ski area is under special use permit.

The construction of campground roads, livestock loading ramps and corrals, vehicle parking, trailer pads, tent pads, picnic tables, fire rings, restrooms, trail heads, meeting shelters, group camping areas, and ski area facilities can negatively impact soils in several ways. Vegetation is removed; soils are exposed, shaped and leveled, compacted, surfaced with gravel, concrete or asphalt and covered with permanent structures (National Soil Survey Handbook 1996; Cole, 1999). Other areas that are not surfaced, such as footpaths, tenting, and picnicking areas, can have exposed, compacted, puddled, and eroded soils (National Soil Survey Handbook 1996; Cole, 1999). Streams adjacent to or within campgrounds often show trampled and shearing banks, bank erosion from stream rerouting, and heavily used terraces with damaged vegetation, soil compaction, and erosion. Recreation plans are being developed in the Bloomington Lake area that will improve soil resource conditions. Other recreation areas on the Forest are often rested to allow recovery of soil quality. Standards and guidelines in the Revised Forest Plan will provide recovery opportunities for affected soils.

No major differences in acres of developed recreation facilities among Alternatives are anticipated in the next planning period. Gradual expansion of campground and trailhead capacities is anticipated as funding allows. Standards and Guidelines in the Revised Forest Plan should also benefit the soil resource in recreation areas.

PHOSPHATE MINING

Phosphate mining has disturbed approximately 6,100 acres on the Forest since the early 1950s. The following summary comes from the AMS (1999):

"During the time a phosphate mine is active and until its final reclamation, the use of the land for mining generally excludes other uses. Lands on the Forest that are disturbed by mining activities are generally reclaimed concurrently where possible as mining progresses so that a minimum amount of area is disturbed at any one time. Reclamation activities follow an approved mine reclamation plan. Reclamation plans reflect the long-term management direction for those lands. Currently, reclamation activities on mine sites include topsoil stripping which is directly placed rather than stockpiled, if possible. In areas where topsoil is not available, middle waste shales[17] have been successfully used as a growing medium for plants, primarily non-native species. Past reclamation efforts have not focused on the establishment of native plant species and their associated communities and structure on these disturbed sites. Available topsoil has not been used to reclaim some sites, resulting in decreased productivity and site potential."

Although the use of center-waste shales as a growth medium is no longer permitted, its past use, and possibly some soil types as plant growth media, has caused elevated levels of selenium and trace elements in plants. Livestock poisoning, due to consumption of these plants, has been reported. Surface run-off and discharge to surface water and to shallow ground water in alluvium from overburden dumps has elevated levels of selenium in Maybe Creek and Pole Canyon (AMS, 1999). A multi-agency team is assessing and developing measures to deal with this concern. State of Idaho Best Management Practices for the Mining Industry and Region 4 Reclamation Guides are used as applicable. (See Issue 5: Minerals section.)

Approximately 1,565 acres of new mining disturbance is anticipated in the next ten years for all Alternatives (Jones, 2001). Approximately 1,738 acres will be reclaimed in the same time period. Alternatives 1, 2, 3, 4, 5, 7, and 7R propose an adaptive approach to mining, reclamation, and associated hazardous substance management. This approach would incorporate Best Management Practices that would evolve over time as monitoring and research indicate. Alternative 6 proposes a prescriptive approach that includes more specific standards and guidelines, benefiting the soil resource now, but has less flexibility during the life of the Forest Plan. A Forest Plan amendment would likely be needed to modify, change or update standards and guidelines in Alternative 6. Comparing Alternative 6 (prescriptive) with the other Alternatives (adaptive) over the next ten years is not possible due to the flexibility of the adaptive approach. The flexibility of the adaptive approach may benefit soils over the prescriptive approach in the long-term.

TIMBER HARVEST

Since 1966, approximately 22,000 acres of timber harvest has occurred on the Forest. Harvest methods, timing, and site characteristics vary. Other than road building, most of the timber harvest impacts to soils occur with yarding and slash treatment activities. Ground based yarding of harvest units and slash reduction with tractor piling or prescribed burning can displace the existing vegetation and organic soil layer, expose the mineral soil surface, compact, puddle, and severely heat forest soils (Clayton, *et al*, 1987; Elliot, *et al*, 1999;

[17] Dark **shales** from the Meade Peak member of the Phosphoria Formation.

Geist, *et al*, 1991; and Clayton, 1990). Soils exposed by mechanical means or by fire are susceptible to erosion from runoff (Clayton, 1990). Soil compaction, erosion, displacement, and puddling all impact long-term soil productivity by reducing the exchange of gases, reducing water infiltration, reducing or eliminating the most productive layer of soil, and disrupting the most highly biologically active layers of soil (Daddo and Warrington, 1983; Clayton, 1990; Harvey, *et al*, 1994; Elliot, *et al*, 1999; Froehlich, *et al*, 1983; and Jurgensen, *et al*, 1997). The use of Best Management Practices, especially limiting the use of land based equipment to periods when soils are dry or frozen, designating skid trails[18] and requiring pulling line, and designing and maintaining skid trail and landing drainage systems, will minimize soil compaction, displacement, puddling, and erosion to acceptable levels (Heffner, 1999; Seyedbagheri, 1996; Grier, 1989; and Idaho Department of Lands, 1992). Soils under landings and skid trails are typically the most severely affected and will require additional measures, such as draining, ripping, and seeding, to return them to productive sites.

Concerns about long-term soil productivity also include the importance of leaving adequate amounts of down woody debris on harvest units after treatment (Amaranthus, *et al*, 1999; Graham, *et al*, 1994; Harvey, *et al*, 1994). Large woody debris amounts required for maintenance of soil nutrient and moisture supplies adequate to sustain site productivity vary by ecological type (FSH 2509.18-95-1). Graham, *et al*, (1994) and Harvey, *et al*, (1994) provide suggested amounts of large down woody debris to be left following slash treatment. Rates for the Forest would range from three to five tons per acre for low-dry habitat types to fifteen to twenty tons per acre for moist spruce and subalpine fir habitat types. Standards and Guidelines in the Revised Forest Plan provide guidance for these requirements for all alternatives, except Alternative 1.

Methods of felling, yarding, and slash treatment will vary by location. Ground-based harvesting methods may approach or exceed the fifteen percent (15%) detrimental soil disturbance threshold found in Regional Soil Quality Standards, but adherence to the standards will maintain harvest related disturbance to an acceptable level.

Until more specific knowledge is available at the project level, the impacts to soils from timber harvest, as described above, can be based only on total acres disturbed. Alternative 6 would impact the least acres and would have the least impact on soils. Alternatives 1, 2, and 3 would have the most impacts relative to the others. Alternatives 4, 5, 7, and 7R would have similar, intermediate impacts affecting approximately 610 to 680 acres annually.

LIVESTOCK GRAZING

Effects of livestock grazing on uplands are usually restricted to small concentrated areas where livestock bed, loaf under shade, water at developments, obtain salt, and trail along fence lines and driveways. The soils of these areas are compacted and have increased wind and water erosion due to reduced vegetative cover and increased bare ground (Clary, *et al*, 2000). As livestock range across the landscape, minor compaction can occur over broader

[18] Confining tractors and skidders to **skid trails** and winching felled logs to designated skid trails before transfer to the landing.

areas, which is seldom enough for long-term degradation. Compaction from livestock is generally a short-term impact as these effects are often controlled naturally by root action, frost-heave action, gopher action, and shrink-swell action. Higher stocking rates have been documented to cause more soil compactions (Willatt, *et al*, 1983; Scholl, 1989).

An effect of ranging livestock on drier portions of the Forest is their impact to microbiotic crusts. Microbiotic crusts are formed by living organisms (cyanobacteria, bryophytes, microfungi, lichens, and mosses) and their by-products (Johnston, 1997). These living and non-living materials create a crust of soil particles bound together by organics and contribute to ground cover. Microbiotic crusts are important for limiting wind and water erosion of soils, soil moisture retention, atmospheric nitrogen fixation, nutrient contributions to plants, and as indicators of ecosystem health (Belnap, *et al*, 1999). These crusts are well adapted to severe growing conditions but poorly adapted to trampling by livestock. Recovery of crusts can be relatively rapid (less than tens of years) when the disturbance is removed (Kaltenecher, *et al*, 1999).

Historic livestock grazing during the early 1900s has had an impact on the loss of some areas that support tall forb plant communities on the Forest (See AMS and Issue 4: Livestock Grazing). Aggressive grazing, primarily by sheep in the early 1900s, replaced the tall forbs with lower growing species adapted to drier conditions. These conditions have been documented in the Forest Properly Functioning Condition Assessment (USDA-FS, 1997) and the Assessment of Habitat Conditions on the Bear River Range (Carter, 2002).

Methodologies used in these assessments differ and conditions assessed by the Carter study do not account for improving trends from historic sheep grazing. Recent field reviews of this information indicate that conditions are improving on many of the sites that were historically overgrazed by sheep (Winward and Hamner, pers. comm., 2002).

Treatments to increase forage production have largely failed on sites where bare ground has increased, and in areas where substantial loss of topsoil has occurred. Annual tarweed (*Madia glomerata*) is common now on some sites where infiltration rates have slowed, topsoils have eroded, and the site potential may no longer support the original tall forbs plant community.

Currently, many of these areas, where potential still exists, are improving with better management and reduced livestock use. Some tall forbs areas on the Forest show signs of improvement with the re-establishment of a variety of tall forbs indicator species that can be seen in areas, such as, South Ant and Franklin basins. Forest Plan Standards and Guidelines would increase the rate of recovery on these sites and improve overall soil conditions on the Forest's rangelands.

Intensive grazing by cattle on riparian zone soils can increase bare ground; increases erosion by water, ice and wind; decreases the litter layer; increases compaction; decreases infiltration; and decreases fertility (Belsky, *et al*, 1999).

At the Forest scale Alternatives 4, 5, 6, 7, and 7R have the least impacts to soils due to grazing standards that would limit impacts, especially in riparian areas. Alternative 1 has the most impacts due to lack of specific grazing standards. Alternatives 2 and 3 are intermediate with respect to soil impacts based on their grazing standards.

PRESCRIBED FIRE

Between 1970 and 2000 approximately 30,000 acres of prescribed fire treatments have been applied on the Forest. Approximately eighty-five percent of these acres were non-forested vegetation types, predominantly mountain big sagebrush (Betz, 2001).

NON-FORESTED VEGETATION

Soil heating from prescribed fire has the potential to impact soils. Burning in non-forested vegetation bares the surface and can result in excessive soil erosion on steep slopes and loss of soil productivity (Intermountain Region Soil Interpretive Guide 1995; USDA-FS, 1990; Simanton, *et al*, 1990; and Clark and Starkey, 1990). Low to moderate fire soil heating from fire applied in a mosaic pattern on slopes less than twenty-five percent with mixed shrub/grass cover would not greatly impact soils (USDA-FS, 1990; Intermountain Region Soil Interpretative Guide 1995; and Simanton, *et al*, 1990). The major effect from fire would be a bared surface, which reduces infiltration and increases the potential for erosion (Clark and Starkey, 1990; Herrick, 1999). Late summer/early fall burns on steep slopes are subject to raindrop impact and may form crusts or result in soil movement following high-intensity storms. Late fall fires preclude vegetation establishment until spring. These soils are subject to wind erosion and loss of winter snow retention. Reestablishing vegetation quickly after burning is critical (Blaisdel, *et al,* 1982; Stark and Hart, 1999).

Maximizing litter on the site after fire is important, not only for minimizing erosion but also for maintaining other components of soil productivity. Mycorrhizae in the soil are associated with many of the native perennial grass and shrub species on the forest (Wicklow-Howard, 1994). These fungi improve the ability of these plants, especially big sagebrush, to establish and grow in stressed environments. These fungi also promote soil structure and nutrient storage (Borrow and McCaslin, 1996). Soil microfungi are strongly tied to soil organic matter, which is reduced by fire (Bunting and Peters, 1994). Maintaining litter on the site with low to moderate soil heating and minimizing the period of time between vegetation removal and regrowth will help reestablish soil microfungi. Nitrogen losses from leaching would also be reduced with rapid vegetation regrowth (Stark and Hart, 1999; Bunting and Peters, 1994).

Soil impacts would vary by location, timing of the fire, soil and vegetation type, and post fire environment. Soil heating from fire would dominantly be moderate to light with some severe heating, depending on conditions that affect burn severity. The severe soil heating, although limited, would detrimentally impact soils by removing vegetative cover, removing litter from the sol surface and depressing microbial populations. Late summer and fall burns, which are often a necessity due to limited opportunities for spring burns, have an increased potential for wind and water erosion. So, the potential for negative soil impacts increases with the number of acres burned. Alternatives 6 and 7R would be the best alternatives for the soil resources, because they treat the fewest acres with prescribed fire. Alternatives 2, 4, 5, and 7 would have similar effects on the soils, but these effects would be greater than those in Alternatives 6 and 7R. In addition, these four alternatives would be better for soils than Alternatives 1 and 3, because they treat fewer acres.

Aspen Forest

Aspen forest does not readily burn. Many aspen stands in the West lack the readily flammable fuels needed to produce a fire effective for stimulating regeneration (Schier, *et al*, 1985). Desired conditions for burning untreated aspen stands exist in some years in October just before the aspen leaves turn color and fall (Jones, *et al*, 1985). A variety of soil heating levels would be found under these conditions, depending on fuel types and loadings. Severe soil heating consumes all of the litter and duff layers, and moderate soil heating consumes much of the litter and duff layers. Mineral soil is exposed and the potential for erosion is increased. Some plant nutrients stored in the burned material are converted to a gaseous state and volatilized by burning. Nitrogen and sulfur are especially susceptible (Harvey, *et al*, 1994). Soil productivity would be negatively impacted in the short term. Severe soil heating may also kill roots in the surface of the soil and reduce the amount of suckering (Jones, *et al*, 1985).

The success of aspen sprouting will impact soils over the longer term. Well-stocked, young stands may produce one ton of litter per acre (Jones and Debyle, 1985). The rapid decay of aspen leaves provides a relatively quick return of nutrients to the soil. Tew found that the upper six inches of mineral soil under aspen in northern Utah differed from that under adjacent stands of shrubs and herbaceous vegetation by having four percent more organic matter, higher water holding capacity, slightly higher pH and more available phosphorus (Jones and DeByle, 1985). Poor aspen reproduction following treatment would negatively impact long-term soil productivity.

Alternative 4 has the potential to treat the most aspen and mixed conifers of all the alternatives, and therefore, would have the greatest impacts to soil heating. Alternative 1 would have the least impact, because no aspen or mixed conifer would be treated. Alternatives 2 and 5 would have low to moderate impacts on soil heating and Alternatives 6, 7, and 7R would have moderate effects as described above. Although Alternative 7R emphasizes the restoration of aspen/conifer, mechanical treatments would be used more extensively than prescribed fire. Alternative 3 does not treat aspen and mixed conifer with fire.

Conifer Forest

The strategy proposed by Williams and Rothermel (1992) to group conifer dominated vegetation when conceptualizing fire dynamics is useful for describing fire impacts to soils. The first group, grass/timber fuel type (Caribou Fire Groups 1 and 2), typically has frequent, non-lethal fires of moderate or lesser soil heating that can occur as soon as the fine fuels cure. The second group, timber/brush fuel type (Caribou Fire Group 3 and often 5 and 6), cures and dries more slowly than the grass type. The timber in the second group occupies more shaded aspects at higher elevations with more moisture. Higher fuel loadings, deeper fuel bed depths and more continuous fuel arrangements often result in more severe soil heating than the grass type. A mix of lethal and non-lethal affects to conifers results. The third group, timber/heavy down fuel type on cool, moist sites (Caribou Fire Groups 5, 6, and 7), dries much more slowly than most other types. These stands often occupy cooler aspects at high elevations. High fuel loadings and vertically continuous fuels are typical of mature stands. Ignitions in this type seldom result in fires of any consequence; low intensity fires with low soil heating are more typical. When ignitions in this type do gain momentum, the fires are of high intensity, extensive in acres burned, and soils are heated and burned more severely. Deep duff layers, concentrated heavy fuels, and a closed canopy result in persistent, difficult-to-suppress fires.

Fire effects on the physical, biological, and chemical properties of forest soils depend on the amount of material consumed during burning, the magnitude and duration of soil heating, the frequency of fire, and the post-fire environment (Hungerford, *et al*, 1991).

In general, most fires of moderate or less-than-moderate soil heating do not produce direct changes in soil structure. However, the ability of soils to absorb water after fire is directly related to the degree of soil heating and amount of organic matter consumed. Although temperatures of smoldering duff (500 to 600 degrees C) are lower than for flaming (1000 to 1500 degrees C) the long duration of smoldering and the close proximity of duff to the soil results in greater heating (Hungerford, *et al*, 1991). Some soils, especially those with coarse surface textures, form a water repellent layer just below the burned organic layer after fire (DeBano, 2000). This water repellent layer will reduce water infiltration and water holding capacity at and below the layer. Erosion is increased until the water-repellent layer is relieved.

Forest organic matter, both living and dead, is important in controlling soil erosion. Excessive removal of vegetation and forest floor surface horizons increase erosion potential. Actual soil movement depends on storm intensity, slope steepness, and soils type, but the surface nutrient–laden soils are the first to be lost. Vegetation recovery and organic matter deposition on bare soils are important for reducing erosion potential. Slower vegetation recovery is associated with greater soil heating.

Fire impacts microbial numbers and activity directly by heat and indirectly by physical and chemical changes in the post-fire environment (Hungerford, *et al*, 1991). Generally, the greater the consumption of duff and higher soil heating, the greater the immediate negative impact to the microorganisms, especially mycorrhizae. Mycorrhizae are valuable, if not essential, for the establishment and growth of conifers.

The degree of volatilization and subsequent loss of nutrients depends on the temperatures produced during burning and the amount of duff consumed (Hungerford, *et al*, 1991). Organic matter in the soil is destructively distilled between 200 and 300 degree C, is charred between 300 and 400 degrees C, and is consumed above 450 degrees C. Fifty to one hundred percent of the nitrogen will be volatilized when soil temperatures reach 300 degrees C or above. Soil heating to 800 degrees C will volatilize nitrogen, phosphorus, and sulphur.

Wildfire would have an impact on the proposed treated acres depending on where, when, and the extent to which it occurs. The occurrence and extent of wildfire would result in a scaling back or abandonment of prescribed acres treated in all alternatives, depending on the amount and type of vegetation burned. Alternatives 2, 4, 5, 6, 7, and 7R would emphasize mixed conifer, aspen-conifer, and aspen vegetation. Alternative 7R emphasizes aspen and aspen/conifer treatments which would include more mechanical methods than fire. Moderate to severe soil heating would be anticipated for most of the burn areas with low soil heating on the remainder. Much of the surface litter and organic matter could be consumed. Over half of the nitrogen in the fuels would be volatilized. Water-repellent layers in the soils would be anticipated with increased potential for erosion. Negative impacts to microbial populations also would be expected. Alternative 3 would emphasize treatments in Douglas-fir, lodgepole pine, and mixed conifer vegetation. Soil impacts would be greatest for Alternative 3 compared to all other Alternatives, because this alternative treats the most acres of this vegetation. type Soil impacts from prescribed fire would be least for Alternative 1 with no acres proposed for fire in conifer vegetation types.

