CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This Chapter summarizes the physical, biological, economic, and social environments of the project area and the effects of implementing each alternative. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

Following each resource description is a discussion of the potential effects (environmental consequences) to the resource associated with the implementation of each alternative. All significant or potentially significant effects, including direct, indirect and cumulative effects, are disclosed. Effects are quantified where possible, and qualitative discussions are also included. The means by which potential adverse effects will be reduced or mitigated are described.

The discussions of resources and potential effects take advantage of existing information included in the Forest Plan EIS, WAs, and other sources as indicated. This EIS is tiered to the Forest Plan EIS. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record includes all project-specific information, including resource reports, ecosystem analyses, and other results of field investigations. The record also contains information resulting from public involvement efforts. The planning record is located at the Klamath National Forest Supervisor's Office in Yreka, California and is available for review during regular business hours. Information from the record is available upon request.

Affected Environment

The proposed project area consists of approximately 1890 acres scattered throughout a 316,000-acre area. This area is comprised of the North Fork Salmon River Watershed, which is about 130,000 acres; the Lower South Fork of the Salmon River Watershed, which is about 67,000 acres, and the Upper South Fork Salmon River Watershed, which is about 119,000 acres. Only information necessary to understand the environmental consequences is included in the affected environment discussions in this document. More detailed information on the affected environment including ecological relationships can be found in Chapters 1 through 4 of the *Upper South Fork Salmon River WA,* in Steps 1 and 3 of the *North Fork WA*, and Steps 1 through 5 of the *Lower South Fork Salmon River WA*, which are incorporated by reference.

Analyzing Environmental Consequences

Environmental consequences are the effects of implementing an alternative on the physical, biological, economic, and social environment. The CEQ regulations implementing NEPA include a number of specific categories to use for the analysis of environmental consequences. Several are applicable to the analysis of the proposed project and form the basis of much of the analysis that follows. They are explained briefly here.

Direct, Indirect and Cumulative Effects

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but would occur in the foreseeable future.

Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. Past, present, and reasonably foreseeable future actions are assessed along with the effects of the Proposed Action to determine whether significant cumulative effects may occur. The assessment area varies by resource.

Depending on the extent of the assessment area, past actions included in cumulative effects analysis may include Glass Roadside Salvage, Upper South Fork Timber Sale, Crawford Road Decommissioning, and Black's Gulch Road Decommissioning. The effects of these past actions are described as part of the existing condition for all resource areas, where appropriate. Other present actions may include Glassups Timber Sale; Knob Timber Sale; Summerville Road Decommissioning; the Salmon River Knapweed Project; Taylor Fuels Project; Pollock's Gulch, Music Creek, Crawford Creek, and North Russian Creek Roads Project; Yoakumville Roads Project; King Solomon Mine Tailings Dam Removal Project; Salmon Plantation; Garden Gulch Fuels Reduction; and Liberty Mine Sampling, Westside and Yankee Dump Sites. Foreseeable future actions may include Liberty Mine Sampling, Eastside Apex; Fork Hazard Tree; and Sawyers Bar Fuels Reduction Project. Refer to each resource area to determine how present and reasonably foreseeable future actions were handled.

Available Information

Much of the Forest resource data resides in an electronic database formatted for a geographic information system (GIS). The Forest uses GIS software to assist in the analyses of these data. GIS data is available in tabular (numerical) format, and as plots displaying data in map format.

There is less than complete knowledge about many of the relationships and conditions of wildlife, fish, forests, jobs, and communities. The ecology, inventory, and management of a large forest area is a complex and developing science. However, the basic data and central relationships are sufficiently well established in the respective sciences for the deciding official to make a reasoned choice between the alternatives, and to adequately assess and disclose the possible adverse environmental consequences. New or improved information would be very unlikely to reverse or nullify these understood relationships.

Vegetation

Affected Environment

Forest Types

Douglas fir, ponderosa pine, mixed conifer, and true fir are the four forest types in the project area, named by major conifer species. Stand health is shaped by the varying disturbance the stands have experienced in the past 100 years. Aspect, soil type, elevation, and moisture regime also affects overall stand growth and vigor.

Past fires and fire suppression play a large part in stand composition and structure. The fire frequency, timing, and intensity affect the size classes and distribution of each of the tree species in the stand. Large fires in 1977 and 1987 had a great effect on much of the landscape, fragmenting the forest and returning many stands to an early seral stage. Insects, diseases, and timber harvest have also shaped these stands.

The Matrix portion of the stands in the project area has been designated as capable, available, and suitable for timber management as described in the *Forest Plan*. The RR portion of the stands is similar in vegetative condition to the surrounding and/or adjacent Matrix; however, it is not available for timber management. The current condition of the stands varies from dense, relatively-young (80 to 140 years), even-aged stands to mature older stands (over 250 years) with significant disease and mortality. Many of the stands exhibit a mixture of young and old trees with a variety of disease conditions. Hardwoods are a component of most of the stands.

High conifer and hardwood stocking levels have led to severe inter-tree competition for limited resources needed for growth and survival. Trees require nutrients, water, root space, sunlight, air, and beneficial soil organisms to grow and maintain health. This high stocking density puts many of these resources at a premium for the individual trees and causes stress and mortality. The result is slow growth rates, increased susceptibility to insect and disease infestation, and increased susceptibility to natural forces such as windthrow and fire.

Some stands are in an advanced state of decline due to long-term insect and disease infestation as well as natural fire damage. Many trees are infested with dwarf mistletoe or other pathogens, which retard the development of a replacement stand. High fuel loading due to recent mortality has led to increased susceptibility to high intensity wildfires. A more detailed description of each stand, along with the proposed prescription, is available on the Stand Record Cards, which are on file in the project record and incorporated by reference. More information about the existing vegetative condition can be found in the North Fork, Upper South Fork, and Lower South Fork WAs.

The stands included in the proposal do not currently meet the desired conditions as identified in the *Forest Plan* and the WAs; refer to **Table 1** in Chapter 1.

Desired Condition

The desired condition is for more vigorous stands with higher growth rates than currently exist. Matrix stands would range in age between seedlings and 120 years. There would be fewer incidences of insect and disease than currently experienced and the area would be free of noxious weeds. Approximately 15% of each of the stands would have an older component, which would provide a more mature structure to the stands. The stands would be comprised

of a variety of species, which would help reduce the spread of insects and diseases that are adapted to a single species. Less densely stocked stands would have rapid growth rates, which would lead to more consistent forest cover over time. Harvesting of overstocked or diseased stands would allow for a continuous flow of forest products, benefiting communities within the Forest's area of influence; refer to Economics Section for more information on the area of influence.

The desired condition for RRs is for healthy, vigorous vegetation with good root systems. The trees would have a low incidence of insect and disease. There would be less tree mortality, leading to a less rapid buildup of fuels, and a low risk of catastrophic fire destroying the vegetation. The RRs would be comprised of a variety of species, which would help reduce the spread of insects and diseases that are adapted to a single species.

The desired condition for both Matrix and RR stands is a condition where wildland fires are not stand-replacing fires, which would help retain forested habitat for wildlife and aquatic species. This would also protect the investments in plantation trees on Matrix land. Large mature trees and snags would be managed to provide habitat for dependant species. Large trees and snags would generally be more abundant in RRs.

The health of the stands would be improved by removing many trees infected with mistletoe and other vectors that would likely be transferred to other healthier trees over time. The resistance of the individual trees to disease and insect attack needs to be improved by providing more of the site resources to those trees through decreased stocking, which would improve stand health.

Botanical Species of Concern

The Region 5 Regional Forester has listed botanical species as Sensitive, if there is a concern for viability. Sensitive species are those which may occur in few to large numbers in a small, localized area, or which may occur in a wide geographical area, but in few numbers in restricted specialized habitats. Thirty-seven Sensitive botanical species are known, or thought likely, to occur on the Forest. This includes 13 botanical species from the Survey and Manage Program that were recently added (April 26, 2004 and May 12, 2004) as they met the criteria for Sensitive species. Habitat assessments were completed for all species of concern. The project area is not within the range or habitat of *Arabis macdonaldiana*, *Astragalus applegatei*, *Fritillaria gentneri*, or *Phlox hirsute*. The proposed project area was determined to contain suitable habitat for *Cypripedium fasciculatum*, commonly known as Clustered lady's slipper, and *Cypripedium montanum*, known as Mountain lady's slipper. The project area has potentially suitable habitat for *Ptilidium californicum. Phaeocollybia olivacea*, and *Sowerbyella rhenana* have the potential to occur in the project area, but the potential is low. Botanical surveys have been conducted and no populations of any species of concern were found. There are no known populations in the area. No suitable habitat exists for most of the other species.

Noxious Weeds

Known populations of three species of noxious weeds exist in the analysis area. Yellow starthistle (*Centaurea solstitialis*), which is widespread throughout the County, is prevalent along the roads and in areas adjacent to proposed units in the Hotelling and Methodist Creek watersheds. Dyer's woad (*Isatis tinctoria*), which is less widespread than star thistle, is present in two small locations on roads adjacent to proposed units. Spotted knapweed (*Centaurea maculosa)* is present on the roads adjacent to proposed Unit 77, and in various locations along the roads and river corridor on the North Fork Salmon River. All locations of spotted knapweed are being controlled through manual treatment, and have not set appreciable amounts of seed in over three years.

Management Direction

The *Forest Plan* determined that removal of vegetation to meet desired conditions, including growth and yield objectives, is appropriate on Matrix land; refer to Forestwide Standards and Guidelines 21-1, 21-13, 21-36. A considerable portion of the Forest is allocated to Late-Successional Reserves (LSRs) (23%), Wilderness (24%), RRs, and other land allocations where the desired conditions do not include growth and yield objectives.

Forestwide Standard and Guideline 6-4 requires that "Landscape areas where little late-successional forest persists should be managed to retain late-successional patches. This standard and guideline will be applied in fifth field watersheds (20 to 200 square miles) in which Federal forest lands are currently comprised of 15% or less late-successional forest. This assessment should include all allocations in the watershed." The 5th field watersheds in this proposal, North Fork Salmon River and South Fork Salmon River, have well above 15% of the capable area in late-successional vegetation, so this successional stage is not lacking. An analysis using the Forest GIS vegetation layer, found the North Fork Salmon Watershed to have 45,731 acres in late-successional vegetation of the 82,146 capable acres in the watershed, which is 55.7%. The South Fork Salmon Watershed had 60,147 acres in late-successional vegetation of the 125,957 capable acres in the watershed, which is 47.8%. After accounting for the Glassups, Upper South Fork, and Knob Timber Sales, the North Fork Salmon would have 55.5% and the South Fork Salmon would have 47.4% of the capable acres in late-successional forest.

The National Forest Management Act requires projects to be consistent with the *Forest Plan* and with management requirements set forth at 36 CFR 217.27. Sections (b) Vegetative manipulation, (c) Silvicultural practices, and (d) Even-aged management relate to vegetation.

Section 7 of the Endangered Species Act, and Forest Service Manual 2670 (USDA FS 1995d), directs Federal agencies to ensure that any action authorized, funded, or permitted by such agencies is not likely to jeopardize the continued existence of 1) species listed, or proposed to be listed, as Endangered or Threatened by the FWS, and 2) species listed as Sensitive by the Region 5 Regional Forester, or to cause a trend to federal listing for species listed as Sensitive.

Forest-wide Standards and Guidelines have been developed that direct the management of Sensitive plant species to ensure the maintenance of reproducing, self-sustaining populations, and to prevent the need for the species to become listed under ESA (USDA FS 1995a).

Methodology

The effects on the vegetation of each alternative are discussed. How well each alternative would move stands towards the desired conditions is highlighted in the discussion. The key indicator used to compare achievement of Purpose and Need is as follows:

- Acres of land where the stand density is low enough to provide for healthy growing conditions, insect and disease infestations are at low levels, and conifer mortality is less than 0.5% per year.

A discussion of the effects on vegetation to demonstrate consistency with law, regulation, and policy is also included in this section. Many of these potential effects were identified as non-significant issues for this proposal.

The supporting documentation for these discussions are as follows: Silvicultural Input to the Meteor Timber Sale by Dan Blessing; Stand Record Cards by Dan Blessing; Analysis for 15% Late-Successional Forest in Fifth Field Watersheds for Meteor by Lynda Karns; EIS Input and Botanical Analysis For Survey and Manage Plant Species by Marla Knight; Biological Assessment/Evaluation For Sensitive, Threatened, and Endangered Plant Species by Marla Knight; Supplemental Biological Evaluation for the Meteor EIS by Marla Knight; and Noxious Weed Risk Assessment by Marla Knight. These documents are incorporated by reference and available in the project record. The documentation provides the descriptions, detailed discussions, assumptions, and figures that support the discussions in this section.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

With the No Action Alternative, no acres would be moved to a stand density condition allowing for low insect, disease, and mortality levels. With this alternative, the high stand densities would cause continued poor growth rates, high mortality, as well as insect and disease problems. This mortality would cause continued fuel buildups, increasing the risk that a fire in the project area would be stand-replacing. Drought conditions over the past few years have also contributed to high mortality levels. Large amounts of dead trees provide breeding areas for bark beetles, which leads to additional high mortality in the stands. Some of the plantations have a single species overstory with natural seedlings invading the understory. Single species stands are susceptible to insect and disease problems and the mortality that accompanies them.

Without treatment the stands proposed for regeneration harvest would die out, infecting surrounding stands with insects or diseases during this process. These stands would not provide good forest cover, the dead trees would lead to an increase in the amount of fuels and associated fire danger, and insect and disease vectors would remain to infect the succeeding stand. These stands would eventually re-establish themselves as a younger successional stage consisting of brush, hardwoods, heavy fuels, and a scattered mix of diseased conifers.

This alternative would not contribute to the Forest's harvest obligations as outlined in the *Forest Plan*. It would not provide commodity outputs or jobs to benefit communities within the Forest's working circle; refer to Economics section.

With this alternative, there would be no change to the amount of late-successional and old growth forest in the fifth field watersheds, barring catastrophic events such as intense fires, catastrophic insect infestation, or widespread disease. There would be 55.5% in the North Fork Salmon and 47.4% in the South Fork Salmon in late-successional forest.

This alternative does not involve vegetative manipulation, timber harvest or cultural treatments, or the creation of openings, so the management requirements at 36 CFR 219.27 would not apply.

There would be no direct effects to Sensitive plant species as a result of this alternative. The short-term indirect effects of the No Action alternative would mainly be the continued accumulation of fuels in forested stands that could, in time, burn with an intensity that would result in long-term loss of habitat for species of concern. Deteriorating stand health could also contribute to a loss of habitat for species of concern over time. Stand health is a critical element in the preservation of cool, moist microclimates that many species of concern

depend on for their continued viability. If dense stands become diseased and/or overcrowded, this can lead to mortality, a loss of shade, and increases in stand temperatures.

This alternative would have a low risk of spreading and/or introducing noxious weeds, as no actions would be implemented.

Cumulative Effects

The mortality that results from overstocking, insect attack, and diseases would cause continued fuel buildups within the project area. Leaving sources of insect infestation and disease also increases the risk of spread to other stands within the assessment area. Mortality from similar causes would also occur in many other untreated stands within the assessment area. The cumulative effect of this mortality and poor stand health is that management objectives would not be met. The cumulative effect of fuels building up throughout the assessment area would increase the risk that any fires occurring within the assessment area would burn at a stand-replacing intensity.