MOTORIZED CROSS-COUNTRY TRAVEL

Executive Orders 11644 and 11989 were issued in the 1970s to establish policies and procedures for regulating the use of off-highway vehicles on federal lands (GAO, 1995). The requirements included: 1) designating federal lands for OHV use, 2) monitoring OHV use to identify adverse effects and any needed corrective actions and to determine compliance with regulations, and 3) addressing or correcting adverse effects caused by OHV use. Existing designated areas for off-road vehicle use on the Caribou National Forest (420,215 acres) have not been systematically monitored. The full nature and extent of the adverse effects from cross-country motorized travel on the soil resource are not known.

Off-road vehicle travel impacts to soils are not limited to the appearance of a tire mark, but include compaction, decreased permeability to air and water, increased runoff, increased erosion, reduction in organic matter, and a decrease in vegetation density and productivity (Payne, *et al*, 1983; Snyder, *et al*, 1976; Weaver, *et al*, 1978; and Cole, 1999). Off- road vehicle travel impacts most vegetation types and soils. Soil texture, soil depth, depth to water table, slope, vehicle type, vegetative cover, and amount and time of use influence soil impacts.

Soil impacts tend to be more severe at high elevations; on steeper slopes; and on wetter, poorly drained soils. Soil impacts are greater at high elevations due to higher precipitation intensity and duration, an extended period of snowmelt resulting in muddy soils, more severe freeze/thaw cycles causing more loose soil, and increased exposure to wind erosion (Leung and Marion, 1996). Weaver and Dale (1978) found trail widths, depths, and erosion were greater from motorcycles compared to horses and humans on steep areas. Erosion resulting from soil compaction and other adverse off-road vehicle impacts, such as trail widening or multiple trails, are generally greater in wetter soils, especially if subjected to heavy use.

Belnap (1995) reported a reduction in soil nutrients as a result of off-road vehicle impacts in several ecosystems including mountain meadow and lodgepole pine. Soil disturbance from off-road vehicles also provides sites for establishment of non-native species and noxious weeds (Cole 1999). Off road vehicles, especially those operated to induce wheel spinning and sliding, easily damage microbiological crusts resulting in reduced soil stability, soil fertility, soil moisture retention, and increased wind and water erosion (Belnap, *et al*, 1999). Drier climates generally have more microbiological crusts than the higher elevations that occur on the Forest.

Type of vehicle allowed varies by prescription. The impacts to soils will vary by location, vegetation and soil types, and post disturbance environment. Impacts to soils are negative and tend to be cumulative with other disturbances including livestock grazing, prescribed fire, and timber harvest.

Alternatives that restrict motorized vehicle use to designated routes and trails reduce the impacts on the soil resource. Alternatives 4 and 6 allow no off-road motorized use and would have the most positive effect on the soil resource. Alternatives 1, 2, and 3 allow the largest area for cross-country motorized travel and will have the greatest impacts on the soil resource. Alternatives 5, 7 and 7R allow similar acreages for cross-country motorized travel which is less that one-tenth the amount allowed in Alternatives 1, 2, and 3. Alternative 7R allows cross-country motorized travel on approximately 29,400 acres. The following table displays the relative rankings by alternative for effects on the soil resource. The ranking ranges from 1 to 8, with "1" having the least negative impacts and "8" have the most negative impacts to the soil resource.

- *Table 4. 120 Ranking of Soil Impacts from Cross-Country Motorized Travel.*

Alternative	Ranking
Alt 1	8
Alt 2	8
Alt 3	8
Alt 4	1
Alt 5	5
Alt 6	1
Alt 7	4
Alt 7R	3

SUMMARY

An attempt to summarize the direct and indirect effects to soil productivity at the Forest level seems to closely follow the proposed extent and acres of soils removed from the productive base, soils disturbed by management activities. Alternative 6 would have the least impact on soil productivity and quality, because it proposes the lowest timber harvest activity, the lowest amount of acres open to motorized, cross-country travel, and the lowest road and trail construction. Alternative 3 would have the greatest impact, because it proposes the highest timber activity, the highest amount of acres open to motorized, cross-country travel, and the highest amount of road and trail construction. Alternatives 1 and 2 have similar effects on the soil resource, but both of these alternatives propose fewer acres of timber harvest and fewer miles of road and trail construction. Alternatives 4, 5, 7, and 7R have intermediate effects that range between Alternative 6 and Alternative 3.

Cumulative Effects

Cumulative effects from all past, present and foreseeable future management actions on the soil resource were evaluated for each alternative. Past and present effects are described in the "Direct and Indirect Effects" section above.

Foreseeable future proposed management actions include open roads and trails, developed recreation and special use areas, and phosphate mining that will continue to remove soils from the productive base for all alternatives. Noxious weed invasions, livestock grazing, timber harvest, road construction, dispersed recreation, cross-country motorized travel, and prescribed fires will remove protective vegetation and litter and will compact, displace, puddle, and erode soils in all alternatives where these actions are proposed. Natural disturbances including wildfire, windthrow, severe rain events, landslides, and extended drought cycles have and will continue to cause similar impacts to soils for all alternatives. Off-forest lands used for agricultural practices, such as dry farming and irrigated farming, have experienced higher soil loss that most Forest soils (USDA, 1979). Cumulatively, soil loss and risk to soil productivity is greater off the Forest, because of urban development and agricultural practices.

An analysis to determine which alternative had the greatest cumulative effect was completed by evaluating the proposed acres open to cross-country motorized travel, proposed open miles of roads and trails, annual proposed timber harvest on suitable acres, annual proposed timber harvest on unsuited acres, annual proposed prescribed fire treatments in conifer, mixed conifer, and aspen, annual proposed prescribed fire treatments in sagebrush/mountain shrubs, proposed animal unit months for sheep grazing, proposed animal unit months for cattle grazing, expected disturbances from mining activities, expected recreational developments, and estimated road and trail construction for each alternative. A ranking system was used, with a ranking of "1" having the least potential cumulative effect and a rating of "8" having the greatest potential cumulative effect on the soil resource.

- *Table 4. 121 Ranking of Cumulative Soil Impacts by Alternative.*

Alternative	Ranking
Alt 1	7
Alt 2	6
Alt 3	8
Alt 4	3
Alt 5	2
Alt 6	1
Alt 7	5
Alt 7R	4

Overall, soil quality on the Forest should improve over the existing situation with the application of Standards and Guidelines in the Revised Forest Plan for the proposed alternatives, particularly Alternative 7R. Soil quality standards and guidelines (FSH 2509.18) have been established and incorporated in the Revision to help direct soil quality improvement, maintenance, and enhancement within managed portions of the Forest. Detrimental soil impacts will be reduced and protective litter and coarse woody debris will improve soil conditions and reduce erosion. Areas requiring soil improvements are identified in the Ranger District's soil and water improvement action plan . This District plan is updated annually and continues regardless of the alternative selected for implementation. Watershed assessments are also used to identify and update soil resource conditions and will continue, as well. Site-specific project implementation, when they occur, will also include soil mitigation measures that reduce detrimental conditions.

Many areas surrounding the Forest have been disturbed by agricultural practices including both dryland and irrigated crop production. Erosion rates on these lands have increased where soils are left exposed to rainstorm events especially on steeper slopes used for dryland farming. By comparison, erosion rates on agricultural lands are often much higher than those on National Forest lands because of the lack of protective vegetative cover (USDA 1979). The erosion report for the Snake River Basin indicates that National Forest lands in Bonneville, Bannock, and Caribou counties have erosion rates less than 0.5 tons per acre per year while lands in these counties that are used for dryland crop production have erosion rates that range between 1.0 and 10 tons per acre per year.

In 1979, approximately 16 percent of the total acres in Bonneville, Bannock and Caribou counties were used for dryland farming, yet these acres accounted for the majority of erosion (USDA 1979). Since that time many privately owned acres adjacent to and surrounding the Forest have been converted to the Conservation Reserve Program where soils are conserved by planting and maintaining perennial vegetation. Erosion rates have been reduced and soils have been conserved on lands where this program has been applied. Cumulatively, erosion rates from any alternative are not expected to vary greatly from the existing condition when considering adjacent lands

Irreversible and Irretrievable Effects

There are no expected irreversible effects or commitments to long-term productivity. Irretrievable effects and commitments include the loss of the productive soil base from mining, road, and trail building and the requirement for other facilities, such as campgrounds, trail heads, and parking areas. The table below displays the expected total soil resource commitment for each alternative.

- *Table 4. 122 Total Soil Resource Commitment by Alternative.*

Alternative	Potential Total Soil Resource Commitment
Alt 1	1,795
Alt 2	1,767
Alt 3	1,864
Alt 4	1,643
Alt 5	1,641
Alt 6	1,592
Alt 7	1,646
Alt 7R	1,640

These irretrievable effects and commitments should be reduced in each alternative as mining acres are reclaimed and in alternatives where roads will be closed and obliterated.

Threatened, Endangered, and Sensitive (TES) Plant Species

Indicator:

- **Viability risk analysis for plant TES (includes proposed sensitive) based on known occurrences and habitat outcomes for each alternative.**

Analysis Methods

LEGAL FRAMEWORK

LAWS, REGULATIONS AND POLICIES

Laws, Regulations, and Policies [36 CFR 219.27 (g)] of NFMA require that "...management prescriptions...shall preserve and enhance the diversity of plant and animal communities, including endemic, and desirable naturalized plant species...reductions in diversity of plant and animal communities and tree species...may be prescribed only where needed to meet overall multiple use objectives."

The Endangered Species Act of 1973 as amended 1978, 1979, 1982, and 1988 [16 U.S.C. 1531 et seq.] sets forth the requirement for all agencies to conserve endangered and threatened species. Section 5 directs the Secretary of Agriculture to establish and implement a program to conserve fish, wildlife and plants, including federally listed species. Section 7 directs agencies to "ensure that actions...do not result in destruction or adverse modification of their critical habitats".

USDA, Department Regulation 9500-4 provides direction that expands viability requirements to include plant species. The Secretary of Agriculture's policy on wildlife, fish, and plant habitat directs the Forest Service to "manage habitats for all existing native and non-native plants in order to maintain at least viable populations of such species". It requires that habitat goals for threatened or endangered plants, or species with special habitat needs, be established in the forest planning process. It also states that monitoring activities will be conducted to determine results in meeting population and habitat goals, and directs "activities and programs to assist in the identification and recovery of threatened and endangered plant species, and to avoid actions which may cause a species to be become threatened or endangered."

The Forest Service management policy (FSH 2609.25,1.25, 1988 and FSM 2670) ensures that for all TES plant species, the following measures will be taken: (1) biological evaluations will be written for all activities that may impact sensitive species and their habitat; (2) "effects" of activities will be determined as similar to those for threatened, endangered, or proposed species; and (3) sensitive species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for federal listing. This management policy will be employed at a species level in all alternatives to ensure mandates are achieved and that sensitive species are conserved.

Forest Plan Direction and Implementation

Forest Plan direction and implementation, including Goals, Objectives, Standards, and Guidelines, have been designed to achieve desired future conditions for plant species biodiversity over the long-term. Rare communities, not unlike rare species, may also increase or decrease in abundance or quality, based upon activities associated with alternative emphasis or prescription categories. To ensure the viability and conservation of all plant species, Forest Plan direction for plant species diversity will be implemented at the appropriate scale for all alternatives.

VIABILITY RISK AND UNCERTAINTY ANALYSIS

Risk--General

To assess the "continued existence" of a species, it may be best expressed through varying levels of risk. A risk Assessment includes reviews of risks to species habitat or populations at the Forest-wide scale. Three levels of risk have been used: low, medium and high.

Low risk – A high likelihood exists that the populations would meet population viability criteria. Effects to individuals and habitat are unlikely and short-term; populations and habitat are expected to be maintained or improved in the long-term.

Moderate risk – An intermediate likelihood exists that populations would stabilize. Impacts to individual populations and habitat may occur in the short-term; populations and habitat expected to be maintained in the long-term.

High risk – It is unlikely that species populations would be maintained. Effects on individual populations and habitat from direct and indirect impacts are expected to be chronic in the short-term; maintaining populations and habitat in the long-term is expected to be low.

Uncertainty

Federally-listed and Region 4 Sensitive Species (current and proposed) on the Forest vary in their distribution and habitats, in the number and types of threats they face, the degree to which Forest management has affected their status, and in the amount of knowledge available to make meaningful predictions of effects of the alternatives on their long-term viability. In addition, rare plants are distributed on the landscape in a fine-grained pattern and the full extent that rare plants exist on the Forest is not fully known. Data and specific models of habitats and populations are lacking by which to quantify likelihood of extirpation and continued existence. The emphasis was qualitative and focused on distribution of occupied habitat provided under planning alternatives. A few basic scientific studies are available the on life history and ecological requirements for species or closely related species.

Causes of rarity can vary greatly for individual plant species. Species may be intrinsically rare or rare as a result of human activities. Other plant species may be rare due to their population ecology, evolutionary history, or basic reproductive biology. Historic or current anthropogenic activities may also contribute to the current distribution of these rare plants. It is assumed in this analysis that certain management actions may promote or detract from the potential long-term viability of TES plant species, or may increase or decrease the availability or quality of habitats that support these plant species.

Effects Common to all Alternatives

Threats are assessed below for their direct and indirect effects to plant populations and habitats. Impacts are grouped into four management actions that have the most potential to affect rare plants: 1) fire (wild and fire use); 2) livestock grazing activities; 3) recreational activities; and 4) mechanical activities. The intensity and spatial extent of the management actions vary by alternative. The direct and indirect impacts to rare plants associated with each of the management actions are described below.

FIRE (WILDFIRE AND FIRE USE)

All of the alternatives have an associated management goal of returning fire to the landscape as an ecological process. Many areas will require mechanical preparation of fuels before fire can be re-introduced as a management tool. The alternatives stress varying amounts of fire and mechanical fuel treatments. The risk of prescribed fire needs to be weighed against the risks of uncharacteristic wildfire and long-term habitat loss of plant species. Direct and indirect impacts can also occur to plants associated with wildfire suppression activities and burn area restoration activities. Examples are: road construction and other mechanical activities; salvage logging; reforestation and seedings following fire. The increased potential for the spread of invasive species, especially noxious weeds, is also An indirect effect of these activities.

LIVESTOCK GRAZING ACTIVITIES

Various direct and indirect impacts are associated with livestock grazing. Direct impacts include livestock trampling, herbivory, congregation and associated soil disturbances, and

ORV use by range riders. Indirect impacts are more varied. These include the increased potential for the spread of noxious weeds and associated herbicide spraying, the introduction of exotic species, and changes in species composition and species densities. These changes can affect the habitat available for rare plant species. Livestock often use and congregate in riparian areas and meadows, which can also alter species composition and change the habitat. Additionally, these changes in vegetation and bank stability can affect hydrological cycles, further stressing plants that depend on stable hydrological conditions. Plant species in the Intermountain West have evolved with herbivory by native species, thus some species could benefit from livestock grazing in the absence of native grazers at appropriate intensity levels.

RECREATIONAL ACTIVITIES

The most important direct impact to plants related to recreation activities is trampling. Road construction and the development of campgrounds and other facilities used by recreationists also impact plants, as these developments make more areas accessible and concentrate use. Dispersed camping and recreation have similar impacts, which are more difficult to monitor. Parking areas, particularly when undesignated areas are used, pose similar impacts to plants. Roads and trails encourage the spread of noxious weeds, and increase the accessibility of areas to livestock grazing, which can increase the impacts of trampling, herbivory, and congregation.

MECHANICAL ACTIVITIES

Mechanical activities include vegetation management treatments, whether for restoration or to meet growth and yield objectives. Activities such as logging can impact rare plants and their habitat through canopy removal, soil disturbance and subsequent erosion, and stream sedimentation. Mining activities could impact plants through road building, vegetation removal, mineral extraction, and other related actions. In addition, mechanical activities for vegetation treatment may require road building. Roads increase access to and fragment habitat and provide an avenue for weed invasion. They are sometimes placed on ridge tops, in riparian areas, or through scree slopes, which are important habitats for a number of species. Reconstruction and maintenance of existing roads can directly or indirectly affect plant populations by introducing competitive weeds and altering availability of light, nutrients, and moisture.

Effects Analysis by Species

THREATENED, ENDANGERED, AND SENSITIVE SPECIES

The current and potential threats to each individual TES plant species were determined from current scientific literature and professional botanical knowledge and expertise. The process included using GIS technology, to create Table 4.123 by overlaying prescriptions with the most current distribution information for element occurrences of TES plant species for each alternative. Species associated with riparian/wetland habitat would occur in most prescriptions under 2.8.3 (Aquatic Influence Zone) that is not included in this table because it is not a GIS-mapped prescription. *Lesqurella multiceps* is not included in this table, because many new occurrences have not been updated in the Idaho Conservation Data Center element occurrence records. Wasatch bladderpod is known from the Bear River Range, and occurrences are currently being surveyed and documented by Michael Mancuso (July 2002); the species is more common then originally thought. Most populations would be within 1, 2, or 3 prescription areas, except for Alternative 3 where they would be within the 5 prescriptions, as well.

- *Table 4. 123. Location of Known Species (Current & Proposed) Plant Occurrences By Prescription.*

Species	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 7(R)
Cache penstemon (*Penstemon compactus*)	1.3(a), 3.2(b), 5.1(b)	1.3(a&d), 5.1(b)	3.2(b), 5.1(b)	1.3(a), 3.3(d)	1.3(a&d), 3.3s(e),	1.3(e), 3.2(d)	1.3(b), 3.2(b&d)	1.3(e), 3.3(b) 5.2(b)& 3.2(b)
Green Spleenwort (*Asplenium viride*)	1.3(d)	1.3(d)	5.1(b)	3.3(d)	1.3(d)	3.2,1.3(e)	2.1.1(e)	2.1.1(e)
Idaho Sedge (*Carex parryana* ssp. *Idahoa*)	6.1(b&c), 8.1u	6.1(b&c), 8.1u, 2.7.1(b&c)	5.1(b&c) 6.1(b&c), 8.1u, 8.1	2.1.2, 2.7.2(b) 3.3(d), 5.3(b), 6.3(b), 8.1u	2.1.2, 2.7.2(b), 3.3(b), 5.3(b), 6.3(b&c), 8.1u	1.3(e), 2.1.2, 2.7.2(b), 3.2(d), 3.3(d), 5.4(d), 8.1u,	2.1.2, 2.7.2(b) 6.3(b&c), 8.1u	2.7.2(d), 3.2(b), 5.2(c) 6.2(b) & 8.1
Payson's bladderpod (*Lesquerella paysonii*)	3.2(b)	3.2(b)	3.2(b)	1.3(b), 3.3(b)	1.3(b)	1.3(e)	1.3(b), 3.3(b)	2.1.4(b)
Red Glasswort (*Salicornia rubra*)	8.1, 2.5	8.1u, 2.5	8.1, 2.5	8.1, 2.5	8.1, 2.5	8.1, 2.5	8.1, 2.5	2.5, & 8.1
Rydberg's musineon (*Musineon lineare*)	1.3 (d)	1.3(d)	5.1(b)	3.3(d)	1.3(d)	1.3, 3.2,	2.1.1, 3.2(d)	2.1.1(e), 3.2(b)
Starveling milkvetch (*Astragalus jejunus* var. *jejunus*)	6.1(b)	6.1(b)	6.1(b)	2.1.2, 2.7.1(b), 3.3(b)	2.1.2, 2.7.1(b), 6.3(b)	2.1.2, 2.7.1(b) 3.3(d)	2.1.2, 2.7.1(b), 6.3(b)	2.1.2(b), 2.7.1(d), 6.2(b)
Uinta Basin Crypthantha (*Cryptantha breviflora*)	6.1(b)	2.7.1(b), 6.1(b),	2.7.2(b), 6.1(b)	3.3(b&d), 2.1.2, 2.7.1(b)	2.7.1(b), 6.3(b)	2.7.1(b), 3.3(d)	2.1.2, 6.3(b) 2.7.1(b)	2.7.1(d), 6.2(b)

CACHE PENSTEMON (PENSTEMON COMPACTUS)

Direct and Indirect Effects

Cache penstemon can be found along ridgelines and summits on carbonate substrates in the southern end of the Bear River Range. Potential habitat exists within the Cache Valley Front and the Bear River Highlands subsections at high elevations, primarily within the Mt. Naomi proposed Wilderness areas. In 2002, when the populations were last visited, no anthropogenic threats to the species or its habitat were evident. Historically, sheep grazing and other impacts to the area may have had an impact on the species, either directly by trampling and consumption, or indirectly by impacting the tall forb communities in the adjacent habitat of the species by reducing the associated species available to pollinators. Tall Forb restoration activities are not proposed to occur in the area of the known populations and would not directly or indirectly impact the species. Restoration activities, if successful, could have a cumulative beneficial effect on the species by increasing the pollinator population within the area.