Alternatives 2 and 3

Alternatives 2 and 3 would respond to the key indicator in a similar manner, differing only in the amount of acres treated. They are discussed together by treatment type with their differences highlighted. Differences are summarized at the end of this section.

Direct and Indirect Effects

Green Tree Retention or Green Tree Retention/Thinning –This prescription uses the advantages of even-aged harvest, yet leaves residual conifers to add stand diversity. The advantages of even-aged harvest include more successful and faster growing regeneration, the ability to grow shade intolerant species such as ponderosa pine, and lack of damage by subsequent overstory harvests. The stands proposed for this treatment have areas with large overmature trees manifesting disease, density-related symptoms, and mortality. The Green Tree Retention system involves a regeneration cut with approximately 10% of the area left intact in islands. This area would include mature trees with the best chance of surviving and providing late-successional features until the developing stand has grown to a mature state. Mature trees would be left scattered throughout the stand on an additional 5% of the area to provide additional structure to the stand. The value of these structural components in maintaining diversity is documented in Franklin and others (1997). The retention of trees can help to reduce the visual impact of the cutting. The combination Green Tree Retention /Thinning prescription would treat the younger overstocked portion of the stands by reducing the stand density (refer to *Thinning* discussion below), while regenerating the older portions of the stand in the manner described above (five acres regenerated in Unit 68 and 12 acres regenerated in Unit 141). Alternative 2 would treat 5 stands (31 acres) and Alternative 3 would treat 3 stands (21 acres) using the Green Tree Retention system.

Seed Tree – This harvest prescription is similar to Green Tree Retention with the 15% mature trees being retained in a more uniform spacing throughout the unit. This is done to provide a seed source to aid in reforesting the stand. This even spacing can also help to retain soil on site and provide a different visual pattern to the landscape. The regeneration would move the stand towards the desired condition in the same manner as Green Tree Retention. Alternative B would treat 2 stands (33 acres) with this prescription; Alternative C would treat 1 stand (5 acres) with this prescription.

Thinning and Thinning/Sanitation – The thinning prescription entails the removal of trees in the lower crown classes as well as diseased or damaged trees. The objective is to concentrate growth on the residual trees, which are the larger and more vigorous trees in the stand with the best ability to respond to less competition. These trees have larger crowns and a greater capacity to photosynthesize and increase their crown size as more light reaches the full crown. These trees also have the best root systems and the best potential to extend their roots to take advantage of the increase in site resources available after thinning. Larger root systems can increase the stability of the trees and slope. By reducing the stocking level, thinning reduces tree mortality and therefore the fuel loading. Thinning also reduces the risk of insect and disease infestation. Sanitation removes trees that are likely to die in the near future. Alternatives 2 and 3 would both treat 19 stands (299 acres total). In two stands with a Green Tree Retention/Thinning prescription, 12 acres would be thinned in Unit 68 and 23 acres would be thinned in Unit 141.

Alternative 2 would treat some RRs by removing scattered suppressed or sick and dying trees. The objective in the selected RRs would be to maintain or improve the health and growth of the vegetation. The residual trees would have fewer incidences of insect and disease, less mortality, and a less rapid buildup of fuels. The decreased fuel buildup along with treatment of fuels would lead to a reduced chance of catastrophic fire destroying the vegetation. The decreased stand density would allow for the maintenance of shade intolerant species such as hardwoods. The largest trees in the dominant and codominant crown classes would be maintained, which would provide a mature structure to the landscape. The RRs would be comprised of a variety of species, which would help reduce the spread of insects and diseases that are adapted to a single species.

Salvage – The stand proposed for salvage (50 acres) in both Alternative 2 and 3 is a two storied stand consisting of scattered overstory trees, many of which are in poor health, over a brushy understory with seedlings that were established after the area was salvage logged following the 1987 fires. This prescription would concentrate growth on the thrifty younger trees by removing some of the overstory, provide dead trees as wood products, and reduce the mistletoe source in the overstory.

Group Selection – This is an uneven-aged silvicultural system designed to regenerate the stand over time. The stands slated for group selection are multi-aged stands with both a decadent component and areas of younger, healthier trees. Approximately 20% of the stand would be regenerated this entry in one to 2½ acre groups. The size and shape of the group depends upon the slope, aspect, and type of tree regenerated. Larger openings are planned on north-facing slopes where light may be limiting tree growth and where pines are slated for replanting. Larger openings would encourage faster growth of seedlings (McDonald and Reynolds 1999). Seedlings grown near the edge of openings grow slower than the seedlings in the middle of the openings due to increased competition for water, light, and nutrients from the larger trees on the perimeter of the openings. The slowest growth of seedlings is experienced where the site is fully occupied by mature trees. The openings would have the site prepared, would be planted, and would be maintained as with even-aged systems to promote growth of the seedlings. This would create even-aged groups within the uneven-aged stand. The remaining 80% of the stand would be thinned or sanitized to promote the growth and health of the stand until the next scheduled harvest; refer to discussion for *Thinning* above. Alternative 2 would treat 14 stands (331 acres) and Alternative 3 would treat 12 stands (275 acres) with this prescription.

Reforestation - Reforestation by planting seedlings would reduce the time needed to create a forested stand. Seed cast by mature trees is unreliable in creating new stands, since many trees have long periods between seed production. The regenerated stands would be reforested with a mix of species similar to that currently in the overstory of the stand to be regenerated using seed gathered from the same zone and elevation as the current stands. The practice of regenerating forests has been widely studied and documented (Hobbs and others 1992, Cleary and others 1978, Shubert and Adams 1971, Burns 1983, Fowells 1965). The key to successful regeneration is to prepare the site properly (refer to hardwood felling), select healthy well-adapted seedlings, protect them from damage or disease (browse protection, gopher control, and sanitation), and make sure that the site resources are available (hand grubbing, chainsaw release, precommercial thinning, and mastication). These practices have been proven to work on the Salmon River District in the past. Seedling survival inventories document the reforestation success and growth of stands planted in the past 30 years. These inventories show that the use of proper site preparation, healthy planting stock, and keeping competition at a low level led to fast growing trees that are currently providing mid-seral habitat and other forest resources. Alternative 2 would reforest 108 acres. Alternative 3 would reforest 78 acres.

Precommercial thinning- Some stands currently have a young component of overstocked trees that are growing and developing slowly. Thinning these areas would increase the growth to provide for larger trees in a shorter time span. Either Action Alternative would precommercial thin 92 acres.

Browse protection - Deer, elk, rabbits, and small rodents sometimes feed on young seedlings, causing slower growth, poor form, and death. Browsers especially prefer young succulent trees grown in a nutrient rich environment. Seedlings planted in the deer winter range are normally protected from damage by installing tubing immediately after planting. In other areas the seedlings are monitored and the protection is only used if there is significant damage. Alternative 2 would install tubing on 101 acres, while Alternative 3 would use it on 71 acres.

Hand grubbing - Seedling growth and survival is dependent on many factors, but the most important factor is often competition for the site's resources with moisture usually the most limiting factor in this area. Hand grubbing is a method of removing the competing growth from around young seedlings to increase the amount of moisture available to the young trees. This is most important in the first years after planting when the roots systems are shallow. Alternative 2 would grub 104 acres, while Alternative 3 would grub 74 acres.

Hardwood felling – Hardwoods would be felled prior to broadcast or jackpot burning to remove the large established hardwood trees that would otherwise capture most of the site's resources and prevent the establishment of the young seedlings. The felled hardwoods would then be burned to provide growing space for the seedlings. Either Action Alternative would fell hardwoods on 28 acres.

Chainsaw release - Many species of brush are able to quickly establish and grow in forest openings, competing with planted seedlings for water, nutrients, light, and space. This frequently results in slow growth and mortality of seedlings. Using a chainsaw to clear brush around the seedlings would stimulate the seedlings, increasing their growth rates. Alternative 2 would release 122 acres, while Alternative 3 would release 113 acres.

Gopher Baiting - High elevation stands, stands near meadows or other areas with current populations of gophers, and stands with soils that allow easy burrowing are prone to gopher

infestation. Gophers would be controlled only where they are a threat to stand reestablishment and only for a short period of time. Gophers are not currently a problem in the stands planned for harvest, but it is expected that some of the stands would have an increase in gopher activity due to the harvest and establishment of more palatable vegetation. With Alternative 2, 55 acres would be monitored to determine if gopher baiting with strychnine bait was needed, while 30 would be monitored with Alternative 3.

Sanitation of understory trees - Small seedlings are rarely infected with mistletoe. As trees grow becoming a larger target to the mistletoe seed released from overstory trees, they are more likely to become infected. Mistletoe robs the tree of resources needed to survive, while deforming the bole and branches. A plantation heavily infected with dwarf mistletoe is unlikely to ever grow into a mature stand. By removing trees in an already infected stand, the number of trees getting infected is reduced, concentrating growth on the remaining trees in the stand. Either Action Alternative would sanitize mistletoe-infected trees in the understory on 72 acres.

Mastication – The plantations and natural stands proposed for this treatment have high stocking densities and the brush and hardwoods in the stands are competing for limited resources such as nutrients, water, and light. The precommercial thinning and mastication of these stands would increase the growth rates of the residual trees and hasten the development of a more mature forest. The masticator would also reduce the resulting slash to a chipped material that breaks down more quickly, reducing the risk of stand replacing fire in the stand. The machine would not be operated on slopes over 45%. Alternative 2 would treat 44 acres within harvest units and 131 acres in nine stands outside harvest units. Alternative 3 would treat 27 acres within harvest units and 41 acres in 3 stands outside harvest units.

These alternatives would contribute to the Forest's harvest obligations as outlined in the *Forest Plan*. Either alternative would provide commodity outputs that would benefit communities within the Forest's working circle; refer to Social section. Timber harvesting and processing provides local jobs as do the subsequent reforestation and stand tending activities; refer to Economics section.

The small amount of acreage that would change successional stage in either Action Alternative would not begin to approach the minimum 15% in the North Fork Salmon and South Fork Salmon 5th Field Watersheds. The silvicultural prescriptions in these alternatives with the potential to convert late-successional vegetation to an earlier successional stage are Group Selection, Seed Tree, and Green Tree Retention. Approximately 20% of the Group Selection acres and 100% of the Green tree Retention and Seed Tree acres would be converted to an earlier successional stage. Thinning and salvage prescriptions would not change the successional stage of the stands. Alternative 2 would convert 77 acres, 0.09%, in the North Fork 5th Field Watershed and Alternative 3 would convert 28 acres, 0.03%. Either alternative would convert 50 acres, 0.04% in the South Fork 5th Field Watershed.

In fulfillment of the requirements at 36 CFR 219.27, the District Silviculturist has made the following determinations:

- There is reasonable assurance that soil, slope, or other watershed conditions would not be irreversibly damaged if the prescriptions are implemented as prescribed in either of the action alternatives.
- Reforestation can be accomplished within 5 years of harvest.
- All lands in all prescription units (stands) are suitable for timber production.

- The regeneration harvest prescriptions that include Green Tree Retention, Group Selection, and Seed Tree, are the optimum harvest methods where they are prescribed because they meet the objectives of the *Forest Plan* for the management area, are scientifically sound methods of regenerating western conifer species, and will retain and protect the most ecologically significant biological and structural forest components.

The determination of scientifically sound methods of regenerating western conifer species is based on the following publications: Appendix F of the *Forest Plan* Final EIS (USDA FS 1995b), Appendix A of the Final EIS for Vegetation Management for Reforestation (USDA FS 1998a), and The Scientific Basis for Silvicultural and Management Decisions in the National Forest System (USDA FS 1989).

Some contend that opening the canopy may increase understory growth, temperatures, and wind; and decrease air humidity and fuel moisture, which could result in decreased conifer regeneration. A wealth of research publications indicates that conifer regeneration success is increased when canopies are opened up. Establishment and growth of conifers is greater in openings compared to the understory of dense stands. Some examples of these publications are McDonald and Reynolds (1999), McDonald (1976a), McDonald (1976b), and Lindquist (1977).

For Sensitive species, *Phaeocollybia olivacea*, and *Sowerbyella rhenana*, the removal of small amounts of canopy cover used for shade, and the removal of some host species could directly affect individuals. Due to the extensive nature of mycelial (vegetative part of fungus) growth, the likelihood of any one treatment on any one unit adversely affecting a specific fungi species is very low. Mastication could cause an increase in fungi after the shredded material starts to decompose due to the beneficial addition of organic matter. While individuals may be affected, a trend toward Federal listing or a loss of viability is unlikely.

Since there are no known populations of TES botanical species in the project area, surveys have not located any new populations, and/or habitat assessments found a low potential for species in the area, the Action Alternatives would not have any short/long term, direct/indirect, or cumulative adverse effects on other botanical species of concern with the exception of the Blue Ridge area for Alternative 3. Poor stand health in this area could contribute to a future loss of habitat for *Ptilidium californicum*, similar to that discussed for Alternative 1. Stand density reduction in Alternative 2 would help maintain suitable habitat in the future.

With the implementation of the Resource Protection Measures, identified in Chapter 2, either Alternative 2 or 3 would have a low risk of spreading and/or introducing noxious weeds.

Comparison of Alternatives 2 and 3

Alternative 2 would treat 744 acres of high priority stands with timber harvest prescriptions. After treatment, these stands would meet the objectives for healthy growing conditions, lower incidence of insects and disease, and lower risk of insect and disease problems in the future. There is an exhaustive body of research that shows how reducing stand density helps reduce the incidence of pest damage to a stand; examples include Fiddler and others 1995, Oliver 1990, Oliver 1995, Sartwell 1971. The growth rates would be greater for the residual trees and less mortality would lead to lower dead fuel levels. Alternative 2 would also reduce the stocking levels in selected RRs, reducing pest damage, increasing growth, and reducing mortality. The 108 acres slated for reforestation in the Matrix portions of stands would be planted with rapidly growing seedlings. An additional 131 acres of younger stands outside

harvest units would be thinned and protected from fire by masticating brush, hardwoods, and suppressed conifers.

Alternative 3 is similar to Alternative 2, but would treat six fewer stands with timber harvest prescriptions and would not treat RRs. After treatment, 650 acres would meet the objectives for healthy growing conditions, lower incidence of insects and disease, greater growth rates, lower mortality, and decrease in dead fuel levels. This would be 13% fewer acres than with Alternative 2. With Alternative 3, 78 acres would be reforested. An additional 41 acres of younger stands outside harvest units would be thinned and protected from fire by masticating brush, hardwoods, and suppressed conifers in Alternative 3. This would be 69% fewer acres than with Alternative 2 with the subsequent reduction in fire protection and stand growth and health.

In the North Fork Salmon 5th Field Watershed, Alternative 2 would convert about 77 acres from late-successional forest to an earlier stage. Alternative 3 would convert about 28 acres. In the South Fork Salmon 5th Fifth Field Watershed, both Alternatives 2 and 3 would convert about 24 acres to an earlier successional stage.

Cumulative Effects

The contribution to beneficial cumulative effects on vegetation of Alternatives 2 and 3 are discussed below. The health and resiliency of the stands in Alternatives 2 and 3 is dependant upon the condition of the stands as well as the conditions found in the surrounding forest. Trees infested with dwarf mistletoe can infect adjacent stands and reduce the growth rate and fire resistance of the stands because trees heavily infected with mistletoe often are more susceptible to crown fire. Dense overstocked stands with high mortality are at a high risk for stand-replacing fire. Regular silvicultural and fuels treatments can reduce the overall fire liability over a landscape (Graham and others 1999).