Populations and habitat within Category 1 prescriptions would be the most protected; within Categories 3 and 5 the populations would be less protected, due to the increased potential of active management and motorized travel along roads and trails within these categories. No populations are known or expected to occur in areas where cross-country travel would be allowed.

Overall, potential impacts to the species could increase if the protective status of the areas or the cross-country travel designation were changed within potential habitat. Alternative 6 would have the highest potential of protecting (low risk) the species from impacts due to the higher percent of the Bear River Range and Cache Valley Front within Category 1 prescriptions (twenty-four percent of Bear River Subsection and thirty-one percent of the Cache Valley Front). Alternatives 4, 5, 7, and 7R do not contain as many acres within Category 1 prescription; however, the potential of impacts to the species is still considered low due to the species habitat in areas of low threats. In Alternatives 1 and 2, Cache penstemon is also found in Prescription 5.1(b) that may pose a moderate risk to the species in site-specific areas due to the increased potential of active management. Alternative 3 would present a higher potential of impacting the species (moderate risk) due to the elimination of all proposed wilderness designations. No alternative would prescribe conditions where the viability of the species could not be sustained by site-specific protection/avoidance actions.

Cumulative Effects

Cache penstemon is endemic to lands managed by the Wasatch-Cache and Caribou National Forests. One of the largest populations is known to occur in the Naomi Peak vicinity in Utah with an estimated one thousand to ten thousand plants. Management of the species habitat is expected to be consistent with the species long-term persistence throughout its range, due to the high percent of species' occurrences and habitat within proposed or designated wilderness.

GREEN SPLEENWORT (*ASPLENIUM VIRIDE*)

Direct and Indirect Effects

Green spleenwort is a boreal species sparsely distributed throughout the United States, Canada and Newfoundland. On the Forest the only known population is associated with the Bloomington Lake Cirque within a chute that retains snow throughout most of the summer, creating a unique microsite of unusually cool/moist climatic conditions. The other nearest populations of the species is north on the Targhee and south into Utah at higher elevations.

Subsections with potential habitat include Cache Front, Bear River Mountains and Caribou Range Overthrust Mountains; however, it is likely to be limited to the microsite conditions only found to occur at Bloomington Lake within the Bear River Range. The species is associated with rock crevices and cliff faces that tend to have low threats. All alternatives would result in a low impact on the species. Alternatives 7 and 7R would be the most beneficial to the species by establishing Bloomington Lake Cirque as a "Special Management Areas" (Prescription 2.1.1). Alternative 3 would be the least beneficial by removing all proposed wilderness designations.

Cumulative Effects

Range-wide, land ownership, land management, threats, and viability vary widely for this species. Green spleenwort also is considered rare in California, Colorado, Maine, Michigan, New York, Oregon, South Dakota, Utah, Vermont, Wisconsin, Wyoming and various locations in Canada. Individual populations are often small and highly localized. Threats to the species can include natural events, such as wildfires and landslides, logging, trampling or over-collection.

IDAHO SEDGE (*CAREX PARRYANA* SSP. *IDAHOA*)

Direct and Indirect Effects

Idaho sedge is found on the Forest within the Caribou Range Overthrust Mountains subsection. Potential habitat also exists within the Webster Ridges and Valleys Subsection. Range-wide, it is rare to infrequent and very local. Habitat includes meadows, swales, and low, moist ground around streams and lakes, which tend to be areas where cattle congregate. Graminoids (grasses, sedges & rushes) are adapted to grazing and usually are able to persist with light to moderate grazing pressure. This suggests that Idaho Sedge would persist under light to moderate grazing but would decline with chronic heavy grazing (Lesica, 1998).

This species would benefit proportionally to the number of streams at risk or nonfunctioning improved and the maintenance of streams that are functioning properly.

On Forest, the species is found in areas of active mining, which impacts a portion of the species metapopulation. This is a localized impact that does not vary by alternative.

Overall, the risks to the species vary by alternative relative to the potential to protect/improve riparian areas (See Riparian section). Alternative 6 would result in the least risks to the species. Alternatives 4 and 5 would result in a low risk, and Alternatives 2, 7, and 7R would have a low to moderate risk. Alternatives 1 and 3 would have a moderate risk to the species.

Cumulative Effects

Idaho sedge is known to occur in Idaho and Montana, primarily on lands managed by the Forest Service and BLM or owned by the States of Montana and Idaho. The metapopulation on the Forest and adjacent lands is disjunct from the larger populations of the species in southwest Montana and other areas bordering Idaho. Almost all populations are in areas grazed by cattle. Other threats include mowing (private land), mining, and road construction/maintenance. In almost all known populations, Kentucky bluegrass is a common associated species. This exotic species is a rhizomatous grass that may out compete Idaho sedge, especially in the presence of grazing and trampling by livestock (Lesica, 1998).

PAYSON'S BLADDERPOD (*LESQUERELLA PAYSONII*)

Direct and Indirect Effects

The one known location for Payson's bladderpod on the Forest is on Caribou Mountain. Potential habitat (calcareous gravel and rock) within the range of the species can be found within the Caribou Range Overthrust Mountains subsection. The population was first discovered in the 1920s or 1930s. The population level from this early time is unknown, however, the plant has persisted as a vigorous population here for the last sixty years (Moseley, 1996). Effects of the alternatives to the known population would not vary greatly for this species. However, the species' suitable habitat and unknown populations can be impacted by road construction and maintenance, off-road use, and livestock grazing by trampling and indirectly by the potential spread of invasive plants and the treatment of noxious weeds.

Alternatives that decrease the impact of off-road use and have the lowest upland utilization standards would benefit the species. Alternative 7R would be the most beneficial to the species by establishing the area within 2.1.4 (Special Interest Area); however, all the alternatives would have a low risk of impacting the species.

Cumulative Effects

Payson's bladderpod is a regional endemic that can be relatively common when found. In Idaho and Wyoming forty-two occurrences of the species are known with populations ranging is size from ten individuals to many thousands of individuals in areas between one to thirty acres. Range-wide, the species appears to be secure with few threats to its long-term viability. Threats to this species may include recreation (hiking and off-road vehicles), ski developments, power lines, and mining. Overall range-wide, threats appear to be low at most sites.

RED GLASSWORT (*SALICORNIA RUBRA*)

Direct and Indirect Effects

The known occurrences of red glasswort on the Forest occur at Elk Valley Marsh and Stump Creek Guard Station. Data for Elk Valley Marsh indicate thousands of individuals in a twenty-acre area (CDC, 2001). No data is available for the Stump Creek population. Impacts to Elk Valley Marsh from livestock grazing have been documented (Jankovsky-Jones 1997, and Jankovsky-Jones, *et al*, 1999).

The potential risks to the known occurrence on the Forest are the same for all alternatives, except for Alternative 7R, which does not consider Elk Valley Marsh as suitable and directs closure of the area on an opportunity basis. If the opportunity occurs, the closure of Elk Valley marsh to grazing would be a benefit to the species. In each alternative Elk Valley Marsh is recommended as a Wild and Scenic Eligible Recreation river (Prescription 2.5), and Stump Creek Guard Station would be managed under Prescription 3.1. These two prescriptions are applied consistently across all of the alternatives and do not vary.

Overall the risk to the species potential habitat elsewhere on the Forest varies by alternative relative to the potential to protect/improve riparian areas (See Riparian section). Alternative 6 would result in the lowest risk to the species, because of the riparian standards and reduction of grazing in Bonneville and Yellowstone cutthroat trout stronghold watersheds. Alternatives 4 and 5 would result in low risk, and Alternatives 2, 7, and 7R would result in a low to moderate risk. Alternatives 1 and 3 would result in a moderate risk to the species.

Cumulative Effects

Ten known occurrences of the species are known in Idaho on lands managed by the State of Idaho, the BLM and on some lands in private ownership. Many of these populations are large with no apparent threats to long-term viability. Threats to the species can include alteration of hydrologic cycles, grazing, and agriculture conversion. Populations persist with light grazing, but numbers decline as ground becomes hummocky (Jankovsky-Jones, 1997).

The population for red glasswort at Elk Valley Marsh is one of the largest in Idaho. None of the alternatives promotes overgrazing or changing the hydrologic regime at the marsh. Viability of this population will not be impacted per Plan direction.

RYDBERG'S MUSINEON (*MUSINEON LINEARE*)

Direct and Indirect Effects

The known occurrences of Rydberg's musineon on the Forest are associated with the headwalls of the Bloomington Lake Cirque. It is a northern disjunct population of a rare endemic to the Bear River Range. Potential habitat for the species may occur elsewhere within the Bear River Range in Idaho, generally in areas associated with limestone cliff faces, rock crevices and ledges between 5,300 and 9,300 feet. However, the unique habitat of Bloomington Lake is likely to be the only place it is found. No apparent anthropogenic threats to the species are known. The isolation of the species and its small size make it more vulnerable to extirpation in Idaho (Moseley, 1992).

Overall, potential impacts to the species are low overall for all alternatives based on the species habitat condition. The population was last surveyed in 2002 and no threats current or potential anthropogenic threats were found. Alternatives 7 and 7R would be the most beneficial to the species by placing Bloomington Lake Cirque under prescription 2.1.1 (Special Management Area).

Cumulative Effects

Rydberg's Musineon is one of the most frequently encountered among several endemics of the calcareous rock outcrops in Logan Canyon, Utah and vicinity. The population in Idaho is significant in that it is disjunct from the Utah population and the only population in the State of Idaho. None of the alternatives are expected to contribute to potential negative cumulative impacts.

Starveling Milkvetch (*Astragalus jejunus* var. *jejunus*) & Uinta Basin Crypthantha (*Crypthantha breviflora*)

Direct and Indirect Effects

Starveling milkvetch and Uinta Basin Crypthantha populations are restricted to exposed Twin Creek Limestone substrate: a raw, loose, and eroding shale generally found in non-forested vegetation. This substrate occurs on the Forest in the Preuss Ridge and Hills subsections.

Threats to the species include livestock grazing (primarily trampling), prospecting, road improvements, and off-road vehicles (Mancuso, 1990). Habitat where the species occurs would not carry fire to any great extent. No direct impacts from fire are expected. Suppression activities associated with a wild or prescribed could have short-term impacts on the species from trampling and ground disturbance. These impacts would be short-term and not expected to have a long-term impact on the viability of the species. Twin Creek Limestone substrate is naturally eroding and easily disturbed. This indicates the species has adapted to disturbance and may benefit from disturbance.

Management actions that are continuous or compact the soils such as trails and roads, including cattle trails would have the greatest impact on the species. Invasive species do not appear to be increasing within the suitable habitat of this species on the Forest but can be found in adjacent habitat. Invasive species or noxious weed spraying could adversely impact the species in site-specific areas.

Overall, the risks to Starveling milkvetch and Uinta Basin *Crypthantha* can be mitigated at the site-specific level, due to their high affinity to a specific area and substrate. Comparison of the alternatives for risks to these species indicates that risks would vary, but would be low to moderate.

Cumulative Effects

Starveling milkvetch is known to be locally abundant in parts of its range in Utah and Wyoming with no apparent threats to its long-term viability. Uinta Basin *Crypthantha* can be locally common in Utah and is not tracked as rare for the State of Utah. In Idaho, populations of Uinta Basin *Crypthantha* and Starveling milkvetch occur on lands managed by the Forest Service and the Idaho Falls District BLM, as well as lands under private ownership. Populations in Idaho tend to be local, usually small, and restricted to a narrow set of habitat conditions. Certain direct and indirect impacts could inadvertently destroy parts of a population. Individually, these impacts would not be expected to impact the long-term viability of the species, but when viewed in the aggregate, their potential cumulative impacts may affect the species long-term viability in Idaho.

Monitoring included in the Forest Plan should detect if this is occurring. All site-specific projects in or near the species habitat or populations will be evaluated to insure the species habitat is not adversely impacted.

WASATCH BLADDERPOD (*LESQUERELLA MULTICEPS*)

Direct and Indirect Effects

This rare endemic is locally common within the Bear River Range in dry gravelly areas usually associated with limestone. Potential threats are most likely related to roads (construction and maintenance), trails, various recreational activities, and sheep grazing. The species' habitat tends to have low threats overall indicating that all activities would have a low impact on the species. Alternatives 7 and 7R would be the most beneficial to the species by establishing Bloomington Lake Cirque as a "Special Management Area" (Prescription 2.1.1). Alternative 3 would be the least beneficial by removing all proposed wilderness designations.

Cumulative Effects

Wasatch bladderpod is a regional endemic plant that is relatively common in the Bear River Range when found. With low threats overall, no measurable cumulative effects are expected.

Irretrievable/Irreversible Effects for all TES plant Species

Alteration of vegetation conditions that present irretrievable/irreversible impact to TES plant species can involve many different activities such as mining, building of permanent roads, and activities that permanently change the hydrology of a given area. What may be an irretrievable/irreversible effect to one rare species may create habitat for another, such as species that are dependent on disturbance events.

Scale of Analysis:

Forest-wide by watershed. A Wild & Scenic Rivers Eligibility process was conducted in 1998. More than 230 streams were evaluated in three separate screens. A regionally significant area was delineated for comparison purposes, which included all watersheds that drain into the Snake River, Bear River, or Salt River.

Because Forest Plan Wild & Scenic River acres do not change among Alternatives, and management direction will be consistent in all Alternatives, no Wild & Scenic River indicator was developed.

Direct and Indirect Effects

The 1998 Wild & Scenic Rivers Eligibility Study for the Caribou National Forest identified two sites that are eligible for study: approximately six miles of St. Charles Creek and a 200-acre complex on Spring Creek called Elk Valley Marsh. A .25-mile river corridor was established on these two sites. Management prescription 2.5 (Wild & Scenic Eligible Recreation River) delineates these corridors. This prescription was applied consistently across all Alternatives.

The Wild and Scenic River Act requires that sites found to be eligible for further study "must be administered in such a way as to protect and enhance the values that made them eligible for the National System, but not to limit other uses that do not substantially interfere with public use and enjoyment of these values" (Interagency Wild & Scenic rivers Coordinating Council, 1999). River segments not considered eligible for Wild and Scenic River designation would not receive the interim management direction associated with that status. Riparian areas would still receive protection under management direction for Aquatic Influence Zones on rivers determined to be "not-eligible."

The types and amounts of activities and changes acceptable within a tentatively eligible river corridor depend on whether it is classified as a Wild, Scenic, or Recreational River. Regardless of classification, free-flowing values, river-related values, and tentative classification must be maintained.

Free-flowing values of eligible sites cannot be modified to allow stream impoundments, diversions, channelization, and/or riprapping to the extent authorized under law. River-related values must be managed to protect the outstandingly remarkable value(s), subject to valid existing rights; to the extent practicable, management actions should enhance these values. Development of eligible sites and their corridors should not be modified, subject to valid existing rights, to the degree that the tentative river classification would be affected (that is, changing a Scenic River to a Recreational River classification).

Both the St. Charles site and the Elk Valley Marsh site are classified as Recreational under the Act. A Recreational River classification places fewer constraints on management and development activities, although the potential for new diversions and hydroelectric power generation is foregone. Generally, existing uses may continue unless they clearly threaten the identified outstandingly remarkable values that made the site eligible.

Timber may be harvested, although visual constraints can increase the cost of logging or reduce outputs. Mining can occur, but would be subject to visual and other resource constraints. Road and campground construction are allowed, as is livestock grazing and other forms of agriculture. Fire use is allowed but should be compatible with recreational uses in the area. Motorized travel is generally allowed but can be restricted to protect river values.

Effects are described briefly for those resource programs that could have the most influence on river values.

SPECIAL USES

New impoundments or diversions could disqualify a river from eligibility for Wild and Scenic River designation. The heart of the Act is the protection of the free-flowing character of eligible sites.

MINERALS MANAGEMENT

Mineral or energy exploration and development could affect scenery, water quality, and habitat by activities such as excavation, drilling, tailings, and the construction of buildings and access roads. These changes could have short and long-term effects on eligibility.

LIVESTOCK GRAZING

Livestock use would not affect a river's eligibility but could have minor short- and long-term effects on vegetation, scenic, and recreational values within the river corridor. In Alternative 7R livestock grazing in Elk Valley Marsh and St. Charles would be phased out on an "opportunity" basis. This direction is to protect the important botanical and fisheries values of the areas, not because they are wild and scenic eligible rivers. All other alternatives would allow livestock grazing to continue to the extent it does not impair or diminish the outstandingly remarkable values that make these two sites eligible for further study for inclusion as a Wild & Scenic River.

VEGETATION MANAGEMENT

Timber harvest could reduce eligibility by negatively affecting vegetation, scenery, and recreational values and by constructing access roads. Harvest could also be used to improve scenery and recreational values over time, which could benefit eligibility over the long-term. Fire activities would also affect scenery, vegetation, and recreational values in the short-term but would not likely reduce eligibility of either site over the long- term. Wild and Scenic River eligibility designation for the two sites removes about 2,200 acres from the suited timber base. Although timber harvest may be permitted to maintain and enhance the outstandingly remarkable values of these eligible sites, any timber removed would not be part of the Forest's Allowable Sale Quantity.

RECREATION AND SCENERY MANAGEMENT

Recreation developments, facilities, and use patterns would not necessarily reduce eligibility of the two sites, but improvements to existing or new facilities would need to maintain or enhance the outstandingly remarkable values of the sites. The effects of scenery management would depend on the visual quality objectives that are assigned to the river corridors and the degree to which visual change would be allowed. Preservation and retention objectives emphasize maintaining a natural-appearing landscape, which would benefit river corridors and eligibility. Modification objectives that allow more evident signs of development could have a short and long-term reduction in maintaining site eligibility.

Cumulative Effects

The identification of an area as eligible under the Wild & Scenic Rivers Act would not have any cumulative effect in any of the alternatives, unless it was determined that outstandingly remarkable values were being degraded from various activities or use levels. For example, if though a site-specific analysis, it was determined that recreation use, livestock grazing, or a combination of other activities in the river corridor were detrimental to maintain outstandingly remarkable values on the two eligible sites, then a reduced level or an elimination of the use or activity would occur.

Irretrievable/Irreversible Effects

For as long as Prescription 2.5 is applied to eligible river corridors, timber production from the 2,200 acres would be irretrievably lost. If both sites are determined to be "suitable" as a result of a suitability study during the planning period, these acres would continue indefinitely to be irretrievably lost to commercial timber production. If the sites were found to be "unsuitable," these acres would then be available for other resource uses.

Caribou-Targhee NF

Caribou-Targhee NF
1405 Hollipark Dr.
Idaho Falls, ID 83401
(208) 557-5760

Final Environmental Impact Statement

Caribou Revised Forest Plan
Chapter 5—List of Preparers

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Chapter 5

List of Preparers

The interdisciplinary team is made up of core members and contributing members. Core members' names and titles are shaded. The core members were involved in all steps of the NEPA process. Contributing members are generally less involved in process; providing background information and analysis for their area of expertise only, for example. Other people were consultants and they are listed as "Other contributors". The Caribou Zone Forest Leadership Team also contributed information and decided upon the preferred alternative. It should also be noted that there have been many Supervisor's Office, Ranger District personnel and members of the public contributing information to the interdisciplinary team process.

INTERDISCIPLINARY TEAM

CHERYL PROBERT – ID TEAM LEADER, FOREST PLANNER, NEPA, APPEALS AND LITIGATION COORDINATOR

Sections in EIS: NEPA and NFMA Compliance, Quality Control, Plan Editor
Education: B.S. Forestry, Range Management
Years with Forest Service: 15 Years

LINDA WARD – MANAGING WRITER/EDITOR

Sections in EIS: Managing Writer/Editor, Document and Project Record Preparation
Education: B.A. English/Liberal Arts
Years with Forest Service: 14 Years

Lynn Ballard – Public Affairs Officer

Section in EIS: Public Involvement
Education: B.S. Forest Resource Management
Years with Forest Service: 27Years

DAVID BETZ – FIRE ECOLOGIST

Sections in EIS: Ecosystem Disturbance, Fire Management
Education: M.S. Forest Ecology
Years with Forest Service: 13 Years

James Capurso – Fisheries Biologist

Sections in EIS: Fisheries
Education: AAS Natural Resource Conservation, B.S. Wildlife Science with graduate studies in Environmental Science, Policy and Law
Years with Forest Service: 19 Years

Matt Cummins – GIS Specialist

Sections in EIS: Maps, Database Management
Education: B.S. Computer Science
Years with Forest Service: 6 Years

WALT GROWS – RANGE SPECIALIST

Sections in EIS: Livestock Grazing, Unique Ecosystems (RNAs), Noxious Weeds
Education: B.S. Resource Management
Years with Forest Service: 27 Years

ROSE LEHMAN – BOTANIST

Sections in EIS: Rare Plants
Education: B.A. Biological Sciences Botany Emphasis
Years with Forest Service: 9 Years

R. LEE LEFFERT – HYDROLOGIST

Sections in EIS: Fisheries, Aquatics, Water Quality, Riparian and Watershed
Education: B.S. Watershed Science
Years with Forest Service: 29 Years

JOHN LOTT – SOIL SCIENTIST

Sections in EIS: Properly Functioning Condition, Non-forested Vegetation, Soils and Air Quality
Education: B.S. and M.S. Agronomy (Soils emphasis)
Years with Forest Service: 25 Years

CAROL LYLE, ECOSYSTEM, PLANNING, AND FIRE BRANCH CHIEF

Sections in EIS: Livestock Grazing, Noxious Weeds
Education: B.S. Physical Geography, B.S. Range Science
Years with Forest Service: 29 years

MARTHA MOUSEL – GIS SPECIALIST

Sections in EIS: Maps, Databases, GIS Analysis
Education: B.S. Forest Management
Years with Forest Service: 20 Years

Mark Orme– Wildlife Biologist

Sections in EIS: Wildlife Habitat Management
Education: B.S. Forestry; M.S. Wildlife Management
Years with Forest Service: 26 years

Bruce Padian – Forester

Sections in EIS: Forested Vegetation, Timber Program
Education: B.S. Forestry
Years with Forest Service: 27 Years

Steve Robison – Mineral Management Specialist

Sections in EIS: Minerals, Geology
Education: B.S. Geology, M.S. Paleontology
Years with Forest Service: 24 Years

Julie Schaefers – Social Scientist, Rocky Mountain Region

Sections in EIS: Social and Economic Environment
Education: B.S. Forest Recreation Management, M.S. Natural Resource Economics
Years with Forest Service: 12 Years

Randy Tate - Forest Engineer

Sections in EIS: Transportation
Education: B.S. Civil Engineering
Years with Forest Service: 25 Years

Deb Tiller – Landscape Architect/Recreation Specialist

Sections in EIS: Recreation and Access, Recommended Wilderness, Roadless Areas
Education: B.A. Landscape Architecture
Years with Forest Service: 17 Years

Randy Thompson – Archeologist

Sections in EIS: Heritage Resources
Education: B.A. Anthropology, M.S. Anthropology in progress
Year with Forest Service: 3 years

Kelli Peck - Office Automation Clerk

Sections in EIS: Graphic Design, Project Record Preparation and Database Assistant
Education: Cert. A.S. Management
Years with Forest Service: 2 Years

Cynthia Hohbach – NEPA and Appeals Coordinator

Sections in EIS: Document Editing
Education: B.A. History
Years with Forest Service: 1 Year

PAST IINTERDISCIPLINARY TEAM MEMBERS

Scott Feltis, Forest Wildlife Biologist, Deceased
Betsy Hamann, Wildlife Biologist
John Hamann, Soil Scientist
Paul Oakes, Forest Planner, Team Leader
Ric Rine, Branch Chief, Planning and Information System Technology
Judy Warrick, GIS Specialist

OTHER AGENCY CONTRIBUTORS

Gary Vecellio - Wildlife Biologist

Education: M.S. Wildlife Science
Years with Idaho Fish and Game: 8 Years

Brad Compton - Regional Wildlife Manager

Education: M.S. Fish and Wildlife Management
Years with Idaho Fish and Game: 16 Years

Anders Mikkelsen – Fish and Wildlife Biologist

Education: B.S. Wildlife Management
Years with Shoshone Bannock Tribes: 7 Years

David Moser – Fish Biologist

Education: B.S. Fresh Water Fisheries, M.S. Stream Ecology
Years with Shoshone Bannock Tribes: 7 Years

FOREST LEADERSHIP TEAM – CARIBOU ZONE

Jerry Reese, Forest Supervisor
Dennis Duehren, District Ranger, Montpelier Ranger District
Dave Whittekiend, District Ranger, Soda Springs Ranger District
Jerry Tower, District Ranger, West Side Ranger District
Carol Lyle, Ecosystem, Planning, and Fire Branch Chief

Randy Tate, Acting Engineering, Lands, Recreation and Minerals Branch Chief
Anthony Varilone, Past District Ranger, Soda Springs R.D. (Retired)
John Newcom, Past District Ranger, Montpelier R.D. (Transferred)
Ric Rine, Past Planning Branch Chief (Transferred)
Wally Bunnell, Past Engineering, Lands, Recreation and Minerals Branch Chief (Ret)
Larry Mickelsen, Past Acting District Ranger, Soda Springs Ranger District

OTHER CONTRIBUTORS

Dr. Alma Winward, USDA-FS, Intermountain Region, Ecologist (Retired)
Dr. Clint Williams, USDA-FS, Intermountain Region, Ecologist
Jack Amundson, USDA-FS, Intermountain Region, Silviculturalist (Retired)
Rose Davis, USDA-FS, Intermountain Region, Public Affairs
Ali Abusaidi, Caribou-Targhee NF, Archeologist
Craig Morris, USDA-FS, Intermountain Region, Regional Analyst
Jim Merzenich, USDA – FS, Pacific Northwest Region, Regional Analyst
Kathie Hauser, USDA-FS, Intermountain Region, Communications Analyst
Bob Davis, USDA-FS, Intermountain Region, Regional Planning Specialist
Jeffrey Foss, USDA-FS, Intermountain Region, Regional Planner
Steve Solem, USDA-FS, Intermountain Region, Director: Planning-Appeals-Litigation

Caribou-Targhee NF

Caribou-Targhee NF
1405 Hollipark Dr.
Idaho Falls, ID 83401
(208) 557-5760

Final Environmental Impact Statement

Caribou Revised Forest Plan
Glossary

Glossary

Glossary of Terms in the Final EIS

Abiotic. Non-living. Climate is an abiotic component of ecosystems.

Access Management. Management of the ingress and egress of people on National Forest System lands. Generally used to describe motorized use allowed.

Acre-foot. A measure of water or sediment volume equal to the amount which would cover an area of one acre to a depth of one foot (325,851 gallons).

Adaptive Management. A type of natural resource management that implies making decisions as part of an on-going process. Monitoring the results of actions will provide a flow of information that may indicate the need to change a course of action. Scientific findings and the needs of society may also indicate the need to adapt resource management to new information.

Administrative Use. Authorized vehicle use of otherwise closed roads and/or areas to carry out forest management activities. Including but not limited to access for prescribed burning, fish and wildlife habitat improvement, timber sales, personal use firewood. Also includes use by permittees to conduct authorized activities.

Aerial Logging. Removing logs from a timber harvest area by helicopter. Fewer roads are required, so the impact to an area is minimized.

Affected Environment. The natural environment that exists at the present time in an area being analyzed.

Age Class. An age grouping of trees according to an interval of years, usually 20 years. A single age class would have trees that are within 20 years of the same age, such as 1-20 years or 21-40 years and so on.

Air Shed. A geographical area that, because of topography, meteorology, and climate, shares the same air.

Allotment (Range Allotment). The area designated for use by a prescribed number of livestock for a prescribed period of time. Though an entire Ranger District may be divided into allotments, all land will not be grazed, because other uses, such as recreation or tree plantings, may be more important at a given time.

Allowable Sale Quantity (ASQ). The amount of timber that may be sold from the area of suitable land covered by the Forest Plan for a time period specified by the Plan. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity.

Alluvial Fan. A body of unconsolidated material and debris flow, conical in shape, forming at the point where a stream emerges from a narrow valley onto a broader, less sloping valley floor.

Alternative. One of several policies, plans, or projects proposed for decision-making.

Analysis Area. See "Regional Analysis Area."

Animal Unit Month (AUM). The amount of forage required by one calf and her cow or 1 horse or 5 sheep for one month.

Appropriate Management Response. The specific actions taken in response to a wildland fire to implement protection and fire use objectives.

Appropriate Suppression Response. The suppression actions taken in terms of kind, amount, and timing on a wildland fire that most efficiently meet Fire Management direction under the current and expected burning conditions.

Aquatic Ecosystem. The stream channel, lake or estuary bed, water, biotic communities and the habitat features that occur therein.

Aquatic Habitat Types. The classification of instream habitat based on location within channel, patterns of water flow, and nature of flow controlling structures. Riffles are divided into three habitat types: low gradient riffles, rapids, and cascades. Pools are divided into seven types: secondary channel pools, backward pools, trench pools, plunge pools, lateral scour pools, dammed pools, and beaver ponds. Glides possess attributes of both riffles and pools and are characterized by moderately shallow water with an even flow that lacks pronounced turbulence.

Aquatic Influence Zone. Used in the context of a land management prescription, the area encompassing aquatic and riparian ecosystems and adjacent lands which directly affect the hydrologic, geomorphic, and ecological processes controlling aquatic and riparian ecosystem health and function.

Aquatic Macroinvertebrates. Invertebrates living within aquatic systems that are large enough to be seen with the naked eye, i.e. most aquatic insects.

Aquifer. A body of rock that is saturated with water or transmits water. When people drill wells, they tap water contained within an aquifer.

Aspect. The direction a slope faces. A hillside facing east has an eastern aspect.

Assessment. The Renewable Resource Assessment required by the Resources Planning act (RPA).

Avoidance Areas. Areas having one or more physical, environmental, institutional or statutory impediments to corridor designation. These are two types of avoidance areas:

> **Discretionary** -- areas that may be crossed by corridors only if necessary and reasonable mitigation or avoidance of significant impacts can be obtained.
>
> **Nondiscretionary --** areas that may not be crossed by corridors unless authorized by the appropriate official (for example, Governor, President, etc.)

Background. The visible terrain beyond the foreground and middleground where individual trees are not visible but are blended into the total fabric of the stand. (See "Foreground" and "Middleground".)

Backslope. The component of the hill slope that forms the steepest inclined surface and is frequently the principal element. The surface is dominantly steep and linear in profile and erosional in origin.

Bark Beetle. An insect that bores through the bark of trees to eat the inner bark and lay its eggs. Bark beetles are important killers of forest trees.

Basal Area. The area of the cross section of a tree truck near its base, usually 4.5 feet above the ground. Basal area is a way to measure how much of a site is occupied by trees. The term basal area is often used to describe the collective basal area or trees per acre.

Base Sale Schedule. A timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and this planned sale and harvest for any decade is not greater than the long-term sustained-yield capacity. (This definition expresses the principle of nondeclining flow.)

Big Game. Those species of large mammals normally managed for sport hunting.

Bio-accumulation. The process whereby living plants or animals incorporate a substance into their tissues, thus introducing the substance into the food chain. Often refers to hazardous substances.

Biological Control. The use of natural means to control unwanted pests. Examples include introduced or naturally occurring predators such as wasps, or hormones that inhibit the reproduction of pests. Biological controls can sometimes be alternatives to mechanical or chemical means.

Biological Diversity. The number and abundance of species found within a common environment. This includes the variety of genes, species, ecosystems and ecological processes that connect everything in a common environment.

Biological Growth-Potential. The average net growth attainable in a fully stocked natural forest stand.

Biological Potential. The maximum possible resource output limited only by inherent physical and biological characteristics.

Biomass. The total weight of all living organisms in a biological community.

Biomass Residue. Organic matter that can be used to provide heat, make fuel, and generate electricity. Wood, the largest source of biomass, has been used to provide heat for thousands of years. Other sources of biomass include plants, and residue from forestry operations.

Biome. The complex of living communities maintained by the climate of a region and characterized by a distinctive type of vegetation. Example of biomes in North American include the tundra, desert, prairie, and the western coniferous forests.

Biota. The plant and animal life of a particular region.

Biotic. Living. Green plants and soil microorganisms are biotic components of ecosystems.

BMP (Best Management Practices). Practices designed to prevent or reduce water pollution. Also referred to as Soil and Water Conservation Practices (SWCPs).

Board Foot. The amount of wood equivalent to a piece one foot long by one foot wide by one inch thick. Generally, five board feet log measure is approximately equivalent to 1 cubic foot of round wood.

Broadcast Burn. Allowing a prescribed fire to burn over a designated area within well-defined boundaries for reduction of fuel hazard, improve forage for wildlife and livestock, or encourage successful regeneration of trees.

Borrow Source. An area from which sand, gravel, or stone is taken for use in another area.

Browse. Twigs, leaves and young shoots of trees and shrubs that animals eat. Browse is often used to refer to the shrubs eaten by big game, such as elk and deer.

Buffer. A land area that is designated to block or absorb unwanted impacts to the area beyond the buffer. Buffer strips along a trail could block views that may be undesirable. Buffers may be set aside next to wildlife habitat to reduce abrupt change to habitat.

Cable Logging. Logging that involves the transport of logs from stump to collection points by means of suspended steel cables. Cable logging reduces the need for the construction of logging roads.

Canopy. The more or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth. It usually refers to the uppermost layer of foliage, but it can be used to describe lower layers in a multi-storied forest. The percent of a fixed area covered by the crown of an individual plant species or delimited by the vertical projection of its outermost perimeter; small openings in the crown are included.

Canopy Cover. Used to express the relative importance of individual species within a vegetation community or to express the canopy cover of woody species. Canopy cover may be used as a measure of land cover change or trend and is often used for wildlife habitat evaluations. (See Crown Closure).

Capability. The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils and geology, as well as the application of management practices, such as silviculture or protection from fire, insects and disease.

Capture (input). One of the ways functions are described; resources (organisms, materials, and energy) brought into the system (i.e., photosynthesis, migration, onto summer range, pollution brought in by wind or water.)

Cartographic Feature File. A data file containing the digital representation of all features, except contours, from a Primary Base Series map. Features are represented as line strings and points in ground coordinates with attribute information attached.

Catastrophic Condition. A significant change in forest conditions on the area that affects Forest Plan resource management objectives and their projected and scheduled outputs, uses, costs, and effects on local communities and environmental quality.

Cavity. The hollow excavated in trees by birds or other natural phenomena; used for roosting and reproduction by many birds and mammals.

Channel Depth. The average depth of channel from mean high water mark to mean high water mark used to define stream type, instream flow calculations and riparian management.

Channel Gradient. The slope of the stream channel expressed on a percent of rise per unit length. A measure of the drop in water surface elevation per unit length of channel. The difference in water surface or streambed elevation of two study sites on a stream divided by the distance between the study sites.

Channel Roughness. A measurement used to determine energy losses and velocities of natural stream channels by using water energy slope (channel slope), velocity and hydraulic radius.

Channel Stability Rating. A rating of stream channels resistance capacity to the detachment of bed and bank materials.

Chemical Control. The use of pesticides and herbicides to control pests and undesirable plant species.

Clean Air Act. (42 U.S.C. 7609) Section 309 provides authority for the Environmental Protection Agency to review other agency environmental impact statements.

Clearcutting. A harvest in which all or almost all of the trees are removed in one cutting. Regeneration then occurs from (a) natural seeding from adjacent stands, (b) seed contained in the slash or logging debris, (c) advance growth, or (d) planting or direct seeding. An even-aged forest usually results.

Climax. The culminating stage in plant succession for a given site where the vegetation has reached a highly stable condition.

Coarse Filter Management. Land management that addresses the needs of all associated species, communities, environments, and ecological processes in a land area. (See fine filter management.)

Collaborative Approach. A way of managing land by actively engaging the American public to foster understanding of the Forest Service mission and goals.

Collector Roads. These roads serve small land areas and are usually connected to a Forest System Road, a county road, or a state highway.

Commercial Forest Land (CFL). See "Timber Classification."

Commodity. A resource product for which a monetary value has been established.

Common (Class B) Landscape. Areas where features contain variety in form, line, color and texture combinations thereof, but which tend to be common throughout the character type and are not outstanding in visual quality.

Composition. What an ecosystem is composed of. Composition could include water, minerals, trees, snags, wildlife, soil, microorganisms, and certain plant species.

Concern. (Also management concern.) An issue, problem or condition which constrains the range of management practices identified by the Forest Service in the planning process.

Congressionally Classified and Designated Areas. See "Wilderness."

Conifer. A tree that produces cones, such as a pine, spruce, or fir tree.

Connected Actions. Closely related actions which automatically trigger other actions cannot proceed unless other actions are taken previously or simultaneously, or are interdependent parts of a larger action and depend on the larger action for justification.