The Upper South Fork and Glassups Timber Sales are treating stands in the vicinity of several Meteor stands. The Knob Timber Sale, which has a signed decision, will also have treatment areas near Meteor stands. The combined effects of these harvests and associated treatments would be to reduce the total acres of overstocked stands and to reduce the acres with high fuel loading over the landscape.

Some of the Meteor stands are in areas that were burned by wildfires, harvested, and subsequently reforested. Many of these plantations are at risk for dwarf mistletoe infection due to adjacent overstory trees with heavy infections. The Meteor Project would reduce the mistletoe infection in these areas, allowing the plantations to develop more rapidly, which would help with the overall recovery of the area.

The silvicultural and fuels treatments in harvest units, mastication of adjacent stands, and treatments from past and current projects would create strategic areas of low fire risk as well as areas with higher growth rates, less mortality from insects and disease, and better stand health.

In the North Fork Salmon 5th Fifth Field Watershed, implementation of Alternative 2 of Meteor plus the Knob and Glassups Timber Sales would leave 55.4% of the 82,146 acres capable of supporting forested vegetation in late-successional forest. A GIS analysis indicated there was 55.7% in the watershed prior to the three projects. Implementation of Alternative 3 plus Knob and Glassups Timber Sales would leave 55.5% of the area capable of supporting forested vegetation in late-successional forest. Approximately 227 acres of the

45,731 acres that supported late-successional vegetation prior to these sales in the North Fork Salmon would be converted to early successional stages by the three sales with Alternative 2 of Meteor; this is about ½ of one percent. Approximately 178 acres of the 45,731 acres that supported late-successional vegetation prior to these sales would be converted to early seral stages in the North Fork Salmon by the three sales with Alternative 3 of Meteor; this is less than ½ of one percent.

In the South Fork Watershed, implementation of either Alternative 2 or 3 of Meteor plus Knob and Upper South Fork Timber Sales would leave 47.8% of the 125,957 acres that are capable of supporting forest in late-successional vegetation. A GIS analysis indicated there was 47.8% in the watershed prior to the three projects. Approximately 453 acres of the 60,147 acres that supported late-successional vegetation in the South Fork Salmon prior to these three sales would be converted to early seral stages by the three sales with either alternative of Meteor; this is less than one percent.

Fire and Fuels

Affected Environment

The area has a Mediterranean climate, combining maritime and continental weather influences. This results in relatively mild winters and hot, dry summers. Thunderstorms with accompanying lightning are common from June until fall. Weather records from the Forest Service weather station at Sawyers Bar show an average of 42 inches of precipitation annually, mostly occurring from late fall to early spring.

Fire Regime

Pre-suppression era

This area primarily supports mixed conifer forest types. Prior to settlement by Europeans the fire regime was characterized as high frequency and low to moderate severity. Effects of fires in this regime and in the Klamath Mountains in particular were highly variable. Fires may have covered wide areas in extent but much of the material consumed would have been ground fuel, leaving the dominant conifer overstory largely intact. Occasional inclusions of areas with higher intensity fire effects resulted in generally small (less than 100 acres) patches of killed timber. This type of fire regime resulted in a fine-grained mosaic on the landscape with small homogeneous patches in a matrix of uneven-aged forest with multiple species.

No fire history studies are known that cover all of the project area, but data from other sites within the Klamath Mountains and on the Salmon River District may be extrapolated to these sites. These studies indicate that the pre-settlement fire return interval probably ranged from 10 to 36 years in this area. This would place the project area in fire regime Groups I and II, which have fire return intervals of 0 to 35 years with severity ranging from low to stand replacing.

The effect of these frequent fires was to consume downfall and litter on the forest floor preventing the buildup of this material. The periodic reduction of this buildup prevented fire intensities from becoming high enough to kill established overstory trees. Dominant species tended to be fire resistant such as Douglas fir, ponderosa pine, and sugar pine. Understories were generally open and free from ladder fuels that could carry fire into the overstory canopies and sustain crown fires. The shortest returns were on low elevation south aspects and the longest return intervals were found in riparian vegetation along perennial streams and high elevation north aspects.

Fire starts were primarily from lightning although it is generally acknowledged that American Indians used fire deliberately throughout California, including the Klamath Mountains.

Modern suppression era

The modern suppression era extends from about the turn of the century to the present day. A more accurate description may be from the start of effective fire suppression/prevention to the present time. For the assessment area, this would be from the end of World War I, roughly the last 70 years. The highly successful suppression/prevention program has resulted in the continuous buildup of fuels on the forest floor along with the encroachment of understory vegetation. This has produced a fire environment of fast moving, high intensity

fires. Once these fires become established, they exceed suppression capabilities resulting in large fires with a high proportion of the acres burning at high intensity, causing stand-replacement. In the Salmon River District this is evident from recent large wildfires including Specimen in 1994 (7,000 acres); Yellow (47,500 acres), Glasgow (13,000 acres), Hotelling (16,000 acres), and Saint Claire (8,600 acres) all in 1987; and Hog in 1977 (46,500 acres).

Some argue that activity fuels (fuels created by management actions), primarily logging slash, are the reason fires attain a large size. However, Yellow and Specimen are the only two of these large fires that started in activity fuels and they both moved across the landscape through natural fuels until weather and topography enabled firefighters to gain control. In all other cases, poor access, stand encroachment, and fuel buildups were the primary causes of the fires burning with high intensities and high rates of spread that exceeded control efforts and caused resource damage.

Current Condition

Fuel conditions across the project area vary greatly, resulting from a variety of factors such as stand composition, stand age, past harvest, past fuels treatment, fire suppression, weather, insects, disease, and wildfires. These factors plus others affect vegetation, which affects fuel composition. Without the benefit of periodic cleansing fires, ground fuel in much of the project area does not currently meet management objectives.

Understories have become flush with stagnant pole-size conifers, hardwoods, and brush. The competition for light and nutrients has increased mortality. Ground fuels have amassed as limbs and foliage fall to the ground. Shade-intolerant species, such as sugar pine, black oak, and ponderosa pine, are fading out of the stands. More frequent stand-replacing fires are occurring, because the vertical stand structure has changed over the years, primarily due to fire exclusion, which has allowed overstocking. Continuous ladder fuels have developed, bridging the gap between the overstory canopy and the forest floor resulting in the fire behavior described above. The total vegetative biomass in these stands creates a lack of stand vigor and increased mortality, which has increased available fuels in all size classes. Under the right conditions, this combination of ladder fuels and heavy ground fuels can lead to rapidly spreading, high intensity fires that can be difficult to control.

Although the fuels profile within each stand may vary, the way fire reacts in each stand can be categorized into three Fuel Models as characterized by the Northern Forest Fire Laboratory (NFFL):

- *NFFL Fuel Model 6:* “Fires carry through the shrub layer where foliage is more flammable, but this requires moderate wind. Fire will drop to the ground at low wind speeds or openings in the stand. This would include stands in the project area that have been affected by recent large fires.”
- *NFFL Fuel Model 8:* "Slow burning ground fires with low flame lengths are generally the case. Only under severe weather conditions and high winds do the fuels pose fire hazards”.
- *NFFL Fuel Model 10:* “The fires burn in the surface and ground fuels with greater intensity than the other timber litter models… Crowning out, spotting and torching of individual trees are more frequent in this fuel situation, leading to potential control difficulties”.

A number of the stands in the project area have been affected by recent large fire activity, most notably in 1977 and 1987. Hardwoods and brush with dense understory vegetation dominate these stands. This understory vegetation acts as the primary fire carrier and can burn with high intensity and extreme rates of spread when environmental conditions are right. Low fuel moistures and high winds can present control problems for initial attack forces. Ground fuel accumulations are low, and without a wind event, the fire would drop from the shrub layer to the ground. These type stands are classified as Fuel Model 6, and there are approximately 46 acres of this fuel type in the project.

The remaining stands in the project area are a combination of Fuel Models 8 and 10. Fuel model 8 represents closed canopy stands of short-needle conifers or hardwoods that support fire in the compact litter layer. This layer is mainly leaves, needles, and occasionally twigs

because little undergrowth is present in these stands. There are approximately 251 acres of this fuel model.

In Fuel Model 10 areas, fires burn in the surface and ground fuels with greater intensity than other timber litter models. Down dead fuels include quantities of 3-inch or larger limbs resulting from overmature trees or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees is more frequent in this fuel type, leading to potential fire control difficulties. These pockets of heavy fuels are usually the result of insect and/or disease infestations, wind-thrown stands, and over-mature stands with fallen dead trees. There are approximately 447 acres of Fuel Model 10 in the project area.

Stylized fuel models, as described above, do not clearly address the contribution to fire behavior of fuels that are greater than three inches in diameter. Fuels in the larger size classes take longer to ignite and under most conditions may not contribute to initial spread rates of a wildfire; however, once these fuels ignite, they burn longer than smaller fuels and contribute significantly to the overall intensity of a fire for a given area. As large fuels deteriorate, they become receptive fuel beds for firebrands (pieces of burning material that could cause ignition of fuels). In addition, larger fuels can offer greater resistance to the construction of firelines, reducing firefighter production rates and resulting in larger size fires.

On August 7, 2002, a small human-caused wildfire burned into a portion of proposed Unit 137. The fire burned approximately 5 acres of the unit. Although the fire as a whole burned with a moderate to low intensity, rapid rates of spread and high flame length occurred as the fire spread upslope into Unit 137. No crown fire developed but the heat from the fire killed the majority of the overstory trees. The area of the fire and Unit 137 is a NFFL Fuel Model 10.

Desired Conditions

Currently, the existing condition of the project area does not meet management goals and objectives. These goals and objectives, include but are not limited to, allowing fire to play a more natural role in landscape processes, reducing unacceptable fuel buildups, reducing the size and severity of future wildfires, and maintaining healthy stands that are resilient to fire events, insects, and disease.

Some contend that opening the canopy may result in increased fire risk by increasing understory growth, temperatures, and wind, while decreasing air humidity and fuel moisture. They suggest that trees surviving past fires are fire resistant. Numerous recent studies, as well as numerous years of personal experience of Fire Managers in the project area, have shown that the fuel treatment methods proposed to reduce the risk of high intensity fire are effective. The *Effects of Thinning and Similar Stand Treatments on Fire Behavior in Western Forests* (Graham and others 1999), a compilation of studies, concludes that the best success in modifying fire behavior through the use of thinning throughout the West is when it is applied in conjunction with prescribed fire. *Modifying Wildfire Behavior – The Effectiveness of Fuel Treatments* (Carey and Schumann 2003), a review of the literature in western ponderosa pine types, found a limited number of studies address the effectiveness of a combination of thinning and burning, but the notion should be viewed as a working hypothesis and tested. *Influence of Forest Structure on Wildlife Behavior and the Severity of Its Effects* (Graham and McCaffrey 2003), which synthesized the information contained in 153 peer-reviewed articles, concluded that "(t)hinning of flammable vegetation and prescribed burning are

standard vegetation management practices whose efficiency has been backed by hundreds of scientific investigations and years of professional experience." Three 2002 fires clearly document that fire intensity and rate of spread were reduced in areas previously treated. The Springer Fire, Coconino National Forest, Arizona on May 14, 2002, and the Bucktail Fire, western Montrose County, Colorado on May 23, 2002, were burning with high intensities and rates of spread. However, fire behavior changed when the fire front reached areas with recent fuel reduction treatments (which included thinning and prescribed fire). Such intermediate treatments can reduce the severity and intensity of wildfires for a given set of physical and weather variables. The Cone Fire which burned in the Blacks Mountain Research Area in 2002 showed almost 100% mortality in untreated areas, considerable tree mortality in areas thinned but not prescribed burned, and only some scorching on trees on the edge of stands thinned and underburned (Skinner 2002b, Nakamura 2002). The *Effect of Fuels Treatment on Wildfire Severity* (Omi and Martinson 2002) found "that treated stands experience lower fire intensities than untreated stands that burn under similar weather and topographic conditions."

Stands that remain after large fires are not an indication that the stand is resistant to catastrophic wildfire or that it would survive another fire event. Many variables contribute to a stand surviving a wildfire such as the time of day, relative humidity, temperature inversions, wind, fuel loading within the stand and adjacent to it as well as suppression actions. Local experience of Fuel Managers has found that in many instances fire damage to understory vegetation and to some of the overstory trees created a heavier fuel loading than existed prior to the wildfire leaving the stand susceptible to greater damage or loss in the next fire event.

Methodology

An analysis of the fuel loading in the project area was completed using Photo Series for Qualifying Forest Residue (Blonski and Schramel 1981) and Aids to Determining Fuel Models for estimating Fire Behavior, General Technical Report INT-122 (Anderson 1982). General Technical Report INT-122 describes the fire behavior that can be expected from each of these NFFL fuel models.

The identified NFFL fuel types were modeled using the BEHAVE PLUS fire prediction system, developed by NFFL, to determine flame lengths and rates of spread under 90th percentile weather parameters. These parameters are taken from a representative weather station. Slope classes appropriate for the project area were also used in the model. The outputs of the BEHAVE PLUS runs are on file in the Meteor project record. The model outputs can be used to estimate fire behavior and potential effects on vegetation.

Movement towards desired conditions is analyzed through a discussion of how well each alternative would meet the Forestwide Standards and Guidelines for Fire and Fuel Management and Prescribed Fire, as outlined on pages 4-52 to 4-55 of the *Forest Plan*. Special attention was given to Standard and Guidelines 22-12 and 22-13 that address managing fuel loading to minimize the intensity of fires on the forest. The key indicators used to display the movement towards desired conditions for fuels, a NFFL Fuel Model 8 or less, are as follows:

- A Flame Length of less than 4 feet and a Rate of Spread of less than 20 chains per hour.

The Fire and Fuels Assessment by Thomas Herold, dated April 16, 2003, provides the basis for these discussions, is incorporated by reference, and is on file in the project record.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

With the No Action Alternative, fuel would continue to accumulate at the current rate, resulting in higher fuel loadings and increased fire intensities over time. Natural fuel accumulation generally occurs slowly on the Forest. In the short term, the fuel conditions would be expected to remain in nearly the same condition as at present, except in areas where stand health is deteriorating. In these stands, live and dead fuel accumulations would be accelerated. Fuel loadings in these stands can reach high levels. Encroachment of understory vegetation, combined with down fuels, provides the ladder for fire to move from the ground to the overstory canopy. Wildfire in these stands would tend to be severe and difficult to control.

With this alternative, impacts to other resources would increase as fuel loadings and subsequent fire behavior increases. Fire would currently burn with moderate intensities throughout the majority of the project area, but the risk of high intensity fire would increase as fuel loading increases. If a fire occurred, a reduction of organic material and cover vegetation could be expected on one-third to two-thirds of the area burned. Generally, vegetation is killed in small patches, but large patches should be expected at the landscape or watershed level.

This alternative would not include any management actions within plantations. The ground and ladder fuels in many of these plantations have reached levels where a fire occurrence would have direct access to tree canopies, which would threaten the plantation's long-term survival.

Fire risk for the project area would not change with this alternative. Fire risk is the probability of fire occurring in a given area. With lightning being the major cause of fire in the Salmon River drainage, fire risk would remain the same. The majority of the district is in the moderate risk class with some higher risk areas along the ridgelines in the higher elevations.