Connectivity (of habitats). The linkage of similar but separated vegetation stands by patches, corridors or "stepping stones" of like vegetation. This term can also refer to the degree to which similar habitats are linked.

Consistency. All resource plans and permits, contracts and other instruments for the use and occupancy of National Forest System land must be consistent with the Forest Plan.

Consumptive Use. A use of resources that reduces the supply, such as logging and mining (See also nonconsumptive use).

Contour. A line drawn on a map connecting points of the same elevation.

Corridor. Elements of the landscape that connect similar areas. Streamside vegetation may create a corridor of willows and hardwoods between meadows where wildlife feed.

Cost-efficiency. The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs, including environmental, economic, or social impacts, are not assigned monetary values but are achieved at specified levels in the least cost manner. Cost efficiency is usually measured using present net value, although use of benefit-cost ratios and rates-of-return may be appropriate.

Council of Environmental Quality (CEQ). The Council issues regulations binding on all federal agencies, to implement the procedural provisions of the National Environmental Quality Act. The regulations address the administration of the NEPA process, including preparation of Environmental Impact Statements (EIS) for major federal actions which significantly affect the quality of the human environment.

Cover. Any feature that conceals wildlife or fish. Cover may be dead or live vegetation, boulders, or undercut streambanks. Animals use cover to escape from predators, rest or feed.

Cover Class. Represents a percentage range for a fixed area covered by the crowns of plants. It is measured as a vertical projection of the outermost portion of the foliage. Cover Class A = less than 40 percent canopy cover; Cover Class B = 40-60 percent canopy cover; Cover Class C = greater than 60 percent canopy cover.

Cover-forage Ratio. The ratio of hiding cover to foraging areas for wildlife species.

Cover type (forested cover type). Stands of a particular vegetation type that are composed of similar species. The aspen cover type contains plants distinct from the pinyon-juniper cover type.

Created Opening. An opening in the forest cover created by the application of even-aged silvicultural practices.

Critical Habitat. Areas designated for the survival and recovery of federally listed threatened or endangered species.

Cross-country Travel. Travel over terrain not on designated roads and/or trails.

Crown Closure. See Canopy Cover.

Crown Fire. A fire that advances from top to top of trees and shrubs more or less independent of a surface fire.

Crown Height. The distance from the ground to the base of the crown of a tree.

Cultural Resource. The remains of sites, structures, or objects used by humans in the past -- historical or archaeological.

Cultural Sensitivity. Refers to the likelihood of encountering significant cultural volumes (quantity and/or quality) that may affect and may be affected by ground-disturbing activities.

Cumulative Actions. Actions which when viewed with other proposed actions have cumulatively significant impacts.

Cumulative Effects or Impacts. The impact on the environment that results from the incremental impact of an action when added to other past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such other action. Cumulative effects or impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cutting Cycle. The planned lapse of time between successive cuttings in a stand.

Cycling. One of the ways functions are described; resources which are transported within the system (i.e., animal migration, nutrient cycling in a forest stand, snow melt becoming part of the surface or groundwater flow.)

d.b.h. Diameter at breast height. The diameter of a tree measured 4 feet 6 inches from the ground.

Dead and down material. Woody material (logs, etc.) laying on or near the ground. Necessary for soil productivity and wildlife habitat.

Decision Criteria. The rules and standards used to evaluate alternatives to a proposed action on National Forest land. Decision criteria are designed to help a decision maker identify a preferred choice from an array of alternatives.

Decking Area. A site where logs are collected after they are cut and before they are taken to the landing area where they are loaded for transport.

Decommissioning. Various levels of treatment leading to stabilization and restoration of transportation facilities that are no longer needed.

Decomposition Class. Any of the five stages of decomposition of logs left in the forest; stages range from essentially sound to almost total decomposition.

Deficit Timber Sale. A timber sale where the costs associated with producing the primary product(s) plus profit margin are greater than the selling value of the same product(s).

Defer (grazing). Delay livestock grazing until after seed set on the vegetation. In this area, usually August.

DEIS (Draft Environmental Impact Statement). The draft version of the Environmental Impact Statement that is released to the public and other agencies for review and comment.

Dependent Communities. Communities whose social, economic or political life would become discernibly different in important respects if market or non-market outputs from the National Forests were cut off.

Designated Corridor. A linear area of land with defined and recognized boundaries identified and designated by legal public notice.

Desired Future Condition (DFC). Land or resource conditions that are expected to result if goals and objectives are fully achieved. The DFC provides the framework to select appropriate standards and guidelines.

Detrimental Soil Disturbance. The condition where established threshold values for soil properties are exceeded and result in significant change.

Developed Recreation. Recreation that requires facilities that, in turn, result in concentrated use of the area. For example, skiing requires ski lifts, parking lots, buildings and roads. Campgrounds require roads, picnic tables and toilet facilities.

d.i.b. Diameter inside bark.

Dispersed Recreation. Recreation that does not occur in a developed recreation site, such as hunting, backpacking and scenic driving.

Distinctive (Class A) landscape. Areas where features of landform, vegetative patterns, water forms, and rock formations are of unusual or outstanding visual quality.

Disturbance. Any event, such as a forest fire or insect infestation that alters the structure, composition, or function of an ecosystem.

Diversity. The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan. See also "Edge," "Horizontal Diversity," and "Vertical Diversity."

Drastically disturbed. Ground surface, usually on a large scale, that has been greatly disturbed or rearranged by such things as mining or digging, and appears very different from what it did before the activity.

Dredging. The process of excavating or removing material like silt, sand, or gravel, from underwater.

Early Forest Succession. The biotic (or life) community that develops immediately following the removal or destruction of vegetation in an area. For instance, grasses may be the first plants to grow in an area that was burned.

Ecological Approach. Natural resource planning and management activities that assure consideration of the relationship between all organisms (including humans) and their environment.

Ecological Classification. A multifactor approach to categorizing and delineating, at different levels of resolution, areas of land and water having similar characteristic combinations of the physical environment (such as climate, geomorphic processes, geology, soil and hydrologic function), biological communities (such as plants, animals, microorganisms, and potential natural communities), and the human dimension (such as social, economic, cultural, and infrastructure).

Ecological Land Classification and Mapping. An hierarchical, multi-factor approach to categorizing and delineating, at different levels or resolution, areas of land having similar capabilities and potentials for management. These areas of land are characterized by unique combinations of the physical environment, biological communities and human dimension.

Ecological Process. The actions or events that link organisms (including humans) and their environment, such as disturbance, successional development, nutrient cycling, carbon sequestration, productivity, and decay.

Ecological Status. The degree of similarity between the present community and the potential natural community on a site. Used to determine the ecological status of a plant community.

Ecological Subsection. A hierarchical level of inventory; lands with relatively uniform ecological potentials. Generally a mountain range.

Ecological Type (Habitat Type). A category of land having a unique combination of potential natural community; soil, landscape, features, climate and differing from other ecological types in its ability to produce vegetation and respond to management. Used to define land capability.

Ecological Unit. The map unit developed for an ecological type or types. This unit often includes a complex of small and intricately associated ecological types too small to delineate separately.

Ecology. The interrelationships of living things to one another and to their environment, or the study of these interrelationships.

Economic Efficiency Analysis. An analytical method in which incremental market and nonmarket benefits are compared with incremental economic costs.

Ecoregion. A continuous geographic area over which the macroclimate is sufficiently uniform to permit development of similar ecosystems on sites with similar properties. Ecoregions contain multiple landscapes with different spatial patterns of ecosystems.

Ecoregion Code. Ecogeographic code that identifies land surface form and hydrologic unit maps of the U. S. by Bailey and Cushwa.

Ecosystem. An arrangement of living and non-living things and the forces that move among them. Living things include plants and animals. Non-living parts of ecosystems may be rocks and minerals. Weather and wildfire are two of the forces that act within ecosystems.

Ecosystem/Cover Type. The native vegetation ecological community considered together with non-living factors of the environment as a unit; the general cover type occupying the greatest percent of the stand location.

Ecosystem Health. The state of an ecosystem in which the structure and functions are sufficiently resilient, allowing the maintenance of biological diversity over time and through a range of disturbance.

Ecosystem Management. The use of an ecological approach to achieve productive resource management by blending social, physical, economic and biological needs and values to provide healthy ecosystems.

Ecotype. A population of a species in a given ecosystem that is adapted to a particular set of environmental conditions.

Ecozone. The transition zone between two biotic communities, such as between the Ponderosa pine forest type and the mixed conifer forest, which is found at higher elevations than the pine.

Edge. The margin where tow or more vegetation patches meet, such as a meadow opening next to a mature forest stand, or a Douglas-fir stand next to an aspen stand.

Edge Contrasts. A qualitative measure of the difference in structure of two adjacent vegetated areas; for example, "low," "medium," or "high" edge contrast.

Edge Effect. The increased richness of plants and animals resulting from the mixing of two communities where they join.

Effects. Environmental consequences as a result of a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are 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, water and other natural systems, including ecosystems.

Effects and impacts as used in this statement are synonymous. Effects include ecological (such as the effects on natural resources and on the components, structures and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social or health whether direct, indirect or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects; even if on balance the agency believes that the effects will be beneficial (40 CFR 1508.8).

Element (of ecosystem). An identifiable component, process, or condition of an ecosystem.

Embeddedness. A rating of the degree that larger substrate particles (boulder, rubble or gravel) are surrounded or covered by fine sediment.

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 and endangered in accordance with the 1973 Endangered Species Act.

Endangered Species Act. The Act which requires consultation with U.S. Fish and Wildlife Service if practices on National Forest System lands may impact a threatened or endangered species (plant or animal).

Endemic plant/organism. A plant or animal that occurs naturally in a certain region and whose distribution is relatively limited geographically.

Environmental Analysis. An analysis of alternative actions and their predictable long and short-term environmental effects. Environmental Analyses include physical, biological, social and economic factors.

Environmental Assessment. A brief version of an Environmental Impact Statement.

Environmental Impact Statement (EIS). A statement of the environmental effects of a proposed action and alternatives to it. It is required for major Federal actions under Section 102 of the National Environmental Policy Act (NEPA) and released to the public and other agencies for comment and review. It is a formal document that must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines, and directives of the agency responsible for the project proposal.

Ephemeral Streams. Streams that flow only as the direct result of rainfall or snowmelt. They have no permanent flow.

Erosion. The wearing away of the land surface by wind or water.

Escape Cover. Vegetation of sufficient size and density to hide an animal, or an area used by animals to escape from predators.

Escaped Fire Situation Analysis. A decision-making process that evaluates alternative suppression strategies against selected environmental, social, political, and economic criteria. Provides a record of decisions.

Ethnographic. Of or pertaining to social traditions of American Indian cultures.

Evaluation Criteria. Standards developed for appraising alternatives. (See decision criteria.)

Even-aged Management. Timber management actions that result in the creation of stands of trees in which the trees are essentially the same age. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

Exclusion Areas. Areas having a statutory prohibition to rights-of-way for lineal facilities or corridor designation.

Exterior Fire Protection. The protection of structures from the exterior, with no interior access or activity.

Eyrie. A ledge along a cliff used for nesting peregrine falcons.

Facilities. Transportation planning, road management and operation, fleet equipment, and engineering services (for example, administrative buildings, water and sanitation systems, sanitary landfills, dams, bridges and communication systems.

Fauna. The animal life of an area.

Felling. Cutting down trees.

Final Cut. The removal of the last seed bearers or shelter trees after regeneration of new tress has been established in a stand being managed under the shelterwood system of silviculture.

Fine Filter Management. Management that focuses on the welfare of a single or only a few species rather than the broader habitat or ecosystem. (See coarse filter management.)

Fire Adapted Ecosystem. An ecosystem with the ability to survive and regenerate in a fire-prone environment.

Fire Behavior. A manner in which fire reacts to the influences of fuel, weather, and topography.

Fire Cycle. The average time between fires in a given area.

Fire Effects. The physical, biological and ecological impacts of fire on the environment.

Fire Management. All activities required for the protection of resources from fire and the use of fire to meet land management goals and objectives.

Fire Management Plan. A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management program in the approved land use plan. The plan is supplemented by operational plans, such as preparedness plans, preplanned dispatch plans, prescribed fire plans, and prevention plans.

Fire Regime. The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality. Fire regimes can be lethal or non-lethal.

Fire Return Interval (Fire Frequency). How often a fire burns a given area (i.e., fire returns to a site every 20-40 years).

Fire Risks. The chance of fire starting as determined by the presence and activity of causative agents; a causative agent; a number related to the potential number of firebrands to which a given area will be exposed during the rating day (National Fire Danger Rating System).
Fire Severity. A qualitative measure used to describe the biological impacts of a fire. It reflects the mortality of flora and fauna and the loss of organic matter.

Fire Type.

Management Ignited. A fire deliberately started by man to achieve a desired management objective.

Prescribed Natural. A fire started by natural causes that is allowed to burn to accomplish certain, pre-set management objectives.

Wildland. A fire not under any management prescription, generally are suppressed immediately.

Fire Use. The combination of Wildland Fire Use opportunities and Prescribed Fire applications to meet natural resource objectives.

Fisheries Classification. Water bodies and streams classed as either having a cold water or warm water fishery. Designation is dependent upon the dominate species of fish occupying the water.

Fisheries Habitat. Streams, lakes, and reservoirs that support fish, or have the potential to support fish.

Flood Plain. A lowland adjoining a watercourse. At a minimum, the area is subject to a 1% or greater chance of flooding in a given year.

Flora. The plant life of an area.

Forage. All browse and non-woody plants that are eaten by wildlife or livestock.

Forb. A broadleaf plant that has little or no woody material in it.

Foreground. The part of a scene or landscape that is nearest to the viewer.

Forest Cover Type. (See cover type.)

Forest Health. A measure of the robustness of forest ecosystems. Aspects of forest health include biological diversity, soil, air, and water productivity, natural disturbances, and the capacity of the forest to provide a sustaining flow of goods and services for people.

Forest Land. See "Timber Classification."

Forest Land Type. A classification of an area based upon its capability of producing industrial wood (i.e., all commercial roundwood products except fuelwood), its legal status concerning timber utilization, and its proximity to urban and rural development.

Forest Roads and Trails. A legal term for Forest roads or trails that are under the jurisdiction of the Forest Service.

Forest Supervisor. The official responsible for administering National Forest lands on an administrative unit, usually one or more National Forests. The Forest Supervisor reports to the Regional Forester.

Forage Utilization. The proportion of current year's forage production that is consumed or destroyed by grazing animals. Forage is all browse and herbage that is available and acceptable to grazing animals.

Forest Vegetation Simulation. A computer model for timber growth and yield. It projects per acre growth and volume yield for commercial timber stands. Formerly known as "Prognosis."

Fragmentation. The splitting or isolating of patches of similar habitat, typically forest cover, but including other types of habitat. Habitat can be fragmented naturally or from forest management activities, such as clearcut logging.

Frost Heave. A land surface that is pushed up by the accumulation of ice in the underlying soil.

Fuels. Plants and woody vegetation, both living and dead, that are capable of burning.

Fuel Arrangement. A general term referring to the spatial distribution and orientation of fuel particles within a natural setting.

Fuel Management. The treatment of fuels that would otherwise interfere with effective fire management or control. Fore instance, prescribed fire can reduce the amount of fuels that accumulate on the forest floor before the fuels become so heavy that a natural wildfire in the area would be explosive and impossible to control.

Fuel Model. Mathematical descriptions of fuel properties (e.g. fuel load and fuel depth) that are used as inputs to calculations of fire danger indices and fire behavior potential.

Fuel Reduction. Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or lessen potential damage and resistance to control.

Fuel Treatment. Manipulation or removal of fuels to reduce the likelihood of ignition and/or lessen potential damage and resistance to control (e.g. lopping, chipping, crushing, piling, and burning).

Fuelwood. Wood cut into short lengths for burning.

Function. All the processes within an ecosystem through which the elements interact, such as succession, the food chain, fire, weather, and the hydrologic cycle.

Game Species. Any species of wildlife or fish that is harvested according to prescribed limits and seasons.

Geoclimatic Setting. The geology, climate (precipitation and temperature), vegetation, and geologic processes (such as landslides or debris flows) that are characteristic of a place; places with similar characteristics are said to have the same geoclimatic setting.

Geomorphic Processes. Processes that change the form of the earth, such as volcanic activity, running water, and glacial action.

Geomorphology. The science that deals with the relief features of the earth's surfaces.

GIS (geographic information systems). GIS is both a database designed to handle geographic data as well as a set of computer operations that can be used to analyze the data. In a sense, GIS can be thought of as a higher order map.

Goal. A concise statement that articulates a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statement form the principal basis from which objectives are developed.

Goods and Services. The various outputs, including on-site users, produced from forest and rangeland resources.

Grazing Period. The period of time livestock use a specific pasture or unit within a grazing allotment.

Ground Cover. Material covering the land surface. It may include live vegetation, standing dead vegetation, litter, cobble, gravel, stones and bedrock. Ground cover plus bare ground would total 100 percent of the area evaluated.

Ground Fire. A fire that burns along the forest floor and does not affect trees with thick bark or high crowns.

Ground Water. The supply of fresh water under the earth's surface in an aquifer or in the soil.

Group Selection. A method of tree harvest in which trees are removed periodically in small groups. This silvicultural treatment results in small openings that form mosaics of age class groups in the forest.

Guidelines. An indication or outline (as by a government) of policy or conduct.

HRV. Historic Range of Variability, see Range of Variability.

Habitat. The area where a plant or animal lives and grows under natural conditions.

Habitat Capability. The ability of a land area or plant community to support a given species of wildlife.

Habitat Diversity. A number of different types of wildlife habitat within a given area.
Habitat Diversity Index. A measure of improvement in habitat diversity.

Habitat Type. A way to classify land area. A habitat can support certain climax vegetation, both trees and undergrowth species. Habitat typing can indicate the biological potential of a site.

Hard Snag. See Snag.

Hardened Campsite. A campsite where gravel or asphalt has been laid to protect the soil and contain use.

Harvest Cutting. The felling of the final crop of trees either in a single cutting or in a series of regeneration cuttings. Generally, the removal of financially or physically mature trees, in contrast to cuttings that remove immature trees. Also referred to as main felling and major harvest.

Hazard. A fuel complex defined by kind, arrangement, volume, condition, and location that forms a special threat of ignition and resistance to control.

Hazardous Areas. Those wildland areas where the combination of vegetation, topography, weather, and the threat of fire to life and property create difficult and dangerous problems.

Hazardous Fuel (Fire). Excessive live or dead wildland fuel accumulations that increase the potential for uncharacteristically large wildland fire and decrease the capability to protect life, property, and natural and cultural resources.

Hazardous Substance. Usually a chemical or element that could affect the health of plants or animals if concentrations are too high. Usually regulated by laws and regulations of the Environmental Protection Agency or other regulatory agencies.

Healthy Ecosystem. An ecosystem in which structure and functions allow the maintenance of biological diversity, biotic integrity, and ecological processes over time.

Herbaceous Vegetation. Vegetation which dies back to ground level each year, generally grasses, forbs and grass-likes.

Heritage Resources. The remains of sites, structures, or objects used by humans in the past: historical or archaeological.

Hiding Cover. The vegetation that will hide ninety percent of an elk from the view of a human at a distance of 200 feet or less. The distance which the animal is essentially hidden is called a sight distance.