With the No Action Alternative, fuels within the burned portion of Unit 137 would continue to accumulate and exceed fire management goals. This unit is located in the Cecilville "Community at Risk" as identified in the Federal Register per National Fire Plan direction. Objectives for this area are flame lengths of less than 4 feet and no crown fires. As the dead vegetation decays and falls to the ground, a fuel bed would be provided to carry fire outside the unit. Within 15 years, fuel conditions in the burned area would be subject to high intensity, rapidly spreading fire that would not meet the objectives of the National Fire Plan.

The No Action Alternative would also jeopardize firefighter safety in the event of a wildfire in the project area. Ground forces under current conditions would be unable to make an effective assault on the fire front due to extreme burning conditions and hazards such as snags and high-risk line locations. At present, the success of initial attack fire suppression forces is limited.

Flame length can be expected to be between 4 and 11 feet. Rates of spread can be expected to be between 3.5 chains per hour to 56.6 chains per hour. Large equipment, aircraft, and engines can be effective on slopes less than 40 percent. Without engine access and the aid of water, fire starts could exceed the suppression capability throughout the majority of the

project area. As fuel loading continues to increase, suppression capability would continue to decrease. Fire suppression would be the only management activity to occur in these stands.

Currently, the fire management objectives are met with this alternative in the short term. However, some values are at the upper limits or just exceeding them. With the No Action Alternative and a continuation of the current stand progression as discussed in the Vegetation Section, fire management objectives would not be met within 5 to 10 years. This would increase the risk the future fires occurring in these stands would burn with stand-replacing intensities.

Cumulative Effects

The increase in fuel levels and in the risk of stand-replacing fires within the project stands over the next 10 years could increase the risk to adjacent and nearby stands, especially, those which have not had any fuel reduction activities. As the fuels increase in the other stands within the assessment area, the risk to the project stands would also increase. The cumulative effect of these fuel increases is an increase in the overall risk of stand-replacing fire occurring within the assessment area. As Alternative 1 does not propose any change in access, there would be no contribution to cumulative effects on access for fire management.

Alternatives 2 and 3

Alternatives 2 and 3 would respond to the key indicators in a similar manner, differing only in the amount of acres treated. They are discussed together with their differences highlighted. Only those activities that affect fuels and fire suppression are addressed in this section.

Direct and Indirect Effects

Within harvest units, approximately 744 acres in Alternative 2 and 650 acres in Alternative 3 would receive fuel treatment. Silvicultural and fuels treatments would produce stands that are healthier, with less mortality, and more resilient to disturbance. Fuel loading after treatment would be at or lower than what currently existed prior to treatment (less than a Fuel Model 10 in individual stands). The combination of handpiling and yarding unmerchantable material would remove material left on site from the harvest activity. This would produce healthier stands that could be carried into the future. Fuel loadings would be at a level that would allow for effective fire suppression efforts 90% of the time (refer to **Table 8** for specific acreages for each fuel model for these alternatives). Fuel loadings within harvested stands would increase in the short term, approximately 1 to 2 years, until implementation of prescribed fire/fuels projects take place.

Table 8. Post- Fuel Treatment Acres by Fuel Model by Alternative for Areas Proposed for Harvest

Alternative	Total Acres	Acres Proposed for Treatment	Fuel Model Type*		
			6	8	10
1 (No Action)	744	0	51 acres	251 acres	442 acres
2	744	744	51 acres	693 acres	0 acres
3	744	650	**	650 acres	**

* Fuel model acre estimates were taken from the Forest GIS layer.
** Acres not treated under this Alternative would be a combination of Fuel Model 6 and Fuel Model 10.

Either action alternative would use a helicopter logging system in Unit 137, which includes the 5 acres that burned in a wildfire in 2002, to salvage the dead trees. Activity fuels would be hand piled and burned. This treatment would move the burned area on Matrix land to a Fuel Model 6, in the next 3 to 5 years. Dead trees in the RR would not be salvaged, as this is a sensitive area; this is consistent with the Beschta Report recommendations for post-fire logging (Beschta and others 1995). Refer to Fuels Report and Soil Report for additional discussions of Beschta Report recommendations. The Fuels Officer determined that there are not enough dead and dying trees in the RR to constitute a fire risk.

The use of prescribed fire is authorized only after a burn plan has been prepared and approved. The burn plan defines the prescription parameters in which fire will be applied to meet the management objectives. The season of the year when these prescribed fire/fuel treatments are applied is a critical factor. Burn plans are written with strict adherence to fuel moisture conditions, relative humidity, wind speed, wind direction, and smoke output. California State law requires the submission and approval of a Smoke Management Plan. This plan describes the project area and includes estimates of particulate matter amounts produced by the burn. A Prescribed Fire Air Quality and Emissions Assessment was completed for this project; refer to Air Quality Section. The First Order Fire Effects Model (FOFEM), version 5.0 was used to estimate emissions from the treatment of the activity and natural fuels.

Typically in the Salmon River District, late fall and late spring are the best time to underburn. These periods are most likely to allow fire to be confined to a predetermined area, while producing the fireline intensity and rate of spread required to attain planned resource management objectives. Due to the stringent specifications in the burn plan, prescribed burning may not be accomplished immediately after harvest. Handpile and tractor pile burning can take place when conditions are moist and the fire will not spread. Treatment of hand piles and tractor piles would be completed the first winter after harvest activities are completed. By combining alternative methods of fuels treatment, timely treatment of activity fuels would be facilitated.

Within harvest units, release for survival and growth, precommercial thinning, sanitation of non-commercial conifers, and hardwood felling would all produce residue that would increase fuel loading and, in turn, increase potential fire behavior. Post-harvest fuel treatments would help to isolate these pockets of fine fuels generated from these types of activities. In these pockets, fuels would be treated using lop and scatter methods to reduce the fuel bed depth and arrangement. Fire hazard would be increased for approximately 3 to 5 years in these areas. Any fires occurring in this fuel type during this time would generate high intensities and very high rates of spread. However, the increase in fuel loading from this work would be scattered throughout the stand and not pose a significant threat to the stand or adjacent stands. After 3 to 5 years, compaction and decomposition of the cut material would reduce the fire hazard and the risk would return to the pre-treatment level.

Non-commercial trees, brush, and slash would be masticated within harvest units on 44 acres with Alternative 2 and on 27 acres with Alternative 3. Non-commercial trees and brush would be masticated in plantations and in one natural stand on 131 acres with Alternative 2 and on 41 acres of plantations with Alternative 3. Mastication would abate the fuels buildup or fire hazard generated from the thinning in these areas; fuel management objectives would be met on these acres.

After fuel treatments are completed within harvested units, fire management objectives would be met in both the short-term and the foreseeable future. Within harvest units, 698 acres in Alterative 2 and all 650 acres in Alternative 3 would be Fuel Model 8, which is the desired condition with modeled flame lengths of 1.5 feet and modeled rates of spread of 3.5 chains per hour. In the 46 acres that would remain as Fuel Model 6 in Alternative 2, the rate of spread may exceed the objectives when winds are a factor. However, the openings created in the stands would provide a break in fuel continuity, slowing the overall rate of spread.

Implementing these alternatives through a combination of harvest and fuel treatments would improve stand health and vigor, reduce ground and ladder fuels, and develop stands that are fire-adapted and resilient to catastrophic wildfire.

Cumulative Effects

The potentially cumulative actions listed at the start of this chapter can be categorized as either timber and fuels management or travel and access management in terms of how fuels would be affected. These actions have both negative and positive effects.

Timber and Fuels Management

All the timber and fuels management projects listed at the start of this chapter have or would have Fuel Management Plans developed for them that would assure that the activities only take place under specified conditions. These conditions are designed to assure that fire management goals are achieved for each project, reducing the risk across the landscape as each project is completed and more stands have a reduced risk of stand-replacing fire. These conditions are also designed to mitigate the adverse effects for each individual project, assuring that the cumulative adverse effects would also be small. Fire Management Plans would also be developed if one of the Action Alternatives were selected for implementation. The cumulative effects of reducing fuels in either Action Alternative plus the fuel reduction in other timber sale and fuel projects would reduce the risk of stand-replacing fire occurring in the landscape.

Travel and Access Management

Projects completed since 1996 have decommissioned 22 miles of roads, while current and foreseeable future actions target up to 53 miles of additional roads for decommissioning. The cumulative effects of decommissioning 75 miles of roads would reduce access. Less road access would increase the difficulty and the cost of fuel management activities. Less road access would increase response times in fire suppression, while reducing the effectiveness of engines and other ground-based resources, making fires more difficult to suppress. This is somewhat offset by fewer opportunities for human-caused fire starts. Either of the Meteor Action Alternatives would decommission approximately 2.26 miles of road. The roads selected for decommissioning are short, unclassified roads and would not significantly contribute to the cumulative effects of road decommissioning on access for fire suppression and fuel management. Past and current projects also include approximately 65 miles of road improvements. The 9.29 miles of road improvements in either of the Action Alternative in conjunction with other projects would benefit Fire Management by maintaining access for fire suppression and fuel management projects.

Air Quality

Affected Environment

Air Basin and Location of Sensitive Sites

The Meteor Project area is within the Northeast Plateau Air Basin. The project vicinity is primarily forested federally-managed lands with no substantial emission sources, other than fugitive dust from logging equipment and recreational vehicles. Other contributions would be smoke and haze from seasonal wildland and prescribed fires from both within and outside the basin.

The Marble Mountains Wilderness, which has its southern boundary in the North Fork Salmon Watershed, is a Class I Airshed. The closest activity fuels treatment is approximately 5 air miles to the south. Class II areas near the project include the Siskiyou Wilderness (36 miles northwest), Trinity Alps Wilderness (10 miles south) and Russian Wilderness (5 miles east). The Pacific Crest National Scenic Trail is east of the project area. It follows the main ridgeline west of Scott Valley from the Trinity Alps Wilderness through the Russian Wilderness and into the Marble Mountain Wilderness on past the project area providing scenic vistas to the mountains and valleys. Local communities that could be affected by smoke and haze include the residential communities of Sawyers Bar, Forks of the Salmon, and Cecilville. Sensitive sites that could be affected include Idlewild, Hotelling, Matthews Creek, East Fork, and Shadow Creek Campgrounds.

Air Quality Standards and Regulations

The Northeast Plateau Air Basin is classified as "attainment" for National Ambient Air Quality Standards within the Federal Clean Air Act, which is the standard of review for federal projects. The California Air Resources Board, which has more stringent standards, classifies the basin as "non-attainment" for particulate matter less than 10 microns (PM_{10}) within the State of California Clean Air Act. Areas where particulate matter has exceeded standards in the past are the communities of Alturas and Yreka, where monitoring stations are located and where there are industries and wood smoke from private residences. The project area is located away from these more populated areas of Siskiyou County where emissions are higher. **Table 9** displays air quality standards. California standards are not to be exceeded. National standards are not to be exceeded more than once a year.

Table 9. State and Federal Ambient Air Quality Standards
(Units are micrograms per cubic meter; numbers in brackets are parts per million)

Emission	Averaging Time	Federal Primary Standard	California Primary Standard
PM_{10}	Annual	50	20
	24-hour	150	50
$PM_{2.5}$	Annual	15	12
	24-hour	65	---
CO	8-hour	10,000 (9)	10,000 (9)
	1-hour	40,000 (35)	40, 000 (20)

Air quality within Siskiyou County is very good. Air quality data compiled by the California Air Resources Board indicates that air quality with respect to PM_{10} has improved from 1988

to 2002. Annual standards for the State have not been exceeded during this time period. The 24-hour State standards for PM_{10} were most recently exceeded at stations in Siskiyou County in 2002 due to summer smoke incursions from the Biscuit Complex wildfires in Southwest Oregon. The 24-hour standard was exceeded at the Yreka station an estimated 24 times. Local hazardous levels of PM_{10} from wildfires were documented as a result of the Big Bar Complex of wildfires near Hoopa, California in 1999 where 24-hour standards were exceeded on 12 days. The smoke from the fires near Hoopa precipitated the first declared state emergency in a California county due to air pollution (Herr 1999).

Forest air pollutant sources with the greatest impact are wildfire and prescribed burns. Other lesser pollutant sources are dust emissions from logging operations, log truck haul on unpaved roads, and other activities such as road maintenance, road reconstruction, and road decommissioning.

Methodology

Air quality is compared between alternatives using the following parameters:

- PM_{10}, fine particulates generally less than 2.5 microns ($PM_{2.5}$), Carbon monoxide (CO)

The three types of emissions from smoke were estimated using FOFEM, version 5.0. FOFEM is based on extensive research in western forest ecosystems. FOFEM takes into account fuel type, fuel loading, moisture conditions, combustion rate, and meteorological conditions. Emissions from both activity and natural fuels within prescribed fire and tractor pile units are considered. Only activity fuels are considered in handpile units. Emissions calculations for wildfire do not include activity fuels. Dust emissions from log haul and roadwork were not modeled, as they comprise such a small amount of total PM_{10} emissions.

The Meteor Project Prescribed Fire Air Quality & Emissions Assessment prepared by Thomas Herold, dated April 8, 2003, provides the basis for this discussion, is incorporated by reference, and is on file in the project record. It also contains a discussion of alternative methods of fuel treatment to burning.

Environmental Consequences

Alternative 1

Direct, Indirect, and Cumulative Effects

No fuel treatment would occur with the No Action Alternative. There would be no production of emissions, smoke, or haze, as long as no wildfires occur in the area. If a wildfire occurred, the units would likely burn at intensities high enough to cause considerable emissions, as was demonstrated in the 1999 fires. No fugitive dust emissions from log haul or road work, or dust abatement on roads would occur with this alternative. There would not be any direct contribution to cumulative air quality effects.

Table 9 reflects estimates of emissions for Alternative 1 without wildfire and if a wildfire would occur in all the units. Emissions for wildfire reflect a one-time event.

Alternatives 2 and 3

The effects of Alternatives 2 and 3 on air quality would be similar, so they are discussed together.

Direct Effects

Either Alternative 2 or 3 would use underburning and jackpot burning (burning concentrations of fuels) to treat natural and activity-generated fuels. Prescribed fire would be applied under controlled conditions to accomplish established resource objectives (refer to Fuels Section). The major air pollutant concern from prescribed fires is the smoke produced by the fire. These include $PM_{2.5}$, PM_{10}, and particles over 10 microns that consist of ash and partially burned plant matter. These larger particles are mostly associated with high-intensity fires. Particulate emissions depend on the mix of combustion phases (preheating, flaming, glowing, and smoldering), rate of energy release, and type of fuel consumed. The emissions and impacts of prescribed burning on air quality are difficult to precisely quantify because of the many site-specific factors involved. The prescribed fire fuel treatments would result in emissions of particulates suspended in the atmosphere for a short time from one to several days. Smoke from prescribed fires can be transported over large distances and can contribute to regional haze and visibility impairment.

Table 10 reflects estimated emissions from activity fuels and from wildfire within the proposed harvest units for the Action Alternatives. Emissions for the Action Alternatives were calculated by combining underburn and hand pile acres from the FOFEM model. Emissions for the Action Alternatives are averaged over the 5-year life of the project. These emissions should be considered a worst-case scenario in the event that the harvesting does not include any biomass extraction beyond the yarding and removal of unmerchantable material in selected units. Biomass extraction, which is dependent on market conditions, could conceivably reduce emissions by 50% or more.

Table 10. Total and Annual Emissions (in Tons)

Emission	No Action Alternative		Alternative 2 (All Units and Stands)		Alternative 3 (All Units and Stands)	
	No Wildfire	Wildfire In Units	Total Emissions	Annual Emissions	Total Emissions	Annual Emissions
PM_{10}	0	861	677	135	571	114
$PM_{2.5}$	0	729	575	115	485	97
CO	0	9,673	7,361	1,472	6,200	1,240

The differences between the Action Alternatives are in the number of acres that would receive fuel treatments. Alternative 2 proposes 744 acres for prescribed burning within harvest units and Alternative 3 proposes 650 acres. Alternative 2 would treat 94 more acres than Alternative 3. Either Action Alternative would include the use of low intensity fire to underburn 50 acres of oak stands for wildlife habitat improvement. Either Action Alternative would use some mechanized fuel treatment that does not contribute to emissions; Alternative 2 would treat 175 acres with a Masticator, while Alternative 3 would treat 68 acres.

Alternative 2 would burn 6 acres of tractor piles and 360 acres of handpiles, while Alternative 3 would burn 350 acres of hand piles. Estimating the difference in emissions from piling methods is based on professional judgment. While only a small number of acres are proposed for tractor piling in Alternative 2, it has the greatest potential for air quality effects. Tractor pile burning may slightly increase emissions overall, but would allow for burning on days when emissions are not being produced by other activities. Tractor pile burning is much hotter than other types of burning, and larger-sized fuels would be burned. The tractor piles may also have more soil included in the pile, decreasing consumption and

increasing smoldering. Critical factors in reducing emission for both tractor piles and handpiles are how the piles are created and how dry they are when they are burned. Tractor piling and burning would most likely take two seasons to accomplish. Hand piles would be burned in the late fall, when the weather does not allow underburning or broadcast burning. Handpiles would be covered to keep dry. Resource protection measures would reduce emissions.

Particulate standards are based on 24-hour or annual averages, whereas smoke from prescribed fires may degrade air quality in a community or at a sensitive site for only a few hours before dispersing (Sandberg and others 2002). Measures to reduce smoke impacts include scheduling prescribed burns during favorable weather conditions to disperse smoke, applying emission reduction techniques, and limiting the material burned in one day. Ignitions would be slowed or stopped when a change in meteorological conditions causes smoke to intrude into sensitive areas, or when the fuels and weather conditions go out of prescription.

For both Action Alternatives, estimated 24-hour emissions are very unlikely to exceed the 24-hour State standard (California) for PM_{10} and $PM_{2.5}$ at the project site (burn location) and are definitely not expected to exceed annual State or Federal standards, and would not degrade air quality or attainment status. Either Action Alternative would be consistent with the Federal Clean Air Act. Prior to igniting each prescribed burn, the District would coordinate with local air district. The only times the 24-hour standards have been exceeded in Siskiyou County in the last several years are when wildfires burned large acreages over a considerable time period.

Smoke emissions during prescribed burning may reduce the visibility in some locations but implementation of smoke management practices and plans, burning during favorable weather conditions when smoke is carried away from Class I and II airsheds and other sensitive areas, and using the best available fire and emission control measures would minimize visibility impairments. Wilderness visitors and residents of local communities may detect unpleasant odors and experience impairment of visibility during the short periods when prescribed burning is occurring.

The Action Alternatives would also generate dust, primarily from timber hauling activities. Timber hauling, logging, road reconstruction, maintenance and decommissioning activities would emit particulate matter for short periods of time during the day, while these activities are taking place. The dust generated by these activities, though certain to occur, is difficult to model or estimate as it comprises such a small amount of the total emissions. Tractor yarding operations disturb the most soil and likely generate the most dust. Cable yarding and helicopter yarding disturb less ground and so generate fewer dust emissions. As the units are spread throughout the Salmon River Watershed, no dust emission problem would occur in any given location. The road-related activities generally take place when there is some moisture content in the soil of the road, in order to achieve some level of compaction. The dust generated is generally less than for tractor logging activities where logs are being dragged along the ground. The volume of truck haul is small and would occur on a number of different road systems. Dust emissions from hauling and road construction would be minimized through the implementation of dust abatement plans in the contracts. The primary objective of dust abatement is to protect public health and safety. Dust abatement actions also protect the life of the road surface, reduce the amount of dust that settles on vegetation and in stream courses, and reduce road-related erosion.

Indirect Effects

The indirect effects of prescribed fire include an expected decrease in wildfire emissions due to reduction of overall fuel loadings. The indirect effect of uncontrolled fugitive dust emissions from project-related traffic on roads includes removal of the road fines from the road surface aggregate, and a resulting potential increase in the likelihood for erosion and sediment production from roads. This effect would be minimized by dust abatement measures.

Cumulative Effects

Other Federal actions that involve prescribed fire include Glassups and Knob Timber Sales as well as Taylor and Garden Gulch Fuels Projects. Sawyers Bar Fuels Reduction Project has been developed from the Sawyer's Bar Community Fire Reduction Strategy and is a foreseeable future project. Significant cumulative effects to air quality are not anticipated, as the burning in these projects is not expected to occur at the same time.

PM_{10} and $PM_{2.5}$ emissions from prescribed burning would contribute to local, air basin and broader regional pollutant loading. Local and air basin effects would include cumulative prescribed burn emissions from Federal, State and private lands in the area. Compliance with Burn Day, Marginal Burn Day and No Burn day designation, and coordination with and permitting from the local air pollution control district, would minimize cumulative effects. Overall cumulative emissions are expected to be similar to those of the past three years when prescribed burns were carried out by state and federal land management agencies. The cumulative effects of these projects in the past three years did not exceed federal air quality standards, so cumulative effects associated with either of the Action Alternatives are also expected to be consistent with the Clean Air Act.

Geology

Affected Environment

North and South Forks of the Salmon River

Dispersed across much of the North and South Forks of the Salmon River, the project area spans a wide variety of rock and geomorphic types. Refer to the Salmon Sub-basin Sediment Analysis (de la Fuente and Haessig 1993) for a description of rock types, rock structure, and geomorphic features. Deep-seated dormant landslides are common in the Methodist, St. Claire, Brown's Knob, Johnson Creek, and Jessups areas. Geological RRs on the Forest include active landslides, toe zones of deep-seated landslides, inner gorges, and deeply weathered and dissected granitic and schist bedrock. Landslide episodes in the Salmon River system occurred in 1964, 1972, 1974, 1983, and 1997. These episodes are documented in the Salmon Sub-basin Sediment Analysis, and in the Phase I Assessment of the 1997 Flood (de la Fuente and Elder 1998). Increases in landslide rates associated with roads and regeneration harvest are addressed in these documents.

The 7th field watersheds, Kanaka-Olsen and Negro-Hotelling, were identified as Areas with Watershed Concerns (AWWCs) in the *Forest Plan ROD*. Management direction for such areas is to promote watershed restoration activities, and to avoid activities contributing the elevated watershed risk. Refer to the Water Quality Section for additional details on AWWCs.

Jones Gulch Watershed

Jones Gulch is a small watershed on the north flank of Blue Ridge, which drains into the North Fork Salmon River a few miles downstream of Little North Fork Salmon. It lies within the Kanaka-Olsen 7th Field AWWC. It occupies about 1,465 acres with about 548 acres in the headwaters and 917 acres in the lower part. A large dormant landslide complex occupies the headwaters of Jones Gulch. During the 1964 flood, a debris slide occurred in the toe of the complex on the banks of Jones Gulch. This debris slide is visible on 1965 aerial photos, and it scoured several segments of Jones Gulch on its way to the Salmon River. Field observations by the District Hydrologist in 2002 revealed that a sediment fan formed in the gentle lower reaches of the stream near its confluence with the Salmon River. Field observations by the Forest Geologist in 2002 in the vicinity of the debris slide revealed the presence of many leaning trees, along with partially healed scarps a few feet in height. No tension cracks or raw scarps were found. These observations indicate that a deep-seated landslide involving an area about an acre in size occurred simultaneously with the debris slide in 1964. At that time, about 5% of the headwaters of Jones Gulch had been logged, and many of the roads were in existence. Subsequently, the Hog Fire burned parts of the headwaters in 1977, followed by the 1987 Fires, which re-burned some of the Hog Fire, plus additional area. Total de-vegetation associated with the early logging, the fires, and associated salvage logging is estimated as about 30% of the Jones Gulch Headwaters. In the 25 years since the Hog Fire and 15 years since the 1987 Fires, plantations were established on most of the de-vegetated areas, and it appears that there has been no additional movement of the debris slide or the associated dormant deep-seated landslide. The plantations in the logged and burned areas are in various stages of growth. If it is assumed that de-forested areas recover to pre-disturbance levels in 40 years, evapotranspiration has now recovered to a level about half where it was prior to harvest and fire. There are about 5.4 miles of road in

the headwaters (density of 6.3 miles per square mile), occupying about 26 acres (40 foot wide corridor). No road related landslide problems were identified in Jones Gulch in 1997.

Methodology

Two significant issues relating to the geological resource were identified for this proposal. One significant issue is that logging in RRs could cause erosion and result in sedimentation in streams. This issue is discussed in the Riparian Reserve Section, later in this Chapter. The other significant issue is that proposed timber harvest in conjunction with past cumulative effects in the upper Jones Gulch Drainage could trigger slope failure in the dormant landslide area below. The key indicators used to analyze this issue are as follows:

- Mass Wasting Model.
- Results of slope stability investigation/evaluation.

The risks of triggering slope failure are discussed for each alternative using the estimates generated by the Mass Wasting Model. GIS coverages were queried separately to determine the amount of disturbance in the Jones Gulch Drainage as it is too small to be discernable in the Mass Wasting Model. The effects for Jones Gulch in the Kanaka/Olsen 7th field watershed were evaluated based on the results of field observations in 2002, air photo evidence, past experience, and monitoring after the 1997 flood. Logging, harvest, and fire history were reviewed in conjunction with historical air photos to get a more refined look at the disturbance history of this area; GIS layers were refined, as necessary. The Forest Geologist evaluated proposed harvest units and any active landslides downslope of proposed activities in the field to assess the landslide potential.

The Mass Wasting Model of the CWE Analysis assumes that roads, timber harvest, and fire increase landslide rates on different geomorphic land types by varying amounts. It estimates landslide production which would be expected in a given watershed under existing road, harvest, and fire disturbances, and compares this amount to that which would be expected if the watershed were completely undisturbed. For example, the model estimates that the North Fork of the Salmon River would produce 305,463 cubic yards of landslide-derived sediment in response to moderate-sized storm (10-year return interval), if the landscape were fully timbered with no roads or past harvesting in it. With the current levels of roads, harvest, and fire, it is estimated that the North Fork would produce 641,526 cubic yards. This landslide acceleration amounts to more than double the undisturbed rate (641,526 / 305,463 = 2.10).

Model results of the current condition for both forks of the Salmon and the Kanaka/Olsen 7th field watershed are listed in **Table 11**.

Table 11. Mass Wasting Model Results for Selected Watersheds

Watershed Name and Field	Background (in cubic yards per decade)	Current (in cubic yards per decade)	Landslide Acceleration	Percent Over Background	Risk Ratio
North Fork Salmon 5th Field	305,463	641,526	2.10	110%	0.55
South Fork Salmon 5th Field	519,119	878,515	1.69	68%	0.35
Kanaka-Olsen 7th Field	23,601	103,038	4.37	337%	1.68

A value of 200% over background[1] is considered an "inference point" above which the risks of adverse cumulative watershed effects need to be closely examined. This value of 200% over background is used to normalize the percent over background computed for each watershed, and generate what is called a risk ratio. The risk ratio is simply the percent over background divided by the inference point value of 200%. A risk ratio of 0.55 is equivalent to landslide production, which is more than double (2.10) the undisturbed rate. The Mass Wasting Model assumes that harvested and burned areas fully recover in 40 years, but that roads do not recover at all. Refer to Water Quality Methodology Section for a more detailed description of all three models in the CWE Analysis.

Much of the modeled acceleration in the North Fork Salmon is due to the fires in 1977 and 1987. In the other areas, it is mostly due to the effects of roads. The model assumes that older harvest and the Hog Fire of 1977 have more than half recovered. Data compiled following the 1997 flood (de la Fuente and Elder 1998, page 44) revealed that landslide densities (landslides per square mile) were very high in harvest units less than 20 years old, but in units greater than 20 years old, they were similar to rates on undisturbed (forested) land. The landslide rate on newly harvested land was about six times the undisturbed rate and on old harvest, it was about 1.4 times the undisturbed rate. Factors affecting landslide occurrence at a given site are very complex, and these figures are not presented as conclusive evidence that recovery occurs in less than 40 years. However, they do suggest that re-vegetation following harvest and fire plays an important role in landslide susceptibility, and that the assumption of a 40-year recovery period is reasonable.

In summary, past fire and harvest have increased landslide rates in the North and South Forks of the Salmon to a level about double that which would be expected if they where completely vegetated, without any roads, harvest, or fire within them.

Also included in this section is an assessment of each alternative's consistency with *Forest Plan* Standards and Guidelines for Geology. Items discussed include landslide potential, the potential for introducing asbestos fibers into the air, the effects on the Limestone Bluffs Research Natural Area, the effects on sediment sources, and the risk of large, high intensity fires.

The Geologic Report prepared by Juan de la Fuente provides the basis for these discussions; it evaluates direct, indirect, and cumulative effects for each alternative. The effects discussions are based on a considerable body of information collected through study of the interactions of management activities and landslide potential in the Klamath Mountains Province. This information includes The Flood of 1997 Klamath National Forest Phase I Final Report (de la Fuente and Elder 1998) and Salmon Sub-basin Sediment Analysis (de la Fuente and Haessig 1993). Additional citations are in the Geologic Report. The Meteor Project Cumulative Watershed Effects Analysis Specialist Report by Don Elder (2003a) contains a more detailed explanation of the methods used in the modeling process and displays data outputs for landslide rates for the alternatives and a list of references. All these documents are incorporated by reference and on file in the project record.

[1] Background is a watershed's natural sediment production and delivery, or sediment delivery, assuming no disturbance (Fish BA page 16).

Environmental Consequences

Alternative 1

Direct, Indirect and Cumulative Effects

With this alternative, there would be no new soil or vegetation disturbances, and consequently, no direct or indirect effects. Plantations established in areas that were logged or burned over the past 40 years would continue to mature. The increased landslide potential associated with past timber harvest and fire would continue to decrease as vegetation matures. Root support and evapotranspiration would gradually return to pre-disturbance levels. The increased landslide potential associated due to roads would remain about the same. Future wildfires would follow recent historic patterns. The cumulative effects associated with this alternative are the result of past road construction, timber harvest, and fire.

Future wildfires would change the forest floor and increase the time frames for rebuilding the litter layer and mesofauna population recovery. Future wildfires would also cause organic matter decomposition rates to increase due to more sunlight and changes in organic litter composition. Areas experiencing high and moderate intensity fire would likely experience accelerated landslide activity due to the removal of vegetation. Adverse cumulative watershed effects would be likely.

The Jones Gulch area has experienced a considerable amount of road construction, timber harvesting, and fire over the past 35 years. The effects of fire and harvesting are likely recovered to about half of pre-disturbance conditions, and would continue to recover hydrologically. The fact that the flood of 1997 did not reactivate the large dormant landslide in the headwaters of Jones Gulch suggests that as further revegetation occurs, the likelihood of reactivation in response to a storm of similar magnitude would continue to decrease.