Hierarchical. A type of classification technique whose successively lower level units must fit entirely within the separate units delineated by the next higher level in that system.

Highwall. A mining term referring to a steep wall or cliff of undisturbed material, usually rock, that is created by mining.

Horizontal Diversity. The distribution and abundance of plant and animal communities or different stages of plant succession across an area of land. The greater the numbers of communities in a given area, the higher the degree of horizontal diversity.

Human Dimension. An integral component of Ecosystem Management that recognizes people are part of ecosystems, that people's pursuits of past, present and future desires, needs and values (including perceptions, beliefs, attitudes and behaviors) have and will continue to influence ecosystems and that ecosystem management must include consideration of the physical, emotional, mental, spiritual, social, cultural and economic well-being of people and communities.

Hydric Greenline (HGL). A belt of perennial riparian vegetation found closest to the water's edge. It is the area where recovery of riparian and aquatic ecosystems is first expressed and, therefore, can be monitored to test the impacts of livestock grazing. It is also the area which approximates the geographic elevation of the active floodplain, a feature otherwise difficult to locate.

Hydrologic Cycle. Also called the water cycle, this is the process of water evaporating, condensing, falling to the ground as precipitation, and returning to the ocean as run-off.

Hydrologic Unit Code (HUC). A coding system developed by the U.S. Geological Service to map geographic boundaries of watersheds of various sizes.

Hydrologically Disturbed. Changes in natural canopy cover (vegetation removal) or a change in surface soil characteristics (such as compaction) that may alter natural streamflow quantities and character. Acres of vegetation within a watershed that are in a non-stocked, seedling, sapling, or first entry category; acres in roads; acres from other types of mechanical treatments and burned acres are included in the calculation of hydrologically disturbed area.

Hydrology. The science dealing with the study of water on the surface of the land, in the soil and underlying rocks and in the atmosphere.

Igneous Rock. Rocks formed when high temperature, molten mineral matter cooled and solidified.

Indicator Species. A plant or animal species related to a particular kind of environment. Its presence indicates that specific habitat conditions are also present.

Indigenous (species). Any species of wildlife native to a given land or water area by natural occurrence.

Individual (Single) Tree Selection. The removal of individual trees from certain size and age classes over an entire stand area. Regeneration is mainly natural, and an uneven-aged stand is maintained.

Induced Edge. An edge that results from the meeting of two successional stages of vegetative conditions within a plant community. These can be created by disturbance, i.e., grazing, timber harvest, fire, insect outbreaks.

Inherent Edge. An edge that results from the meeting of two plant community types. These often result from abrupt changes in soil type, topographic differences, geomorphic differences, and changes in microclimate.

Initial Attack. The wildfire control efforts taken by resources that are first to arrive at a wildfire.

Instream Flow. The quantity of water necessary to meet seasonal stream flow requirements to accomplish the purposes of the National Forests, including, but not limited to fisheries, visual quality, and recreational opportunities.

Integrated Pest Management. A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studies and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated pest population on various resource values, alternative regulatory tactics and strategies, and benefit/cost estimates for these alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides. A basic principle in the choice of strategy is that it be ecologically compatible or acceptable.

Interdisciplinary Team. A team of individuals with skills from different disciplines that focuses on the same task or project.

Intermediate Cut. The removal of trees from a stand sometime between the beginning or formation of the stand and the regeneration cut. Types of intermediate cuts include thinning, release, and improvement cuttings.

Intermittent Stream. A stream that flows only at certain times of the year when it receives water from streams or from some surface source, such as melting snow.

Intermountain Region. The portion of the USDA Forest Service, also referred to as Region Four, that includes National Forests in Utah, Nevada, southern Idaho and southwestern Wyoming.

Inventoried Roadless Area. (West of the 100th meridian) An area which meets the statutory definition of wilderness, does not contain improved roads maintained for travel by standard passenger-type vehicles, and meets one or more of the following criteria:

1. Contains 5,000 acres or more.
2. Contains less than 5,000 acres, but:
    - Due to physiography or vegetation, is manageable in a natural condition.
    - Is a self-contained ecosystem such as an island.
    - Is contiguous to existing wilderness, primitive area, Administration-endorsed wilderness, or roadless area in other Federal ownership, regardless of size.

Inventoried Roadless Area. (East of the 100th meridian) An area which contains no more than a half mile of improved road for each 1,000 acres, and the road is under Forest Service jurisdiction and:

1) The land is regaining a natural, untrammeled appearance.

2) Improvements existing in the area are being affected by the forces of nature rather than humans and are disappearing or muted.

3) The area has existing or attainable National Forest System ownership patterns, both surface and subsurface, that could ensure perpetuation of identified wilderness values.

4) The location of the area is conducive to the perpetuation of wilderness values, considering the relationship of the area to sources of noise, air and water pollution and other unsightly conditions that would have an effect on the wilderness experience.

Invasive Species. A plant species moving into areas outside of its former range.

Invertebrate. Small animals that lack a backbone or spinal column. Spiders, insects, and worms are examples of invertebrates.

Irretrievable. Applies to losses of production, harvest or commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible. 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.

Issue. A point, matter or question of public discussion or interest to be addressed or decided through the planning process.

> _Preliminary issue_ is an issue identified early in the scoping phase and is sometimes referred to as a tentative issue.
>
> _Significant issue_ is an issue within the scope of the proposed action which is used to formulate alternatives in an Environmental Analysis (EA) or Environmental Impact Statement (EIS).

Key Area. A relatively small portion or a pasture or management unit selected because of its location, use or grazing value as a monitoring point for grazing use. It is assumed that key areas, if properly selected, will reflect the overall acceptability of current grazing management over the pasture or unit as a whole.

Key Summer Range. The portion of a wildlife species' summer range that is essential for the animal's pre, post, and reproduction cycles. Deer require "fawning areas" where does give birth and hide their fawns for an essential period of time in the spring.

Key Winter Range. That portion of big game's range where the animals find food and cover during severe winter weather.

Kuchler Vegetation Types. Potential natural vegetation of the conterminous United States, classified by Kuchler.

Ladder Fuels. Vegetation located below the crown level of forest trees which can carry fire from the forest floor to tree crowns. Ladder fuels may be low-growing tree branches, shrubs, or smaller trees.

Land-Aquatic Type Associations. Code numbers given to a mapped unit of land in which land forms, soils, vegetation and water have the dominating influence.

Land Class. The topographic relief of a unit of land. Land classes are separated by slope. This coincides with the timber inventory process. The three land classes used in the Forest Plan are defined by the following slope ranges: 0 to 35%, 36-55%, and greater than 55%.

Land Use Class. The predominant purpose for which an area is used, i.e., agricultural land, forest land, rangeland, wetland, urban and suburban, roads, railroads or utility corridor.

Landform. Any physical feature of the earth's surface having a characteristic, recognizable shape and produced by natural causes. Landform is one criteria used in determining the capability and suitability of lands to produce resources and accommodate management activities.

Landing. Any place where cut timber is assembled for further transport from the timber sale area.

Landline. The boundary lines for National Forest land.

Landscape. A large land area composed of interacting ecosystems that are repeated due to factors such as geology, soils, climate, and human impacts. Landscapes are often used for coarse grain analysis.

Landscape Ecology. A study of the principles concerning structure, function and change of landscapes, and the use of these principles in the formulation and solving of problems; the body of knowledge pertaining to the structure, function and change of spatial patterns in ecosystems.

Land Use Planning. The process of organizing the use of lands and their resources to best meet people's needs over time, according to the land's capabilities.

Late Forest Succession. The stage of forest succession in which most of the trees are mature or overmature.

Legal Notice. A notice of a decision which can be appealed that is published in the Federal Register or in the legal notice section of a newspaper of general circulation.

Lek. An area used habitually by grouse species where the males display for the females each spring. Number of males are counted on the lek each spring to establish general population trends.

Lethal Fire. In forests, fires in which less than 20 percent of the basal area or less than 10 percent of the canopy cover remains; in rangelands, fires in which most of the shrub overstory or encroaching trees are killed.

Lichen. Any of the various flowerless plants composed of fungi and algae, commonly growing in flat patches on rocks, trees, etc.

Life Zone. Areas of "belts" of land that have distinct plant and animal characteristics determined by elevation, latitude, and climate. When ascending a high mountain, you will pass through these life zones.

Litter (forest litter). The freshly fallen or only slightly decomposed plant material on the forest floor. This layer includes foliage, bark fragments, twigs, flowers and fruit.

Leasable Minerals. Minerals, including phosphate, coal, oil and gas, that are administered under the 1920 Mineral Leasing Act. The Bureau of Land Management is the leasing agency; the Forest Service can provide input for leasing actions.

Locatable Minerals. These are generally precious metals, such as gold, silver, and copper, that are administered under the 1872 Mining laws.

Logging Residues. The residue left on the ground after timber cutting. It includes unused logs, uprooted stumps, broken branches, bark, and leaves. Certain amounts of "slash" provide important ecosystem roles, such as soil protection, nutrient cycling, and wildlife habitat.

Long-Term Sustained Yield Capacity. The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified intensity of management consistent with multiple-use objectives.

M. Thousand. Five thousand board feet of timber can be expressed as 5M board feet.

MM. Million

Macro Climate. The general, large scale climate of a large area, as distinguished from the smaller scale micro climates within it.

Macroinvertebrate Biotic Condition Index. An index that compares the tolerance or sensitivity to pollution of an existing community of macroinvertebrates to the predicted potential tolerance of a community of undisturbed conditions for a given stream. Generally reflects the condition of the aquatic ecosystem.

Management Action. Any activity undertaken as part of the administration of the National Forest.

Management Concern. An issue, problem or a condition which constrains the range of management practices identified by the Forest Service in the planning process.

Management Direction. A statement of multiple-use and other goals and objectives, the associated management prescriptions, and standards and guidelines for attaining them.

Management Intensity. A management practice or combination of management practices and associated costs designed to obtain different levels of goods and services.

Management Practice. A specific action, measure, course of action or treatment.

Management Prescription. Management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives.

Market Area. An area encompassing the National Forest and adjacent mills that purchase and/or manufacture timber products from that Forest.

Market-Value Outputs. Goods and services valued in terms of what people are willing to pay for them rather than go without, as evidenced by market transactions.

Mass Movement/Wasting. The down-slope movement of large masses of earth material by the force of gravity. Also called a landslide.

Mass Stability. The existing condition of the soil mantel related to the potential for land mass failure such as landslides, mud flows and debris slides.

Matrix. The least fragmented, most continuous pattern element of a landscape; the vegetation type that is most continuous over a landscape.

Mature Timber. Trees that have attained full development, especially height, and are in full seed production.

MBF. Thousand board feet (See board feet.)

Maximum Modification. See "Visual Quality Objectives."

Mean Annual Increment of Growth. The total increase in size or volume of individual trees. Or, it can refer to the increase in size and volume of a stand of trees at a particular age, divided by that age in years.

Mechanical Felling. Cutting trees using mechanical methods (i.e. chainsaws, shears etc.) and leaving them on the site.

Micro climate. The climate of a small site. It may differ from the climate at large of the area due to aspect, tree cover (or the absence of tree cover), or exposure to winds. Can create a micro-environment.

Microbiotic Crust. Thin crust of living organisms on or just below the soil, composed of lichens, mosses, algae, fungi, cyanobacteria, and bacteria.

Middleground. A term used in the management of visual resources, or scenery. It refers to the visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly from the stand.

Mineral Soil. Soil that consists mainly of inorganic material, such as weathered rock, rather than organic matter.

Minimum Impact Suppression Techniques (MIST). In wildland firefighting, a concept of employing the minimum amount of forces needed to effectively achieve fire management protection objectives consistent with land and resource management objectives. Can feature a range of suppression and support actions to minimize impacts to these values, and special rehabilitation measures.

MIS (management indicator species). A wildlife species whose population indicate the health of the ecosystem in which it lives and, consequently, the effects of forest management activities to that ecosystem. MIS are selected by land management agencies. (See indicator species.)

Mission (of the USDA Forest Service). "To care for the land and serve people. As set forth in law, the mission is to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people.

Mitigate/mitigation. To lessen the severity. Actions taken to avoid, minimize or rectify the impact of a land management practice.

Mixed Stand. A stand consisting of two or more tree species.

MMBF. Million board feet (See board feet.)

Modification. A visual quality objective; management activities may visually dominate the original characteristic landscape, but they must borrow from naturally established form, line, color or texture so that the activity blends with the surrounding area.

Monitoring. The determination of how well project or plan objectives have been met and how closely management practices should be adjusted. (See adaptive management.)

Mortality. Trees that were merchantable and have died within a specified period of time. The term mortality can also refer to the rate of death of a species in a given population or community.

Mosaic of Forest and Openings. Areas with a variety of plant communities over a landscape, such as areas with trees and areas without trees occurring over a landscape.

Mountain Brush. Vegetation characterized by woody species usually found between sagebrush/grasslands and coniferous forests at upper elevations. Prominent species include mountain mahogany, mountain maple, chokecherry, serviceberry, etc.

Mountain Pine Beetle. A tiny black insect, ranging from 1/8 to 3/4 inch in size, that bores through a pine tree's bark. It stops the tree's intake and transport of the food and nutrients it must have to stay alive, thus killing the tree.

Multiple-Use. The management of all the various renewable surface resources of the National Forest System lands for a variety of purposes such as recreation, range, timber, wildlife and fish habitat, and watershed.

Municipal Watershed. A watershed that serves a public water system as defined in Public Law 93-523 (Safe Drinking Water Act); or as defined in State safe drinking water regulations. The definition does not include communities served by a well or confined ground water unaffected by Forest Service activities.

National Environmental Policy Act (NEPA). This is the basic national charter for protection of the environment. It establishes policy, sets goals and provides means for carrying out the policy.

National Forest Management Act (NFMA). These are rules that require an integration of planning for National Forests and Grasslands, including the planning for timber, range, fish and wildlife, water, wilderness, recreation resources, together with resource protection activities, such as fire management, and the use of other resources, such as minerals.

National Forest System (NFS) Land. Federal lands that have been designated by Executive Order or statute as National Forests, National Grasslands, Purchase Units, and other lands under the administration of the Forest Service, including Experimental Areas and Bankhead-Jones Title III lands.

Native Species. A species of flora or fauna occurring naturally in the United States and that not introduced by humans.

Natural Barrier. A natural feature, such as a dense stand of trees or downfall, that will restrict animal travel.

Natural Catastrophic Condition. A significant change in forest conditions on the area that affects Forest Plan resource management objectives and their projected and scheduled outputs, uses, costs, and impacts on local communities and environmental quality.

Natural Disturbance. See Disturbance.

Natural Range of Variability. See Range of variability.

Natural Resource. A feature of the natural environment that is of value in serving human needs.

Nest Survey. A way to estimate the size of a bird population by counting the number of nests in a given area.

Net Public Benefits. An expression used to signify the overall long-term value to the Nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of units of the National Forest System is consistent with the principle of multiple-use and sustained-yield.

NFRS. National Forest recreation sites that have been inventoried.

No Action Alternative. The most likely condition expected to exist in the future if management practices continue unchanged.

Noncommercial Vegetative Treatment. The removal of trees for reasons other than timber production.

Nonconsumptive Use. The use of a resource that does not reduce its supply; for example, nonconsumptive uses of water include hydroelectric power generation, boating, swimming and fishing.

Nondeclining Flow. The principle expressed by the definition of the base sale schedule.

Nonforest Land. See "Timber Classification."

Nongame. Species of animals not managed for sport hunting.

Noninterchangeable Component (NIC). A portion of the allowable sale quantity (ASQ) which cannot be substituted for from other areas or species types. Volume programmed from a NIC will not be replaced by volume from other NICs. The volume in the NICs are mutually exclusive.

Nonmarket-Valued Outputs. Goods and services not generally traded in the marketplace, but valued in terms of what reasonable people would be willing to pay for them rather than go without. Those obtaining the actual outputs do not necessarily pay what they would be willing to pay for them.

Nonnative Species. A species introduced into an ecosystem through human activities.

Nonpoint Source Pollution. Pollution whose source is not specific in location. The sources of discharge are dispersed, not well-defined, or constant. Rain storms and snow melt often make this type of pollution worse. Examples include sediments from logging activities, and runoff from agricultural chemicals.

Non-renewable Resource. A resource whose total quantity does not increase measurably over time, so that each use of the resource diminishes the supply.

Notice of Intent. A notice printed in the Federal Register announcing that an Environmental Impact Statement (EIS) will be prepared.

Noxious Weeds. A plant recognized by law as being especially undesirable, troublesome, and difficult to control.

Nutrient Cycle. The circulation of chemical elements and compounds, such as carbon and nitrogen, in specific pathways from the non-living parts of ecosystems into the organic substances of the living parts of ecosystems, and then back again to the non-living parts of the ecosystem. For example, nitrogen in wood is returned to the soil as the dead tree decays; the nitrogen again becomes available to living organisms in the soil, and upon their death, the nitrogen is available to plants growing in that soil.

Objective. A clear and quantifiable statement of planned results to be achieved within a stated time period. Something aimed at or striven for within a predetermined time period. An objective must be achievable, be measurable, have a stated time period for completion, be quantifiable, be clear and its results must be described.

Off-Road Vehicles (ORV's). Vehicles such as motorcycles, all-terrain vehicles, four-wheel drive vehicles and snowmobiles.

Old Growth. Old forests often contain several canopy layers, variety in tree sizes and species, decadent old trees, and standing dead woody material.

Open Motorized Route Density (OMRD). Includes all open roads and open motorized trails. Density may be displayed in miles per square mile for a specified analysis area.

Opportunities. Ways to address or resolve public issues or management concerns in the land and resource management planning process.

Optimum. A level of production that is consistent with other resource requirements as constrained by environmental, social, and economically sound conditions.

Organic Soil. Soil at least partly derived from living matter, such as decayed plant material.

Output. One of the ways functions are described; resources which leave a system, i.e., animals migrating out of an area, mass erosion, removal of commercial timber from an area.

Overburden. The rock and/or soil that covers an ore body, or material that is extracted during mining that does not have high enough values to be considered ore.

Overmature Timber. Tress that have attained full development, particularly in height, and are declining in vigor, health, and soundness.

Overstory. The upper canopy layer; the plants below comprise the understory.

Paleontological Resource. Any remains, trace or imprint of a plant or animal that has been preserved in the Earth's crust since some past geologic time.

Parent Material. The mineral or organic matter from which the upper layers of soil are formed.
Park-like Structure. Stands with large scattered trees and open growing conditions, usually maintained by ground fires.

Partial Retention. A visual quality objective which, in general, means human activities may be evident, but must remain subordinate to the characteristic landscape.

Particulates. Small particles suspended in the air and generally considered pollutants.

Patch. An area of homogenous vegetation, in structure and composition.

Patch Cut. A clearcut that creates small openings in a stand of trees, usually between 15 and 40 acres in size. Patch cuts are used to provide the disturbance needed to regenerate aspen.

Percolation. Downward flow or infiltration of water through the pores or spaces of rock or soil.

Perennial Stream. A stream that flows throughout the year and from source to mouth.

Perlite. A volcanic glass containing water that expands or "pops" when heated to form a lightweight aggregate.

Permitted Grazing. Grazing on a National Forest range allotment under the terms of a grazing permit.