Alternative 1 would not introduce asbestos fibers into the air or affect the Limestone Bluffs Research Natural Area. Since it does not propose any watershed restoration activities, there would not be any beneficial effects from stabilizing sediment sources associated with past human activities.

Alternatives 2 and 3

Alternative 3 differs from Alternative 2 in that it would not include harvest, mastication, or post-harvest activities in Jones Gulch and it would not thin any Hydrologic or Geologic RRs. Both alternatives would include restorative road actions in the Jones Gulch area. The effects on landslide potential of the Action Alternatives are discussed together with any differences highlighted. Some uncertainty is always associated with estimating the effects of prescriptions, harvesting systems, roadwork, and post-harvest activities.

Direct Effects

Neither Action Alternative would have direct effects on landslide potential, but the direct effects on vegetation could lead to indirect and cumulative effects on landslide potential, so are discussed here to set the stage. With either of the Action Alternatives, trees would be removed from Matrix lands using a range of silvicultural prescriptions; refer to Vegetation Section. In Alternative 2, individual trees would also be cut in selected RRs to achieve stand health objectives; refer to Riparian Reserve Section. All cutting prescriptions entail some ground disturbance. The direct effects of logging include local soil disturbance and the physical removal of trees. The intensity of disturbance varies with the size of tree removed

and the yarding method. Smaller tree size in thinning units usually allows yarding with minor soil disturbance. In Alternative 2, tree removal in Geologic RRs by helicopter yarding would cause minimal ground disturbance and minimal disturbance to residual vegetation.

Roads would be maintained and rocked where needed for timber haul, using existing rock sources. Some roads would also be stormproofed, and some decommissioned. Decommissioning may involve excavating fills, outsloping road surfaces, excavating for landslide repair, and local placement of rock in channels. These actions restore hydrologic patterns, eliminate the potential for failure of high-risk fills, and reduce the risk of cut bank failures and further landsliding. Decommissioning does not return the area completely to pre-road conditions. Stormproofing involves excavating and removing unnecessary fill volume, excavating to create drainage ways to prevent stream diversion, and filling of ditches to create an outslope to the road bed. These measures reduce the risk of fill failures and landslides caused by drainage diversions. Refer to Fisheries Section for more information on roadwork and stream crossings. Maintenance involves blading of the road surface and ditches, and cleaning of culverts. These actions restore surface drainage patterns. Changing a road from unclassified to classified is an administrative process with no direct effects.

Roads proposed for maintenance, stormproofing, decommissioning, or rocking which are underlain entirely or partly by ultramafic rock have the potential to introduce asbestos fibers into the atmosphere during project implementation. Appropriate asbestos toxic control standards (described in the Geologic Report) would be applied to those underlain by asbestos-bearing rock.

Helicopter noise associated with yarding the units in St. Claire watershed would be heard in the Limestone Bluffs Research Natural Area, which is about a mile distant.

Indirect Effects

Logging can cause reductions in root support and evapotranspiration that persist for many years. Reduced evapotranspiration could increase ground water and landslide potential. Landslide responses are often delayed until a large storm occurs. The most common indirect effects are changes in landslide potential due to ground disturbance and vegetation removal. Thinning would cause a very small to negligible increase in landslide risk due to a short-term reduction in root support and evapotranspiration. In the longer term (10 to 20 years), the increased vigor of the residual trees would have a positive effect. This applies to thinning in Matrix and RRs for Alternative 2 and to thinning in Matrix for Alternative 3. In the other prescriptions, removal of individual or groups of trees would cause an increase in landslide potential due to loss of root support and evapotranspiration, ranging from minor to moderate.

Alterative 2 would regenerate approximately 25 acres, 4.6% of the headwaters draining through the landslide complex in Jones Gulch. The Group Selection prescription in Units 88, 108, and 256 would create small openings. Units 255 and 261 would be regenerated through Green Tree Retention. Part of Unit 190 would be regenerated with a Seed Tree prescription and the remainder sanitized. The units are located on the gentler part of the landslide complex, which appears stable and not prone to on-site landsliding. The landform itself is stable and only a very small proportion of the watershed area and landslide complex would be involved.

Restricting tractors to 35% slopes or less, avoiding unstable areas, prohibiting the construction of new full bench skid roads, and installing water bars to avoid drainage diversions would keep adverse effects on landslide potential very small. The indirect effects of cable yarding could be gouging of hillslopes, which would divert surface flow. The indirect effects of helicopter yarding would be localized ground disturbances where large trees fall, which could concentrate water, but this is rare. Generally, the adverse effects of helicopter yarding would be very small. About 13 acres of existing landings would be used. Landing maintenance could increase landslide potential if runoff is concentrated or loose fill is placed on a steep slope. Application of design standards would minimize landslide potential associated with landing maintenance. No adverse effects on slope stability are expected from helicopter logging the fire-killed trees in Unit 37. The disposal of logging slash would slightly reduce the risk of future high intensity wildfire.

Decommissioning would restore hydrologic patterns, eliminate the potential for failure of high-risk fills, reduce the risk of cut bank failures, and reduce the risk of reactivation of existing landslides. Stormproofing would eliminate diversion potential, reduce the risk of failure of high-risk fills, and eliminate road ditch problems, thus decreasing landslide risk. Road maintenance would restore surface drainage patterns, and clear pipes and ditches. Changing a Road Maintenance Level from a 2 to 1 entails physically closing the road, which reduces use and maintenance. When adding an unclassified road to the transportation system, road use and maintenance generally increase.

Despite some soil disturbance and displacement, the six acres of tractor piling in Alternative 2 is expected to have a minimal effect on landslide potential. Hand piling, jackpot burning, and underburning would all maintain adequate soil cover in either Action Alternative, so the effects on landslide potential would be negligible. Post-harvest silvicultural activities would maintain or increase soil cover, so are expected to have negligible effects on landslide potential.

Either Action Alternative would have a low likelihood of increasing landslide rates or introducing asbestos into the air due to resource protection measures, primarily delineating Geological RRs in the field and protecting them from adverse direct effects. Stormproofing and decommissioning activities would decrease road-related landslide potential.

Alternative 3 varies from Alternative 2 in that there would be no increase in on-site landslide potential associated with regeneration harvest in Jones Gulch, and no increase in landslide potential associated with tree removal in RRs. While Alternative 3 would not have any short-term adverse effects associated with tree removal in RRs, there would be a long-term trade-off in that the RR areas would be less vigorous than with Alternative 2. The removal of individual dying trees and scattered suppressed and intermediate trees would reduce stocking, improving stand vigor in Alternative 2. Refer to Riparian Reserve Section for additional discussion.

Cumulative Effects

Refer to Water Quality Section for a more detailed description of the Mass Wasting Model; the major results are summarized here. It is estimated that landslide potential has been increased several-fold above undisturbed rates in several 7th field watersheds due to roads, past wildfires, prescribed fires, harvesting, and underburning, as discussed for Alternative 1. Timber harvest activities associated with either Alternative 2 or 3 would only increase landslide potential by a very small amount in some watersheds. The effects of the proposed

activities are very small relative to past roads, harvest, and fire within the project area. As a result, the Mass Wasting Model does not show much discrimination between alternatives as displayed by the risk ratios in **Table 14** in the Water Quality Section.

At a more localized scale, the potential for adverse cumulative watershed effects occurs in the headwaters of Jones Gulch. Reduced evapotranspiration from harvest could increase groundwater in downslope areas. However, it is estimated that there would be only a very small adverse effect on the water balance for the landslide complex, because only a small proportion of the watershed area is involved. Only a very small increase in landslide risk is anticipated, as the area did not re-activate during the 1997 flood. Road decommissioning of a short spur and stormproofing Road 39N27 would offset this small adverse effect in Alternative 2. Alternative 3 would not contribute to potential adverse cumulative effects in the Jones Gulch watershed. Road decommissioning of a short spur and stormproofing Road 39N27 would have a small restorative effect in this area.

The proposed underburning, spot burning, and hand pile burning would have only small effects on slope hydrology, so are not likely to contribute to adverse cumulative watershed effects.

Soil Productivity

Affected Environment

Soils in the study area have developed primarily from metasedimentary and metavolcanic rock types. The geomorphic landforms are predominately steep mountain slopes and dormant landslides. Soils on north-trending mountain slopes are generally moderately deep to deep (20 to 60 inches), gravelly to very gravelly loams with areas of extremely gravelly loams. Soils on south-trending mountain slopes are generally shallow to moderately deep (12 to 40 inches) and very gravelly loams. Soils on dormant landslides are generally very deep (over 60 inches), well developed, gravelly loam over gravelly clay loam soils.

Soil productivity is a measure of a soil's ability to produce vegetation. Soils on north-trending slopes are generally moderate to highly productive while the south-trending soils are generally low to moderately productive. Soils on dormant landslides are generally very productive.

Erosion hazard is a relative measure of a soil's sensitivity to erosion processes. Soil disturbance has the potential to increase the erosion hazard as cover is reduced. Some of the project sites in the assessment have been previously disturbed by wildfire and harvesting. The maximum erosion hazard ratings vary from moderate to very high for 100% bare soil. Currently, erosion hazards are low due to the high amount of existing soil cover present.

Coarse woody debris, consisting of downed logs 20 inches in diameter or greater, is an important component of coniferous forest ecosystems. Existing levels of coarse woody debris are a result of past fires, past management activities, and the age of the existing vegetation. Currently, coarse woody debris levels range from 1.1 to 10.7 logs per acre and average 4.6 logs per acre.

Methodology

Alternatives are discussed using the parameters of soil disturbance, soil fertility, and the resulting effect on soil productivity.

The Soil Report provides the basis for this discussion, is incorporated by reference, and is on file in the project record. The Soil Report, prepared by Tom Laurent, uses the Region 5 Soil Quality Standard (SQS) guidelines and the Soil Standards and Guidelines from the *Forest Plan*. The report provides a detailed discussion of the direct and indirect effects of each activity with the potential to affect soils for each alternative. It then provides a discussion of cumulative effects.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

With the No Action Alternative there would be no new soil disturbances. The level of existing soil disturbance within the project area would remain unchanged. Nutrient cycling would be maintained as the fine organic matter within duff/litter layers increases. Soil fertility would be maintained in managed stands due to the increased organic matter on the soil surface and in the soil. Compacted soils (soils with reduced porosity) in old skid trails (Unit 68) would slowly increase their porosity due to biological activities and thereby regain lost soil productivity over the next 40 to 50 years.

Areas that were burned in the 1987 wildfires with low burn intensities (Units 113 through 131, 152) or have been underburned with prescribed fire (Units 133, 134, 141) have a much thinner and less compacted duff mat than other stands. Soil microbial populations, reduced by fires in the past, are currently at near pre-fire populations and would continue to recover. Most of the project area has had very little past management activities.

Removal of the litter and duff layers in future fires would reduce soil mesofauna populations (organisms between 0.2 millimeters and 1 centimeter in size) and favor a fungal and bacterial system that reduces decomposition rates and nutrient cycling. Future wildfires would change the forest floor and increase the time frames for rebuilding the litter layer and mesofauna population recovery. Future wildfires would also cause organic matter decomposition rates to increase due to more sunlight and changes in organic litter composition. Soil erosion would significantly increase after a wildfire.

Cumulative Effects

Alternative 1 would not contribute to cumulative effects on soil productivity.

Alternatives 2 and 3

The effects of these alternatives on the soil resource would be similar, so they are discussed together. Alternative 3 proposes 6 less acres of tractor harvest, 14 less acres of cable harvest and no tractor piling compared to Alternative 2. It is reasonable to assume that there would be less soil disturbance and therefore less impacts to soil productivity with Alternative 3 as it would treat approximately 20% fewer overall acres than Alternative 2.

Direct Effects

The main areas of concern for direct effects are the 74 acres of tractor logging with Alternative 2 and the 68 acres of tractor logging with Alternative 3. Tractor logging can

result in soil compaction that exceeds Soil Quality Standards (SQS) but this only occurs on highly used main skid trails. The amount of ground that is in highly used main skid trails would be below the allowable SQS guidelines of 15% of the project acres. Re-using existing skid trails and using endlining to keep skidders on the main skid trails and landings would minimize the amount of area in skid trails. Tractor piling is also a concern as it can result in detrimental surface soil disturbance (soil displacement) when the tracked vehicles make turns. Six acres of tractor piling is proposed in Alternative 2. Careful use of the brush rake in this alternative is expected to minimize the incorporation of soil into the piles.

Mastication of precommercial thinning and brush treatment in plantations and the harvested stands would maintain high levels of existing soil cover as the existing live and/dead standing material is cut into smaller pieces and allowed to fall on the soil surface. Requiring the track mounted masticator to travel and work up and down the slopes (perpendicular to the contour) and using the maximum boom reach would minimize ground disturbance. The equipment would also travel and work over surface organic material that has just been masticated. There would be 175 acres of mastication with Alternative 2 and 68 acres with Alternative 3.

Coarse woody debris would be partially affected by the tractor yarding, underburning, jackpot burning, and tractor piling. Some of the more decomposed logs may be disturbed by heavy equipment operations and could therefore lose some of their effectiveness. A sufficient number of trees would remain on site in the project area and coarse woody debris would increase over time from the natural falling of standing trees and snags.

Due to the design features and resource protection measures discussed above, ground disturbance would be minimized in either Action Alternative allowing Forest *Plan* and SQS guidelines for soil cover, porosity, soil organic matter content, and surface organic matter levels to be met. This would maintain the soil moisture regime, soil hydrologic function, buffering capacity and soil biological system. Overall, these alternatives would not significantly decrease short or long-term soil productivity. Refer to Water Quality and Fisheries Sections for modeling results and discussions of effects of soil material that reaches water.

Indirect Effects

The main areas of concern for indirect effects are tractor logging and tractor piling. Alternative 2 would have 74 acres of tractor logging and six acres of tractor piling, while Alternative 3 would have 68 acres of tractor logging. Tractor logging and tractor piling can result in increased surface erosion from ground disturbance and soil cover removal as well as a reduction in soil fertility due to compaction and soil displacement. This occurs primarily in the main skid trails. The amount of ground in highly used main skid trails would be below the allowable SQS guidelines of 15%. Installing water bars on all skid trails is very effective in controlling runoff and preventing off-site sedimentation. Recent BMP monitoring of skid trails revealed that water bars were very effective in controlling erosion and preventing sediment from reaching a stream course. Monitored waterbars were 96 to 100% effective. Tractor piling in Alternative 2 would cause a small loss of nutrients in the tractor piles due to piling of nutrient rich material and some topsoil that inadvertently ends up in the pile. Burning the piles would also result in a loss of nitrogen, but would generate a positive effect from nutrients in the ash leaching into the soil. These alternatives would meet the *Forest Plan* and SQS guidelines for soil erosion and fertility. Overall, these alternatives would not significantly decrease short or long-term soil productivity.

Cumulative Effects

The main areas of concern for cumulative effects are tractor logging and tractor piling in areas that have been subjected to past wildfires (Units 113 through 131, 152), underburning (Units 133, 134, 141), and logging. In the 15 years since the 1987 wildfires, the area has probably fully recovered from any fire effects on nutrient cycling. The low intensity of the planned harvesting and fuel reduction activities would minimize any cumulative effects on nutrient cycling by minimizing the consumption of the fine organic component (duff mat). The dynamic and highly variable nature of soil and ecosystem processes and strong buffering capacity of the soil reduce the possibility of any measurable adverse long-term cumulative effects on soil productivity.

The re-use of existing skid trails would minimize areas of new compaction and minimize the cumulative effects of multi-harvest entries over time. Currently, existing detrimental soil disturbance ranges from 0 to 11% and averages 3% for the project area. New logging disturbances combined with existing detrimental disturbances would not exceed the SQS threshold for detrimental disturbance (15% of the project acres) in either Action Alternative. The use of predominately cable and helicopter yarding systems, which have a very small insignificant impact on soil productivity, would also minimize the cumulative effects of multiple entries. The cumulative effects of past wildfires, prescribed fires, harvesting and underburning would not significantly decrease short or long-term soil productivity. Overall, these alternatives would meet the *Forest Plan* and SQS guidelines for maintaining long-term soil productivity, so would be consistent with the National Forest Management Act.

Water Quality

Affected Environment

Background

The Salmon River Watershed was identified in the *NW ROD* and *Forest Plan* as a key watershed. Important considerations for water resources are the maintenance or enhancement of channel conditions, riparian conditions, and water quality for the beneficial uses within the project area. Beneficial uses, as defined by the California Porter-Cologne Water Quality Control Act, identified for the North and South Forks of the Salmon River are anadromous fish habitat, domestic water use, and WSR designations. The Outstandingly Remarkable Values identified for the Salmon River WSRs include anadromous fisheries, for which for water quality and RR objectives are important.

The objectives for maintaining or enhancing the water quality (also known as antidegradation policy) within the North and South Forks of the Salmon River watersheds are delineated in the *Water Quality Control Plan for the North Coast Region* (North Coast Regional Water Quality Control Board 1993). Applicable objectives include the following:

- **Suspended sediment** – "Waters shall not contain substances in concentrations that cause nuisance or adversely affect beneficial uses."
- **Settleable material** (bedload sediment) – "Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses."
- **Turbidity** – "Turbidity shall not be increased more than 20 percent above naturally occurring background levels."
- **Temperature** – "The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses. At no time or place shall the temperature be increased more than 5 degrees Fahrenheit above natural receiving water temperature."

Under the Clean Water Act, the Environmental Protection Agency delegated its authority for regulation of water quality on Federal Lands in California to the State (North Coast Regional Water Quality Control Board). A Management Agency Agreement between the U.S. Forest Service and the North Coast Regional Water Quality Control Board was developed to cover management activities on National Forest System lands. The Management Agency Agreement requires the U.S. Forest Service to implement the state certified and Environmental Protection Agency approved water quality management program and practices referred to as BMPs to protect water quality from sources of pollution. Both the program and practices were developed in compliance with the Clean Water Act requirements and are consistent with the California Porter Cologne Water Quality Act and with the North Coast Regional Water Quality Control Board Basin Plan.

The *Forest Plan* lists management goals for RRs (MA 10), and directs activities to be consistent with ACSOs; refer to Chapter 1 – Management Direction Section for those most applicable to this proposal.

Existing Conditions

Beneficial use and road density Information is summarized below in **Table 12** for each 7th field watershed that encompasses the project area. Generally 7th field watersheds range from about 2,500 to 10,000 acres in size. The 7th field watersheds are located in two 5th field watersheds, North Fork Salmon River and South Fork Salmon River. Generally, 5th field watersheds range from about 40,000 to 250,000 acres in size. Additional information on temperature, aquatic, and channel conditions can be found in the Fisheries Section.

Table 12. Existing Conditions			
7th Field Watershed Name	**Acres**	**Beneficial Uses**	**Road Density (miles/mile^2)**
Eddy Gulch	4,427	One domestic use, 2.7 miles anadromous fish habitat	4.4
Tanner-Jessups	4,546	Two domestic uses, municipal water supply, 2.6 miles anadromous fish habitat	3.15
Kanaka-Olsen	8,308	One domestic use, one developed spring, 5.8 miles anadromous fish habitat	1.78
Shiltos-Kelly	3,901	One domestic use, 3.3 miles anadromous fish habitat	3.43
East Fork Know-nothing Creek	6,382	3.0 miles anadromous fish habitat	1.75
Methodist Creek	8,130	2.8 miles anadromous fish habitat, 3.9 miles additional resident fish habitat	2.60
Cody-Jennings	7,658	One domestic use, 7.4 miles anadromous fish habitat	2.09
Negro-Hotelling	6,535	One municipal supply, four domestic use, two developed springs, 4.6 mile anadromous fish habitat	4.16
St. Claire Creek	6,792	2.9 miles potential anadromous fish habitat, 1.9 miles additional resident fish habitat	0.98
Crawford Creek	8,354	One domestic use, 4.2 miles potential anadromous fish habitat, 3.6 miles additional resident fish habitat	2.68
Rays-Gibson	10,288	Two domestic uses, 7.2 miles anadromous fish habitat	2.96
Gooey-Ketchum	4,385	One domestic use, 4.8 miles anadromous fish habitat	1.86
Cecil Creek	3,670	One domestic use, 1.0 mile anadromous fish habitat, 1.1 miles additional resident fish habitat	3.42
Timber-French	6,639	Two domestic uses, 7.1 miles anadromous fish habitat	1.27

Methodology

Since the project activities are dispersed over a large geographic area, in order to assess cumulative effects and determine the differences between alternatives, this analysis is conducted at the 7th field watershed scale, then discussed at the 5th and 4th field scales.

The assessment is based on field investigations of the proposed treatment areas, field review and confirmation of channel conditions, aerial photo review of the project area, existing information in District files and the Forest GIS database, effects from the Soil Report and the Geology Report for the project, and the modeled CWE Analysis.

Two significant issues were identified related to Water Quality. One significant issue is that logging in RRs could cause erosion and result in sedimentation in streams. This issue is discussed in the Riparian Reserve Section, later in this Chapter. The other significant issue is that timber harvest, fuel reduction, and road activities could cause soil erosion or trigger slope failure, which could increase sediment in streams, contributing to cumulative effects to water quality. The key indicators used to analyze this issue are as follows:

- Intensity of proposed treatments.
- CWE modeling.

Cumulative watershed effects for this project are assessed quantitatively and qualitatively. The Hydrology Report provides the basis for this discussion, is incorporated by reference, and is on file in the project record. The Hydrology Report, prepared by Sharon Koorda, provides a more detailed discussion of the existing conditions for each 7th field watershed,

and of the direct, indirect, and cumulative effects of each activity with the potential to affect the water resource.

The CWE Analysis includes three models: Mass Wasting, Surface Erosion, and Equivalent Road Acres (ERA). Much of the CWE assessment of sedimentation and hydrologic runoff incorporates model-supported information, which accumulates disturbances relative to land sensitivity. The Forest CWE Analysis is based on a set of assumptions and coefficients. The CWE Analysis quantifies disturbances and land sensitivity at the 7th field watershed scale. The estimated results fall on a continuum. As disturbances increase (and recover) over time and space, at some point the risk of initiating or contributing to existing adverse cumulative watershed impacts becomes a cause for concern.

These model-specific levels are called inference points or for the ERA Model, the Threshold of Concern (TOC). These points are used to inform management decisions. Ecologically, a transition exists from lower to higher risk of adverse effects to beneficial uses – from insignificant to potentially significant. From a management perspective, inference points are intended to represent the center of the transition zone or inference range. Inference points do not represent the exact point at which CWEs will occur ("red flag" indicator). Rather, they serve as a "yellow flag" indicator of increasing susceptibility for significant adverse effects occurring within a watershed. Modeled CWE levels, relative to defined inference point values, are expressed as risk ratios and are displayed in **Tables 13, 14, and 15**. Risk ratios are calculated by dividing accelerated sedimentation and ERA values by an inference point value. For the Surface Erosion and Mass Wasting Models, existing levels are shown as "percent over background," which is a measure of accelerated sedimentation. Mass Wasting estimates the sediment generated from landslide features. The inference point for the Surface Erosion Model has been identified as 800% over background, while the inference point for the Mass Wasting Model is 200% above background. In the ERA model, the ERA is compared to a theoretical TOC to create a risk ratio, with values of 1.0 serving as the inference point. This risk ratio is used to assess the risk of altering hydrologic runoff. These inference points are intended to provide an indication of when effects need to be analyzed and discussed in detail. Risk ratio values represent a continuum of and serve as indicators of relative watershed condition. Inference point values have been reviewed and validated using site-specific information from field reconnaissance.

The sediment rates predicted by the Surface Erosion Model are realized during a six-hour maximum rainfall with a two-year recurrence interval. The probability of this event occurring is 1 in 2 for any given year or 50%. The Mass Wasting Model predicts sediment volumes from landslide activity associated with a flood event with a recurrence interval of 10 to 20 years (or a probability of 10% to 5% in any given year). The index for magnitude of effects on surface runoff is reflected through ERA, which because of the nature of the model is more difficult to tie to probability of occurrence. Runoff *risk* can be interpreted as increasing, for any given rainfall recurrence interval, with increasing ERA.

The CWE modeling uses the most up-to-date Forest GIS coverages to describe existing conditions as of February 28, 2003. There are some minor acreage differences between field estimates used in the EIS and modeled unit acres; this is due to the level of refinement in the digitizing process. Differences are within the standard error of the model. Modeling for the current conditions includes past actions, including wildfires, as well as present actions that have been approved in a decision document, but have not been completed. These include Glassups Timber Sale, Knob Timber Sale, Taylor Fuel Project, Jackson 1 Underburn,

Summerville Roads Project, and Yoakumville Roads Project. The modeled effects of the alternatives are added to the existing condition, as are the modeled effects of reasonably foreseeable actions. The Meteor Project Cumulative Watershed Effects Analysis Specialist Report, by Don Elder (2003a) contains a more detailed explanation of the methods used in the modeling process and displays data outputs for each model for the alternatives. It is incorporated by reference and on file in the project record.

Silvicultural prescriptions, logging systems, fuel treatments/site preparation activities, and road and landing work were considered in the CWE assessment. The proposed project drainages and the entire Salmon River sub-basin are primarily National Forest System land, with only 0 to 4% of private land. Short sections of County Road on National Forest System easements occur within some of the project drainages. Actions on these private lands and the County road segments are included in the CWE assessments.

Long-term past disturbance from old lode gold mine sites are modeled through use of the forest GIS layer. The roads and openings associated with past lode mines are mapped in GIS. Road and opening information is included in the three CWE models. Historic placer mining effects are considered and reflected in the channel condition ratings for each watershed to determine the TOC.

On-going actions not included in the CWE model due to extremely small disturbance factors are precommercial thinning, release, roadside hazard/sanitation/salvage, routine road maintenance and improvement, handpicking of knapweed, grazing, mining, and Off-Highway Vehicle use. These activities were evaluated qualitatively; a complete discussion is included in the Hydrology Report.

A number of actions were foreseeable future actions when the planning for this project began. Some of these have now been approved. Other projects have been initiated since the Meteor analysis began. The status of these actions and the projected effects are described below.

The King Solomon Mine Dam Restoration project in the Matthews Creek Drainage of the South Fork 5th Field Watershed was approved on June 16, 2003, and implementation is scheduled to begin in 2003. While no activities would occur within the Meteor assessment area, this project is included in cumulative effects at the 5th field scale. The project is estimated to have less than 5 cubic yards of construction related sediment delivery potential, a minor amount. The risk of sediment delivery will be minimized by project design standards and implementation of BMPs, which include erosion control measures and rerouting of water during construction. In addition, the foreseeable effects of the Julie and Matthews Creek Claims Plans of Operations for exploratory activities in the Matthews Creek drainage have the potential to deliver 1.5 cubic yards of activity-related sediment in the first year. The CWE for surface erosion for these two actions and the Yoakumville Roads Project is expected to result in a net sediment decrease in the short-term (1st year) by approximately 15.1 cubic yards, even if all activities proceeded in the same year. In the long term, the proposed King Solomon Mine Dam Restoration project will reduce the potential delivery of up to 8,000 cubic yards of material to Matthews Creek, which would combine with an estimated reduction in sediment delivery by the Yoakumville project of approximately 3,500 cubic yards per decade.

The Klamath Fish Passage Restoration Project, a foreseeable action, would result in reconstruction of 5 crossings within the South Fork Salmon River 5th field watershed. Two of

these sites have been approved for work in 2003. The purpose is to re-establish passage for anadromous salmonids and other native fish species. Under a worst-case scenario, the sediment delivery associated with the construction is estimated at 1.0 cubic yards per site. This is similar to that for stream crossing reconstruction associated with stormproofing on perennial channels. However, the risk of sediment delivery would be minimized by project design standards and implementation of BMPs.

Fork Hazard Tree Project remains a foreseeable future action. Dead or dying trees along some forest roads with the potential to fall within the roadway and pose a public safety threat are being considered for removal from the Forks of the Salmon extending into the Little North Fork area. Individual trees would be felled onto the existing roadways and some would be removed. Past experience with hazard tree removal has shown the disturbance to be very minimal. This is primarily due to the stumps and roots being left in place, and heavy equipment being confined to the roadway. No water quality degradation effects are anticipated.

Liberty Mine Sampling, Westside Klamath and Yankee Dump Sites was planned during winter 2004 and approved on April 19, 2004. None of the proposed actions are of the design, scale, or duration that they can be quantified in the CWE models. The activities proposed, sampling of existing piles being the major activity, have a low risk of resulting in adverse water quality conditions due to the low impact of all proposed treatments and the application of the project design standards.

Liberty Mine Sampling, Eastside Apex is in the very early stages of analysis. Resource protection measures will be developed as necessary to assure that mineral operations comply with all Federal and State laws related to the Clean Water Act; the Comprehensive Environmental Response, Compensation, and Liability Act; the Resource Conservation and Recovery Act; and the California Porter Cologne Water Quality Control Act. Until these measures are developed, effects cannot be assessed.

Sawyers Bar Fuels Reduction Project was initiated during winter 2004. The proposed fuel reduction activities are not of the magnitude of scope and intensity that quantitative analyses and model runs can be done; the project would not increase or decrease the risk ratios. The addition of this action to cumulative effects is negligible in the short term at the 7th and 5th field watersheds. Overall the cumulative watershed effects are beneficial in the long term as fuels and the risk of moderate to high intensity wildfires would be reduced.

Two lode gold mines will be active within the assessment area. Discovery Day Mine, located in the Knownothing Creek area, is scheduled to begin operations in 2003. This is an existing lode mine that does not involve any new development and does not operate on an annual basis. BMP evaluation monitoring at this site, after past operations, resulted in all BMPs being successfully met. Existing roads are accounted for in the forest GIS layer, as explained above. No new disturbance will result from this project. Specimen Cross-Cut project, in the Eddy Gulch 7th Field Watershed, is also scheduled to begin activity in 2003. It is a lode mine development with one adit (mostly horizontal mine passage) planned. No new road building is associated with the project, but improvement of existing roads at the site is part of the project. The roadwork would have a beneficial long-term watershed effect. The adit development would not result in degradation of water quality.

Garden Gulch Fuels Reduction was approved on April 19, 2004, between Draft and Final EIS. The effects are quantifiable in the CWE model and are discussed in the appropriate

sections. Supporting information can be found in the Garden Gulch Fuels Project Hydrology Report by Sharon Koorda, which is incorporated by reference and available in the project file. The report includes a cumulative effects analysis for Garden Gulch that includes the effects of the Meteor Project.