Permittee. A person or persons who utilize the National Forest System lands under a permit, usually a Special Use Permit or livestock grazing permit.

Personal Use. Normally used to describe the type of permit issued for removal of wood products (firewood, posts, poles, and Christmas trees) from National Forest land when the product is for home use and not to be resold for profit.

Persons-At-One-Time (PAOT). A recreation capacity measurement term indicating the number of people who can use a facility or area at one time.

Planning Area. The area covered by a Regional Guide or Forest Plan.

Planning Corridor. A general broad linear area of land used to evaluate where a specific right-of-way could be placed.

Planning Period. The 50-year time frame for which goods, services, and effects were projected in the development of the Forest Plan.

Planning Regulations. The rules which guide land and resource management planning (Forest Plans) on the National Forests.

Plant Association. A potential natural plant community of definite floristic composition and uniform appearance.
Plant Community. A group of one or more populations of plants in a common spatial arrangement.

Plant Species. The major subdivision of a genus or subgenus of a plant being described or measured.

PNV. See present net value.

Pole/sapling. The stage of forest succession in which trees are between 3 and 7 inches in diameter and are the dominant vegetation.

Pole timber. Live trees at least five inches in diameter at breast height but smaller than the minimum size for sawtimber.

Policy. A guiding principle that is based on a specific decision or set of decisions.

Pool. A potion of the stream with reduced current velocity, often with water deeper than the surrounding areas, which is frequently used by fish for resting and cover.

Pool-Riffle Ratio. The ratio of the length or percent of pool habitat divided by the length or percent of riffle habitat.

Potential Natural Community. The biotic community that would be established if all successional sequences of its ecosystem were completed without additional human-made disturbance under present environmental conditions. Grazing by native fauna, natural disturbances, such as drought, floods, wildfire, insects and disease are inherent in the development of potential natural communities which may include naturalized non native species. The potential natural community and its environmental characteristics provide a reference standard to which existing seral communities can be related.

Potential Natural Vegetation. The vegetation that would exist today if man were removed from the scene and if the plant succession after his removal were telescoped into a single moment. The time compression eliminates the effects of future climatic fluctuations, while the effects of man's earlier activities are permitted to stand.

Practice (Also Management Practice). A specific activity, measure, course of action, or treatment.

Precommercial Thinning. The practice of removing some of the trees less than merchantable size from a stand so that the remaining trees will grow faster.

Predator. An animal at or near the top of food chains that lives by preying on other animals.

Pre-existing Use. Land use that may not conform to a zoning ordinance but existed prior to the enactment of the ordinance.

Preparatory Cut. The removal of trees near the end of a rotation, which permanently opens the canopy and enables the crowns of seed bearers to enlarge, to improve conditions for seed production and natural regeneration typically done in the shelterwood system.

Prescribed Fire. Any fire ignited by management actions to meet specific objectives. A written, line officer approved prescribed burn plan must exist, and National Environmental Policy Act (NEPA) requirements must be satisfied prior to prescribed fire ignition.

Prescribed Natural Fire. Naturally ignited fire that burns under specified conditions that allow the fire to be confined to a predetermined area and produce fire behavior and fire characteristics to attain planned fire treatment and resource management objectives.

Prescription. Management practices selected to accomplish specific land and resource management objectives.

Present Net Value. Also called present net worth. The measure of the economic value of a project when costs and revenues occur in different time periods. Future revenues and costs are "discounted" to the present by an interest rate that reflects the changing value of a dollar over time. The assumption is that dollars today are more valuable dollars in the future. PNV is used to compare project alternatives that have different cost and revenue flows.

Preservation. See "Visual Quality Objectives."

Presuppression. Activities in advance of fire occurrence to assure effective suppression action.

Primary Base Series. A topographic map series that includes culture, drainage, land net ownership, and contours and is prepared on a stable base film. The map series is used to produce Forest Service cartographic products used in managing National Forest System lands. Similar maps are available for other lands.

Primitive ROS (Recreation Opportunity Spectrum). A classification of wilderness and recreation opportunity. It is characterized by an essentially unmodified environment, where trails mail be present but structures are rare, and where it is highly probable to be isolated from the sights and sounds of people. (See ROS.)

Production. One of the ways functions are described; resource which are "manufactured" within the system (i.e., plant growth, animal reproduction, snags falling and becoming down woody material).

Production, Forage. Annual production of herbage, shrubs, woody vines, and trees which may provide food for grazing animals or harvested for feeding. Forage production is expressed in pounds per acre per year and is used to determine available food supply for grazing animals.

Productivity. The ability of an area to provide goods and services and to sustain ecological values; the growth rate of biomass per unit area, usually expressed in terms of weight or energy.

Production Potential. The capability of land or water to produce a given resource.

Program. When capitalized, the Renewable Resource Program required by the RPA. Generally, sets of activities or projects with specific objectives, defined in terms of specific results and responsibility for accomplishment.

Programmatic Direction. Sideboards for management which are usually general in nature and designed to be applied over a large area. In the Forest Service, generally referring to Forest Plan direction.

Properly Functioning Condition (PFC). The condition of a resource or ecosystem at any temporal or spatial scale when they are dynamic and resilient to disturbances to structure, composition and processes of their biological or physical components.

Proposal. Exists at the stage in the development of an action when an agency is actively preparing to make a decision on one or more alternative means of accomplishing a goal and the effects can be meaningfully evaluated.

Proposed Action. A proposal by the Forest Service to authorize, recommend or implement an action.

Protocol. A specific way of conducting monitoring or analysis.

Public Access. An indication if the property is posted or restricted from public use.

Public Domain. The territory ceded to the Federal government by the original thirteen states, plus additions by treaty, cession, and purchase.

Public Issue. A subject or questions of widespread public interest relating to management of the National Forest System.

Public Land. Land for which title and control rests with a government - federal, state, regional, county or municipal.

Public Participation. Meeting, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service planning and decision making.

Pumice. A light-colored, lightweight volcanic rock consisting mostly of volcanic glass.

Purpose and Need. A statement which briefly specifies the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action.

Quadratic Mean Diameter (QMD). Indicates the diameter of the cross-section of average area. This number is used for determining basal area and volume.

Range (Rangeland). Land on which the principle natural plant cover is composed of native grasses, forbs, and shrubs that area available as forage for big game and livestock.

Range Allotment. An area designated for the use of a prescribed number and kind of livestock under one management plan.

Range Development. An activity or structure used to improve livestock distribution, rangeland conditions, or otherwise improve range management. Can be structural (fence, water development, etc.) or nonstructural (seeding, vegetation manipulation, etc.).

Range Management. The art and science of planning and directing range use intended to yield the sustained maximum animal production and perpetuation of the natural resources.

Range of Variability. (Natural Variability, Historical Variability.) The components of healthy ecosystems fluctuate over time. The range of sustainable conditions in an ecosystem is determined by time, processes such as fire, native species, and the land itself. For instance, ecosystems that have a 10-year fire cycle have a narrower range of variation than ecosystems with 200-300 year fire cycles. Past management has placed some ecosystems outside their range of variability. Future management should move such ecosystems back toward their natural, sustainable range of variation.

Ranger District. The administrative sub-unit of a National Forest that is supervised by a District Ranger who reports directly to the Forest Supervisor.

Raptor. A bird of prey, such as an eagle or hawk.

RARE II. *Roadless Area Review and Evaluation.* The national inventory of roadless and undeveloped areas within the National Forests and Grasslands.

Real Dollar Value. A monetary value that compensates for the effects of inflation.

Recharge. The addition of water to ground water by natural or artificial processes.

Reclamation. The process of restoring disturbed areas, usually consisting of reshaping, replacing topsoil, and seeding the area.

Recreation Capacity. The number of people that can take advantage of any supply of recreation opportunity at any one time without substantially diminishing the quality of the experience.

Recreation Opportunity Class. An assessment of the general potential of the site for outdoor recreation. The following minimum number of classes are recognized:

Primitive - Area is characterized by essentially unmodified natural environment with a high probability of experiencing isolation from the sights and sounds of man.

Semi-primitive - Area is characterized by a predominantly natural or natural-appearing environment with a moderate probability of experiencing isolation from the sights and sounds of man. Semi-primitive can be motorized or non-motorized.

Roaded Natural - Area is characterized by a predominantly natural or natural-appearing environment with a low probability of experiencing isolation from the sights and sounds of man.

Rural - Area is characterized by a substantially modified natural environment with a low probability of experiencing isolation from the sights and sounds of man.

Urban - Area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements, i.e. ski resorts.

Recreation Types:

Developed Recreation. The type of recreation that occurs where modifications (improvements) enhance recreation opportunities and accommodate intensive recreation activities in a defined area.

Dispersed Recreation. That type of recreation use that requires few, if any, improvements and may occur over a wide area. This type of recreation involves activities related to roads and trails. The activities do not necessarily take place on or adjacent to a road or trail, only in conjunction with it. Activities tend to be day-use oriented and include hunting, fishing, berry picking, off-road vehicle use, hiking, horseback riding, picnicking, camping, viewing scenery, snowmobiling, and many others.

Recreation Visitor Day (RVD). Twelve visitor hours, which may be aggregated continuously, intermittently, or simultaneously by one or more persons.

Reforestation. The natural or artificial restocking of an area with forest trees.

Regeneration. The renewal of a tree crop, whether by natural or artificial means. Also, the young crop itself, which commonly is referred to as reproduction.

Regionalization. A mapping procedure in which a set of criteria are used to subdivide the earth's surface into smaller, more homogeneous units that display spatial patterns related to ecosystem structure, composition, and function.

Regional Analysis Areas. Geographic areas within the Region that encompass several Forest or Grasslands.

Regional Forester. The official of the USDA Forest Service responsible for administering an entire region of the Forest Service.

Regulations. Generally refers to the Code of Federal Regulations, Title 36, Chapter II, which covers management of the Forest Service.

Release Cutting. Removal of competing vegetation to allow desired tree species to grow.

Removal Cut. The removal of the last seed bearers or shelter trees after regeneration is established.

Rendezvous Site. In wolf management, an area where wolves gather.

Research Natural Area (RNA). Designated areas of land, usually more than 300 acres in size having characteristics concerning ecological processes that are of scientific or educational interest. These areas are valuable for conducting observation and research activities on plant and animal succession, habitat requirements of species, insect and fungus depredations, soil microbiology, phenology, and other related subjects.

Residual Stand. The trees remaining standing after some event such as selection cutting.

Residue Utilization. Removal and use of forest residue (such as slash, litter, brush, dead trees, and snags) for energy production, home heating or wood products.

Resilience. The ability of an ecosystem to return to or maintain diversity, integrity and ecological processes following disturbance.

Responsible Official. The Forest Service employee who has been delegated the authority to carry out a specific planning action.

Restoration. Actions taken to modify an ecosystem in whole or in part to achieve a desired condition.

Retention. A visual quality objective; management activities that are not visually evident; activities repeat form, line, color, and texture characteristics found in the landscape.

Revegetation. The re-establishment and development of a plant cover by either natural or artificial means, such as re-seeding.

Riffle. A shallow rapids where the water flows swiftly over completely or partially submerged obstructions to produce surface agitation, but standing waves are absent.

Right-of-Way. An accurately located strip of land with defined width, point of beginning, and point of ending. It is the area within which the user has authority to conduct operations approved or granted by the landowner in an authorizing document, such as a permit, easement, lease, license, or Memorandum of Understanding (MOU).

Riparian Area. They are along a watercourse or around a lake or pond.

Riparian Ecosystem. The ecosystems around or next to water areas that support unique vegetation and animal communities as a result of the influence of water.

Risk (Fire). The probability that potential harm or undesirable consequences will be realized.

Risk to Communities (Fire). The risk associated with adverse impacts to communities resulting from unwanted wildland fire.

Risk to Environment (Fire): The risk associated with losing key ecosystem components resulting from unwanted wildland fire.

Road Density. The miles of road per square mile.

Road System. An alpha code indicating primary systems designation where primary indicates the system under which principle funding and management criteria for operation and maintenance of a road is derived.

ROD. Record of Decision. An official document in which a deciding official states the alternative that will be implemented from a prepared EIS.

ROS. Recreation Opportunity Spectrum. The land classification system that categorizes land by its setting and the probable recreation experiences and activities it affords. (See Recreation Opportunity Class.)

Rotation. The number of years required to establish and grow timber to a specified condition of maturity.

Roundwood. Timber and fuelwood prepared in the round state, such as house logs and telephone poles.

RPA. The Forest and Rangeland Renewable Resources Planning Act of 1974. Also refers to the National Assessment and Recommended Program developed to fulfill the requirements of this Act.

R.S. 2477. Revised Statute 2477; legislation that allows counties to assert that they have access rights on roads and/or trails that existed prior to the establishment of the Forest.

Run-off. The portion of precipitation that flows over the land surface or in open channels.

Sacrifice Area/Site. In range management, a site allowed to be overgrazed to obtain efficient overall use of the management area. In cultural resource management, it may refer to a site intentionally sacrificed to extensive public use in order to preserve the larger cultural area.

Sale Schedule. The quantity of timber planned for sale by time period from an area of suitable land covered by a Forest Plan. The first period, usually a decade, of the selected sale schedule provides the allowable sale quantity. Future periods are shown to establish that long-term sustained yield will be achieved and maintained.

Saleable Minerals. These minerals, including sand, gravel and stone, are administered under the 1947 Mineral Materials Act. The Forest Service has the discretion to dispose (sell) of these materials.

Salvage Harvest. Harvest of trees that are dead, dying, or deteriorating because they are overmature or have been materially damaged by fire, wind, insects, fungi, or other injurious agents before the wood becomes unmerchantable.

Sanitation Harvest. The harvest of dead, damaged or susceptible trees done primarily to prevent the spread of pests or disease and to promote forest health.

Sapling. A loose term for a young tree more than a few feet tall and an inch or so in diameter that is typically growing vigorously.

Sawtimber. Trees that are 9 inches in diameter at breast height or larger and can be made into lumber.

Scale. In ecosystem management, scale refers to the degree of resolution at which ecosystems are observed and measured.

Scoping. The on-going process to determine public opinion, receive comments and suggestions, and determine issues during the environmental analysis process. It may involve public meetings, telephone conversations or letters.

Second Growth. Forest growth that was established after some kind of interference with the previous forest crop, such as cutting, fire, or insect attack.

Security Area. Security areas are non-linear blocks over ½ mile from an open route and at least 250 acres in size. Cover may be provided by vegetation or topography.

Sediment. Solid material, both mineral and organic, transported from its site of origin by air, water, gravity, or ice.

Seedlings and Saplings. Live trees less than 5 inches in diameter at breast height.

Seed Tree Harvest. Removal of the mature timber crop from an area in one cut, except for a small number of seed bearers.

Selection. See "Group Selection" and "Individual (Single) Tree Selection."

Sensitive Species. Plant or animal species which are susceptible to habitat changes or impacts from activities. The official designation is made by the USDA Forest Service at the Region level and is not part of the designation of Threatened or Endangered Species made by the U.S. Fish & Wildlife Service.

Sensitivity Level. A particular degree of measure of viewer interest in scenic qualities of the landscape. Three sensitivity levels are employed, each identifying a different level of user concern for the visual environment:

Level 1 - Highest Sensitivity
Level 2 - Average Sensitivity
Level 3 - Lowest Sensitivity

Seral. The stage of succession of a plant or animal community that is transitional. If left alone, the seral stage will give way to another plant or animal community that represents a further stage of succession, generally expressed as late, mid, or early.

Shade-Intolerant Plants. Plant species that do not germinate or grow well in shade.
Shade-Tolerant Plants. Plants that grow well in shade.

Shelterwood. A cutting method used in a more or less mature stand, designed to establish a new crop under the protection of the old.

Sight Distance. The distance at which 90 percent or more of a deer or elk is hidden from an observer. Hiding cover exists when 90 percent or more of a standing deer or elk is hidden at a distance of 200 feet or less.

Significance. As used in NEPA, requires consideration of both context and intensity.

Silvicultural System. The cultivation of forests; the result is a forest of a distinct form. Silvicultural systems are classified according to harvest and regeneration methods and the type of forest that results.

Silviculture. The art and science that promotes the growth of single trees and the forest as a biological unit.

Similar Actions. Actions, which when viewed with other reasonable foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as timing or geography.

Single-Tree Selection. See "Individual (Single) Tree Selection."

Sinuosity. The ratio of a stream's channel length to valley length.

Site Preparation. The general term for removing unwanted vegetation, slash, roots, and stones from a site before reforestation. Naturally occurring wildfire, as well as prescribed fire can prepare a site for natural regeneration.

Size Class. One of the three intervals of tree stem diameters used to classify timber in the Forest Plan data base. The size classes are: Seedling/Sapling (less than 5 inches in diameter); Pole Timber (5 to 7 inches in diameter); Sawtimber (greater than 7 inches in diameter).

Skidding. Hauling logs by sliding, not on wheels, from stump to a collection point.

Skid Trail. Narrow path on which logging equipment travels when moving logs from the forest to a designated landing location.

Skier days. Twelve skier hours, which may be aggregated continuously, intermittently, or simultaneously by one or more persons.

Skyline logging. A logging system used to remove timber from steep slopes. Logs are brought up-slope on a suspended cable, or skyline. Since the weight of the log is completely or partially supported by the cable, there is little disturbance to soil or other vegetation.

Slash. The residue left on the ground after timber cutting and/or accumulating there as a result of storm, fire, or other damage. It includes unused logs, uprooted stumps, broken or uprooted stems, branches, twigs, leaves, bark and chips.

Slump. A landslide where the underlying rock masses tilt back as they slide from a cliff or escarpment.

Small Game. Birds and small mammals typically hunted or trapped.

Smoke Management. Application of fire intensities and meteorological processes to minimize degradation of air quality during prescribed fires.

Snag. A standing dead tree important as habitat for a variety of wildlife species and their prey.

Soil Compaction. A physical change in soil properties that results in a decrease in porosity and increase in soil bulk density and soil strength.

Soil Cover. The type of cover on the soil surface, i.e. live vegetation, litter, rock, pavement, exposed.

Soil Displacement. The movement of the forest floor (litter, duff, and humus layers) and surface soil from one place to another by mechanical forests such as a blade used in piling or windrowing. Mining of surface soil layers by discing, chopping, or bedding operation are not considered displacement.

Soil Drainage Class. Natural soil drainage refers to the rapidity and extent of the removal of water from the soil, in relation to incoming water. This is especially true of water by surface runoff and by flow through the soil to underground spaces. Soil drainage, as a condition of the soil, refers to the frequency and duration of periods when soil is free of saturation or partial saturation.

Soil Erosion Type. A classification system that further defines erosion by running water, wind or gravitational creep that is used to determine watershed condition.

Soil Quality. Long term soil productivity and soil hydrologic function.

Soil Map Unit. A named portion of a landscape shown by a closed delineation and symbol on a soil map. Generally used to assess or monitor watershed condition, site productivity, and site capability.

Soil Puddling. A physical change in soil properties due to shearing forces that alters soil structure and porosity. Puddling occurs when the soil is at or near liquid limit.

Soil, Severely Burned. A condition where most woody debris and the entire Forest floor is consumed down to bare mineral soil. Soil may have turned red due to extreme heat. Also, fine roots and organic matter are charred in the upper one-half inch of mineral soil.

Soil Structure. Structure is described by grade, class and type. Terms are used to describe the natural aggregates in the soil called peds in contrast to clods caused by disturbance, fragments by rupture of peds, and concentrations by local concentrations of compounds that irreversibly cement the soil grains together. The six structures, each with its own distinctive shape and arrangement, are: granular, platy, prismatic, columnar, angular blocky, subangular blocky, and structureless.

Soil Texture. Texture refers to the relative proportions of clay, silt and sand (less than 2mm in diameter). Clay particles are the smallest, silt particles are intermediate and sand particles are the largest. Loams contain various mixtures of the three basic particle sizes.

Soil and Water Conservation Practices (SWCPs). See BMP.

Soil Compaction. The reduction of soil volume. For instance, the weight of heavy equipment on soils can compact the soil and thereby change it in some ways, such as its ability to absorb water.

Soil Productivity. The capacity of a soil to produce a specific crop. Productivity depends on adequate moisture and soil nutrients, as well as favorable climate.

Sound Wood. Timber that is in solid, whole, good condition. Sound wood is free from damage, decay, or defects.

Special Forest Products. Nontimber renewable plant products such as mushrooms, berries, flowers, etc.

Special Use Permit. A permit issued to an individual or group by the USDA Forest Service for use of National Forest land for a special purpose. Examples might be a Boy Scout Jamboree or a mountain bike race.

Species at Risk. Species which demonstrate a potential for loss of resilience or sustainability if disturbed.

Stand (Tree Stand). A group of trees that occupies a specific area and is similar in species, age, and condition.

Stand Density Index (SDI). The index number is the number of trees per acre at an average stand diameter of 10 inches. This index changes for different species, since some trees are more shade tolerant than others. For example, the maximum trees per acre for an Engelman spruce-subalpine fir stand is 670, while the maximum trees per acre in a Douglas-fir stand is 200-250.

Standards and Guidelines. Requirements found in a Forest Plan which impose limits on natural resource management activities, generally for environmental protection.

State Air Quality Regulations. The legal base for control of air pollution sources in that State. Prescribed burning is generally covered under these regulations.

State Implementation Plan. A State plan that covers implementation, maintenance, and enforcement of primary and secondary standards in each air quality control Region, pursuant to section 110 of the Clean Air Act.

Stewardship. Caring for land and associated resources and passing healthy ecosystems to future generations.

Stocking level. The number of trees in an area as compared to the desirable number of trees for best results, such as maximum wood production.

Storage. One of the ways functions are described; resources which are conserved within the system (i.e., sediments and water retained in wetlands, carbon and other nutrient storage in down woody material).

Stream Channel. The defined bed and bank of a watercourse down which water travels.

Stream Order. A numbering scheme used to characterize the relative position of stream channels within a drainage. First-order streams are those which have no tributaries. Second-order streams are those which have as tributaries only first-order channels. Third-order streams are formed when two second-order channels come together. Stream order is used to analyze hydrologic response and fisheries.

Stream Type. Alpha-numeric identification given to reoccurring stream channel types based on measurable morphological features such as channel gradient, width/depth ratio, dominant particle size of bed and bank materials, entrenchment of channel and confinement of channel in valley, and landform features, soil erodibility, and stability.

Stream Width. The width of streams or rivers. Generally used to determine stream type, flood hazard, instream flows, and riparian management.

Streamflow. A measure of the volume of water passing a given point in a stream channel at a given point in time.

Stringer. A strip of vegetation different from surrounding vegetation, such as a stringer of aspen in an area of spruce.

Structure. How the parts of ecosystems are arranged, both horizontally and vertically. These parts include vegetation patches, edge, fragmentation, canopy layers, snags, down wood, steep canyons, rocks in streams, and roads. For example, structure might reveal a pattern, mosaic or total randomness of vegetation.

Subnival. A mountainous environment below the snow zone in which frost action is an important ecological process.

Subwatershed. A drainage delineated for one of the streams within a National Forest System (NFS) watershed, often to analyze the effects of a proposed action. The subwatershed chosen for analysis may depend on the size and anticipated effects of a proposal.

Succession. The natural replacement, in time, of one plant community with another. Conditions of the prior plant community (or successional stage) create conditions that are favorable for the establishment of the next stage.

Successional Stage. A stage of development of a plant community as it moves from bare ground to climax. The grass-forb stage of succession precedes the woody shrub stage and so on.

Suitability. The appropriateness of certain resource management practices to an area of land. Suitability can be determined by environmental and economic analysis of management practices.

Suitability for Timber Production. Timber harvest, other than salvage sales or sales to protect other multiple-use values, cannot occur on lands not suited for timber production.

Suppression. The action of extinguishing or confining a fire.

Surface Fire. Fire that burns loose debris of the surface, which includes dead branches, leaves and low vegetation.

Surface Resources. Renewable resources that are on the surface of the earth, such as timber and forage, in contrast to ground water and minerals which are located beneath the surface.

Suspended Sediment. Sediment which remains in suspension in the water for a considerable period of time without contact with the bottom of the water source and is generally recorded in parts per million or milligrams per liter.

Sustainability. The ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time.

Sustainable. The yield that a renewable resource can produce continuously at a given intensity of management is said to be sustainable.

Sustained-Yield. The yield that a renewable resource can produce continuously at a given intensity of management.

Tall Forb Community. A vegetation community made up of tall broad-leaved plants, rated as "at risk" in the Intermountain Region due to conifer encroachment and historic overgrazing. Common plants include anise, mountain bluebell, and coneflower.

Target. A National Forest's annual goal for accomplishment for natural resource programs. Targets represent the commitment of the Forest Service has with Congress to accomplish the work Congress has funded, and are often used as a measure of the agency's performance.

Terrestrial. Pertaining to the land.

Thermal Cover. Cover used by animals to ameliorate effects of weather; for elk, a stand of coniferous trees 40 feet or more tall with an average crown closure of 70 percent or more.

Thinning. A cutting method used in an immature stand of trees to accelerate growth or improve the form of the remaining trees without permanently breaking the canopy.

Threatened and Endangered Species Habitat. Those areas currently or potentially occupied or utilized by threatened and endangered species. T&E Species habitat generally falls into one of several categories: critical habitat, proposed critical habitat, occupied habitat, or potential habitat.

Threatened Species. Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future as designated by the U.S. Fish & Wildlife Service under the Endangered Species Act of 1973.

Timber Classification. The classification of forested lands into land management alternatives according to how the land relates to management of the timber resource there.

> Nonforest Land -- Lands never having or incapable of having greater than 10 percent of the area occupied by forest trees and lands formerly forested and currently developed for nonforest use.
>
> Forest Land -- Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for nonforest use. Lands developed for nonforest use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width and adjoining road clearing and power line clearing of any width. The term occupancy when used to define forestland will be measured by canopy cover of live forest trees at maturity. The minimum area for classification of forestland is 1 acre. Unimproved roads, trails, streams and clearings in forest areas are classified as forest if they are less than 120 feet in width.

Suitable Forest Land -- Land that is managed for timber production on a regulated basis.

Unsuitable Forest Land (Not Suited) -- Forest land that is not managed for timber production because: (1) the land has been withdrawn by Congress, the Secretary or the Chief; (2) technology is not available to prevent irreversible damage to soils, productivity or watershed conditions; (3) there is not reasonable assurance that lands can adequately be restocked within 5 years after final harvest based on existing technology and knowledge; (4) there is at present, a lack of adequate information to responses to timber management activities; or (5) timber management is inconsistent with or not cost-effective in meeting management requirements and multiple-use objectives specified in the Forest Plan.

Tentatively Suitable (Commercial Forest Land) -- Forest Land which is producing or is capable of producing crops of industrial wood and (1) has not been withdrawn by Congress, the Secretary or the Chief; (2) existing technology and knowledge is available to ensure timber production without irreversible damage to soils, productivity, or watershed conditions; and (3) existing technology and knowledge provides reasonable assurance that adequate restocking can be attained within 5 years after final harvesting.

Timber Harvest Schedule. See "Sale Schedule."

Timber Treatment Opportunity Class. A class to identify the physical opportunity for increasing timber production. Classes are:

No treatment required - Stand is characterized by an adequate stock of growing stock trees in reasonably good condition.

Regeneration without site preparation - Area is characterized by the absence of a manageable stand because of inadequate stocking of growing stock. Growth will be consistently below potential for the site if the area is left alone. Prospects are not good for natural regeneration. Artificial regeneration will require little or no site preparation.

Regeneration with site preparation - Area is characterized by the absence of a manageable stand because of inadequate stocking of growing stock. Growth will be considerably below potential for the site if the area is left alone. Either natural or artificial regeneration will require site preparation. Such preparation may include clear felling existing stand.

Stand conversion - The area is characterized by stands of undesirable, chronically diseased, or off-site species. Growth and quality will be considerably below potential for the site if the area is left alone. The best prospect is for conversion to a different forest type or species.

Thinning seedlings and saplings - The stand is characterized by a dense stocking of growing stock. Stagnation appears likely if left alone. Stocking must be reduced to help crop trees attain dominance.

Thinning poletimber - The stand is characterized by a dense stocking of growing stock. Stocking must be reduced to prevent stagnation or to confine growth to fewer, high quality crop trees.

Other Stocking Control (Clean and Release, Cull Tree Removal) - Stand is characterized by an adequate stocking of seedlings, sapling, and/or poletimber growing stock mixed with competing vegetation either overtopping or otherwise inhibiting the development of crop trees. The undesirable material must be removed to release overtopped trees, prevent stagnation, or improve the composition, form or growth of the residual stand.

Other Intermediate Treatments - The stand would benefit from other special treatments such as pruning to improve the quality of individual crop trees.

Clearcut Harvest - The area is characterized by a mature to overmature stand of sufficient volume to justify a commercial harvest. The best prospect is to harvest the stand and regenerate.

Partial Cut Harvest - The stand is characterized by poletimber or sawtimber sized trees with sufficient merchantable volume for a commercial harvest which will achieve intermediate stand treatment needs to prepare stand for natural regeneration. The stand is of a favored species composition and may be even or uneven aged. Included in such treatments as seed tree or shelterwood regeneration and selection harvest to maintain an uneven age stand.

Salvage Harvest - The stand is characterized by excessive damage to merchantable timber due to fire, insects, disease, wind, ice or other destructive agents. The best prospect is for removal of damaged or threatened material followed by regeneration.

Time Since Disturbance. The number of years between when the most recent disturbance took place (stand history) and the current time that is used to determine successional trends. Elements include age of sprouts on stumps or damaged trees, color and condition of resin on the stump, stage of decay, bark tightness and tree age.

Total Maximum Daily Load (TMDL). From the Clean Water Act, an amount of a given pollutant the is allowed in a Water Quality Limited Stream.

Total/ Timber Sale Program Quantity (TSPQ). The volume of timber planned for sale during the first decade of the planning horizon. It includes the allowable sale quantity (chargeable volume) and any additional material (nonchargeable volume) planned for sale. The timber sale program quantity is expressed as an annual average for the first decade.

Tractor Logging. A logging method that uses tractors to carry or drag logs from the stump to a collection point.

Transitory Range. Rangelands not normally suitable for livestock grazing which have been made suitable for a period of time by a management action. In the Forest Service, mostly pertains to areas that have been logged and provide forage for one or two decades until the trees return at high densities.

Transportation System. All existing and proposed roads, trails, airfields, and other transportation facilities wholly or partly within or adjacent to and serving the National Forests and other areas administered by the Forest Service or intermingled private lands.

Treatment Area. The site-specific location of a resource improvement activity.

Tree Opening. An opening in the forest cover created by even-aged silvicultural practices.

Trend. The direction of change in ecological status of a plant community usually expressed as moving "toward", "away from", or "not apparent".

TSI (Timber Stand Improvement). Actions to improve growing conditions for trees in a stand, such as thinning, pruning, prescribed fire, or release cutting.

Turbidity. A measure of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines.

Type Conversion. The conversion of the dominant vegetation in an area from forested to non-forested or from one species to another.

Uncharacteristically Large Wildland Fire. An increase in wildfire size and resistance to control, and the associated impact to people and property compared to that which occurred historically.

Underburn. A burn by a surface fire that can consume ground vegetation and "ladder" fuels.

Understory. The trees and woody shrubs growing beneath the overstory in a stand of trees.

Uneven-Aged Management. Actions that maintain a forest or stand of trees composed of intermingling trees that differ markedly in age. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

Unregulated Harvest. Tree harvest that is not part of the allowable sale quantity (ASQ). It can include the removal of cull or dead material or non-commercial species. It also includes volume removed from non-suitable areas for research, to meet objectives other than timber production (such as wildlife habitat improvement), or to improve administrative sites such as campgrounds.

Unsuitable Lands. Forest land that is not managed for timber production. Reasons may be matters of policy, ecology, technology, silviculture or economics. Also applied to lands not suitable for livestock grazing.

Unwated Wildland Fire. Any wildland fire not covered by a Fire Management Plan. This includes all fires occurring outside of approved Wildland Fire Use areas, all non-lightning caused fires, and fires occurring in Wildland Fire Use areas that are not managed for Wildland Fire Use.

Upland Habitat. Habitat located outside of riparian areas or wetlands. Soils are not saturated throughout the growing season.

Use, allowable. An estimate of proper range use. Forty to fifty percent of the annual growth is often used as a rule of thumb on ranges in good to excellent condition. It can also mean the amount of forage planned to be used to accelerate range rehabilitation.

Utility and Transportation Corridors. A strip of land, up to approximately 600 feet in width, designated for the transportation of energy, commodities, and communications by railroad, State highway, electrical power transmission (66 KV and above), oil and gas and coal slurry pipelines 10 inches in diameter or larger, and telecommunication cable and electronic sites for interstate use. Transportation of minor amounts of power for short distances, such as short feeder lines from small power projects including geothermal or wind, or to serve customer service substations along the line, are not to be treated within the Forest Plan effort.

Utilization (of forage).Variability. (Natural variability, historic variability, range of variability) The observed limits of change in composition, structure, and function of an ecosystem over time as influenced by frequency, magnitude and pattern of disturbance.

Variety Class. A way to classify landscapes according to their visual features. This system is based on the premise that landscapes with the greatest variety of diversity have the greatest potential for scenic value.

Vegetation Management or Manipulation. Activities designed primarily to promote the health of forest vegetation for multiple-use purposes.

Vegetation Type. A plant community with distinguishable characteristics.

Vegetative Structural Stage. A method of describing the growth stages of a stand of living trees. It is based on tree size (DBH = diameter at breast height) and total canopy cover. The stages are: Grass/forb/shrub (VSS 1) = 0-1 inch DBH; Seedling/sapling (VSS 2) = 1-5 inches DBH; Young Forest (VSS 3) = 5-12 inches DBH; Mid-aged Forest (VSS 4) = 12-18 inches DBH; Mature Forest (VSS 5) = 18-24 inches DBH; Old Forest (VSS 6) = 24+ inches DBH.

Vertebrate. Species having a backbone or spinal column.

Vertical Diversity. The diversity in a stand that results from the complexity of the above-ground structure of the vegetation; the more tiers of vegetation or the more diverse the species makeup, or both, the higher the degree of vertical diversity.

Vertical Fuel Arrangement. Fuels above the ground and their vertical continuity, which influences fire reaching various vegetation strata.

Viable Population. A number of individuals of a species sufficient to ensure the long-term existence of the species in natural, self-sustaining populations adequately distributed throughout their region.

Viability. The ability of a population or species to exist over the long-term in natural, self-sustaining populations distributed throughout their region.

Virgin Forest. A natural forest virtually uninfluenced by human activity.

Visual Quality. Degree of obstruction or contrast degradation of viewing a scene due to air contaminants or weather.

Visual Quality Objectives (VQO's). A set of measurable goals for the management of forest visual resources used to measure the amount of visual contrast with the natural landscape caused by human activities. The following are VQOs:

Preservation -- Ecological change only here.

Retention -- Human activities should not be evident to the casual Forest visitor.

Partial Retention -- Human activity may be evident but must remain subordinate to the characteristic landscape.

Modification -- Human activity may dominate the characteristic landscape but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Maximum Modification -- Human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

Visual Resource. A part of the landscape important for its scenic quality. It may include a composite of terrain, geologic features, or vegetation.

Visual Resource Management Class. As assessment if the relative visual resource quality on National Forest system lands as it relates to potential resource use and/or development. (See Visual Quality Objectives).

Waste Embankment. A man-made pile or heap of rock or earth material, usually left over from mining or construction.

Watershed. The entire region drained by a waterway (or into a lake or reservoir). More specifically, a watershed is an area of land above a given point on a stream that contributes water to the stream flow at that point.

Water Quality Limited Segment (WQLS). A stream or segment of a stream which has been listed by the State as water quality limited for one or more parameters such as temperature, sediment, contaminants, etc. Required by section 303(d) of the Clean Water Act.

Water Table. The upper surface of groundwater. Below it, the soil is saturated with water.

Water Uses. The status of water uses subject to State water laws that is used to determine the water uses and legal status of waters on the National Forests.

Water Yield. The run-off from a watershed, including groundwater outflow.

Wet Areas. Often referred to as "moist sites," they are very important components of elk summer range. These sites, often occurring at the heads of drainages, may be wet sedge meadows, bogs, or seeps.

Wetlands. Areas that are permanently wet or are intermittently covered with water.

Wilderness (Wilderness Area). Undeveloped federal land retaining its primeval character, without permanent human habitation or improvements; It is protected and managed to preserve its natural condition. Wilderness Areas are designated by Congress.

Wildland Fire. Any non-structure fire, other than agency-ignited Prescribed Fire, which occurs in the wildland. This includes Wildland Fire Use and Unwanted Wildland Fire.

Wildland Fire Use. The management of naturally ignited wildland fires to accomplish specific, pre-stated resource management objectives in predefined geographic areas outlined in Fire Management Plans.

Wildland/Urban Interface. The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. The area where humans and their development meet or intermingle with undeveloped wildland or vegetative fuels.

Wildlife and Fish User Days (WFUD). A 12-hour day in which a person participates in a wildlife- or fish-related recreation activity that used to determine the annual use of wildlife and fish resources by recreationists on the National Forests.

Wildlife Habitat Diversity. The distribution and abundance of different plant and animal communities and species within a specific area.

Windthrow. Trees that have been uprooted by the wind.

Wood Fiber Production. The growing, tending, harvesting and regeneration of harvestable trees.

Woodland Products. Harvestable items from forested woodlands. These include fuelwood, nuts, berries, and Christmas trees.

Water Quality Limited Stream (WQLS). Water bodies (or segments of water bodies) listed by EPA as not meeting State water quality standards. They are to be monitored to determine if water quality standards are, or are not, being met. On those not meeting standards, TMDLs may be assigned.

Yarding. Moving cut trees to a centralized place (landing) for hauling away from the stand.

ZOI (Zone of Influence). The areas influenced by Forest Service management activities.

Caribou-Targhee NF

Caribou-Targhee NF
1405 Hollipark Dr.
Idaho Falls, ID 83401
(208) 557-5760

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Caribou-Targhee NF

Caribou-Targhee NF
1405 Hollipark Dr.
Idaho Falls, ID 83401
(208) 557-5760

Final Environmental Impact Statement

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Equal Employment Opportunity Statement