There are no current or future foreseeable actions on state or private lands within the 7th field watersheds related to the project. No timber harvest plans have been submitted to the California Department of Forestry for future harvest actions on private lands within the 5th or 7th fields related to the proposal.

Interpretation of the modeling is tempered with observed past responses of the specific watersheds to a range of precipitation events and the relationship to the presence or absence of management activities. Project design standards and application of BMPs are not part of the modeling, but are an important component of interpretation of the modeling results, since they will mitigate effects. Field knowledge of the units and watersheds, combined with the knowledge of the unique qualities and responses of the areas throughout time, contribute to the professional judgment applied to evaluate the project.

Environmental Consequences

Alternative 1

With the No Action alternative, no new short-term management disturbances would take place as a result of this proposal, but recovery of unhealthy stands needing treatments would be slow, and the hazard for high intensity, stand-replacing wildfires within these stands would continue and increase over time as described in the Vegetation and Fuels Sections earlier in this chapter. Risks in RRs would be as described in the Riparian Reserve Section later in this chapter. For water resource concerns, the stands currently under stress, and at risk for high fuels and stand-replacing fire, have a moderate to high potential to adversely impact beneficial uses.

Estimates for Surface Erosion, Mass Wasting, and ERA disturbance levels from the CWE model for Alternative 1 by 7th field drainage are displayed in **Tables 13, 14, and 15**, respectively. These estimates include the modeled effects described above in the Methodology section. With the addition of Garden Gulch, the risk ratios would increase 0.01, 0.02, and 0.01, respectively. The other actions within the assessment area and the Salmon River Watershed, described qualitatively in the Methodology Section, would also continue with this alternative.

Alternatives 2 and 3

Alternative 2 differs from Alternative 3 in that it proposes harvesting and associated activities on six units within the Jones Gulch area of the Kanaka-Olsen 7th field watershed and it proposes thinning in some RRs. The proposed restorative road-related actions in the Jones Gulch area are the same for either Action Alternative. The effects for the two alternatives are discussed together with the differences highlighted for the Kanaka-Olsen 7th Field Watershed and for RRs where treatment would vary between the two alternatives.

Domestic water use occurs in a number of 7th field watershed; refer to **Table 12**. Stand alterations are not of the intensity nor size (in acres) that a noticeable change in the water table would occur. If any change at all occurs in the water table it would be a slight rise due to less stems per acre drawing up water by root systems for the first year until the residual stand trees expand their root systems and increase their uptake.

Domestic water users, aquatic habitat, and WSR features would be protected from possible adverse impacts due to project activities through the use of design features developed to mitigate adverse effects, such as employing BMPs to minimize the risk of short-term sediment increase. Refer to Chapter 2 – Design Features Common to Alternatives 2 and 3 Section. The *Forest Plan* standards and guidelines for soil cover and sensitive geologic features would also ensure that minimal soil movement would occur. Refer to Soil Productivity and Geology Sections in this chapter for more details. Water quality objectives are dependent on soil and geologic objectives being met, since surface erosion and mass wasting are both processes that impair water quality and may adversely impact beneficial uses.

This section includes a description of the specific watershed effects for each 7th field watershed, organized by 5th field watersheds, followed by a discussion of the watershed effects at the 5th field scale, and a summary table for the 4th field scale. The effects are predominantly indirect and cumulative effects. Direct effects such as ground disturbance, changes in soil productivity, and soil movement have been described previously in the Geology and Soils Sections. The key estimated values that were calculated by the three CWE Models are displayed in **Tables 13, 14, and 15**. A full set of the modeling data can be found in Elder 2003a. Supporting data by individual unit can be found in the Hydrology Report.

The EIS discussion is intended to provide an indication of the potential *magnitude* of effects associated with implementation of the proposed alternatives. Combined with an estimate of the *probability* of these effects occurring, this information can be interpreted as the relative *risk* of altering (increasing or reducing) stream flows, surface erosion, or mass wasting attributable to implementation of either alternative.

On-going and future actions are described above in the Methodology Section. The discussion below is focused on the effects of harvesting and logging systems. These two types of actions, along with fuel treatments and road actions are included in the CWE modeling. Precommercial thinning, release, gopher baiting, and other silvicultural activities included in the Action Alternatives are not discussed below as they were found to be negligible for the water resource. The effects of these individual actions are documented in the Hydrology Report.

The direct, indirect, and cumulative effects analyses focus on how each alternative would affect water quality standards, beneficial uses, and WSR attributes.

Table 13. Surface Erosion
(Values represent estimated sediment delivery in cubic yards/year)

7th Field Watershed Name	Acres	Current Value or Alternative 1	Risk Ratio for Current or Alternative 1	Value for Alternative 2 or 3	Risk Ratio for Alternative 2 or 3
Rays-Gibson	10,288	585.2	0.60	586.5	0.60
Gooey-Ketchum	4,385	190.7	0.48	191.2	0.48
Cecil Creek	3,670	281.2	0.68	281.7	0.68
Crawford Creek	8,354	419.8	0.49	420.4	0.49
St. Claire Creek	6,792	243.6	0.16	244.8	0.16
Timber-French	6,639	208.0	0.28	209.2	0.29
Cody-Jennings	7,658	306.2	0.43	307.9	0.44
Methodist Creek	8,130	318.7	0.27	321.5	0.27
Negro-Hotelling	6,535	458.5	0.80	458.8	0.80
East Fork Know-nothing Creek	6,382	215.5	0.21	215.6	0.21
Eddy Gulch	4,427	657.0	1.02	657.0	1.02
Tanner-Jessups	4,546	243.8	0.58	227.7	0.54
Shiltos-Kelly	3,901	280.9	0.75	282.2	0.75
Kanaka-Olsen	8,308	485.1	0.37	489.4/ 484.0 *	0.38/ 0.37 *

* Value for Alternative 2 is first figure/ Value for Alternative 3 is second figure.

Table 14. Mass Wasting
(Values represent estimated sediment delivery in cubic yards/decade)

7th Field Watershed Name	Acres	Current Value or Alternative 1	Risk Ratio for Current or Alternative 1	Value for Alternative 2 or 3	Risk Ratio for Alternative 2 or 3
Rays-Gibson	10,288	60,740	0.64	60,770	0.64
Gooey-Ketchum	4,385	16,233	0.45	16,233	0.45
Cecil Creek	3,670	19,645	0.89	19,645	0.89
Crawford Creek	8,354	36,473	0.38	36,485	0.38
St. Claire Creek	6,792	27,987	0.31	27,996	0.31
Timber-French	6,639	26,106	0.25	26,106	0.25
Cody-Jennings	7,658	49,666	0.37	49,669	0.37
Methodist Creek	8,130	41,596	0.33	41,599	0.33
Negro-Hotelling	6,535	69,220	0.82	69,220	0.82
East Fork Know-nothing Creek	6,382	40,176	0.45	40,176	0.45
Eddy Gulch	4,427	23,485	0.85	23,485	0.85
Tanner-Jessups	4,546	33,461	0.78	32,321	0.73
Shiltos-Kelly	3,901	22,782	0.68	22,782	0.68
Kanaka-Olsen	8,308	103,038	1.68	102,928/ 102,911 *	1.68

* Value for Alternative 2 is first figure/ Value for Alternative 3 is second figure.

Table 15. Equivalent Road Acres (Values represent estimated Equivalent Road Acres)					
7th Field Watershed Name	**Acres**	**Current Value or Alternative 1**	**Risk Ratio for Current or Alternative 1**	**Value for Alternative 2 or 3**	**Risk Ratio for Alternative 2 or 3**
Rays-Gibson	10,288	354.6	0.36	363.4	0.37
Gooey-Ketchum	4,385	60.1	0.12	61.4	0.12
Cecil Creek	3,670	177.4	0.46	179.0	0.46
Crawford Creek	8,354	206.7	0.31	210.2	0.31
St. Claire Creek	6,792	318.7	0.49	322.2	0.50
Timber-French	6,639	159.0	0.23	161.0	0.23
Cody-Jennings	7,658	364.9	0.45	367.6	0.46
Methodist Creek	8,130	443.8	0.68	449.1	0.69
Negro-Hotelling	6,535	968.0	1.85	969.0	1.85
East Fork Know-nothing Creek	6,382	276.6	0.51	277.1	0.51
Eddy Gulch	4,427	174.1	0.46	174.2	0.46
Tanner-Jessups	4,546	238.4	0.75	234.9	0.74
Shiltos-Kelly	3,901	151.0	0.41	153.1	0.41
Kanaka-Olsen	8,308	515.1	0.62	523.3/ 514.5 *	0.63/ 0.62 *
* Value for Alternative 2 is first figure/ Value for Alternative 3 is second figure.					

NORTH FORK SALMON RIVER 5TH FIELD WATERSHED

Eddy Gulch

A portion of Unit 132, located at the ridge top in Eddy Gulch, would be logged by tractor to existing skid roads and by helicopter. Helicopter logging is a low intensity harvest system with minimal disturbance to the soil and residual vegetation. Tractor logging entails some soil disturbance, compaction, and loss of organic matter as discussed in the Soil Productivity Section. As no channels exist within the unit boundaries, no direct effects are anticipated. The Group Selection/ Thinning prescription is a moderate intensity treatment that reduces vegetative density and creates openings ranging from one to 2½ acres in size on approximately 20% of the area as described in the Vegetation Section. Stand structure would not be substantially altered. Any change in runoff, an indirect effect, would be minimal and short term within the watershed.

For cumulative effects, the change in Surface Erosion due to either Action Alternative is predicted as 0.03 cubic yard/year, which is unlikely to impact water quality. There is no predicted change in Mass Wasting. The change in ERA is predicted as 0.10. There would not be any change in the risk ratio from current in any of the three models. While the Surface Erosion risk ratio is within the inference range where actions need to be looked at closely, the proposed activities are minor and not anticipated to change disturbance levels within the watershed or to result in either a short or long term measurable impact. The other two models would remain below the inference range.

Tanner-Jessups

The other portion of Unit 132 and Unit 259 are proposed for Group Selection/Thinning prescriptions. Located in the upper portion of the watershed, they pose a low risk of adverse effects to the Sawyers Bar water supply and are over a mile from the nearest steelhead or salmon habitat in the North Fork of the Salmon River. As no channels exist within the unit

boundaries, no direct effect is anticipated. The creation of several one to 2½-acre openings per unit might cause a slight increase in snowpack in those openings with a resulting very minor indirect increase in runoff for the 7th field. The proposed activities would not increase CWE values for any of the three models, but in fact would result in slight decreases due to the proposed road decommissioning. The short-term effects of roadwork are considered negligible and in the long term, there is a net reduction for all three models showing an improving trend in watershed conditions. All models are below their inference points, supporting the assessment of a low impact for either of the Action Alternatives. Short-term effects might compound each other, if implementation of harvest and road decommissioning activities overlap in time in the Knob and Meteor Timber Sales within this 7th field.

Kanaka-Olsen

Alternative 2 would treat Units 88, 108, 190, 255, 256, and 261. All units are on the south side of the North Fork Salmon River where soils are not as susceptible to surface erosion. Alternative 3 would not treat any units in this drainage.

Design features for Alternative 2 would protect Hydrologic RRs, buffering channels from direct effects. Design features would also mitigate a potential alteration of runoff by limiting the number of openings, creating only small openings, retaining stocking around openings that provide a filtering effect for streams, or retaining canopy cover. Soil cover would also be maintained, consistent with Soil Cover Standards. Units 255 and 261 have Green Tree Retention prescriptions, which would create openings on about 9 acres. The Group Selection/Thinning and Seed Tree/Sanitation prescriptions would result in a total of only 20 acres of small openings over an 84-acre area. Group Selection and Seed Tree prescriptions entail a local loss of root support and a reduction in evapotranspiration. In the Sanitation and Thinning portions of these units, canopy cover and ground cover would remain dispersed throughout the area, providing interception for potential increased runoff. RR buffers would be applied to all Hydrologic and Geologic RRs and the units would not include any perennial channels within the unit boundaries.

Alternative 3 would have a very high probability of maintaining all water resource objectives. The low risk and improvement of conditions would be due to the road improvement work and treatment of existing plantations to release them for increased growth. A detrimental effect is possible if the mistletoe infestation in the adjacent stands (proposed for treatment in Alternative 2) were to spread to the plantations and increase the number of acres of unhealthy low vigor stands throughout the area thereby increasing fuels and wildfire risk in the long term.

For cumulative effects, Surface Erosion in Alternative 2 related to harvest units is predicted to cause a sedimentation increase of 5.41 cubic yards per year, while roadwork in either Alternative 2 or 3 is predicted to cause a reduction of 1.10 cubic yards per year. Surface erosion is currently modeled as a 0.37 risk ratio, which would increase to 0.38 for Alternative 2 plus Garden Gulch Fuels Reduction Project. The risk ratio would remain at 0.37 for Alternative 3 plus Garden Gulch Fuels Reduction. While accelerated sedimentation from surface erosion remains a concern in localized areas of Kanaka-Olsen (specifically on the north side of the drainage outside the project area), drainage-wide the existing modeled Surface Erosion risk is relatively low and the modeled increase for Alternative 2 is minor.

The ERA model in Alternative 2 related to harvest units is predicted to cause an increase of 8.80 ERAs, while roadwork in either Alternative 2 or 3 is predicted to cause a reduction of

0.6 ERAs. The current ERA/TOC risk ratio is 0.62 and is estimated to increase to 0.63 with implementation of Alternative 2 plus Garden Gulch Fuels Reduction and remain at 0.62 with Alternative 3 plus Garden Gulch Fuels Reduction.

Mass Wasting in Alternative 2 related to harvest units is predicted to increase sedimentation by 16.6 cubic yards per decade, while roadwork in either Alternative 2 or 3 is predicted to cause a reduction of 126.8 yards per decade. Mass Wasting is high; the current risk ratio is 1.68. The high values are a result of the wildfire disturbance from the 1977 Hog Fire and the 1987 Fires. The Mass Wasting risk ratio would remain the same with implementation of either Action Alternative plus Garden Gulch Fuels Reduction. The modeled result for Alternative 2 is very low; however, this would be additive with pre-existing high risk conditions. The risk of increasing the rate of landslide initiation and sediment delivery would be minimized to the extent possible through project design standards.
If the estimated 16.6 cubic yards of sediment were delivered in the first year, it would likely be winnowed out over time depending on storm intensities and duration, and RR condition. Sediment delivery rates would be reduced in the long term; the total sediment delivery for Kanaka-Olsen would be less than Alternative 1 with an overall savings of up to 110 cubic yards (126.8 minus 16.6). The flows in the North Fork Salmon and South Fork Salmon during a 10- to 20-year-recurrence-interval flood would lessen the sediment introduced from ground disturbing activities to negligible on both turbidity and on substrate conditions in anadromous fish habitat. The streams would clear quickly after storm events.

The risk of triggering landslide events exists when a high rainfall event occurs after harvest and before recovery has occurred. Higher rainfall events have a low risk of occurring in any given year, but are a possibility in any year. A rainfall event larger than a 40- or 50-year event has a higher risk of initiating active landslide failure in Jones Gulch area with implementation of Alternative 2. Alternative 2 would create additional openings, increase snow accumulation, and increase peak flow runoffs. Whitaker and others (2002) states that peak flow increases are caused by greater snow accumulation and melt in clear-cut areas while similar evapotranspiration rates are predicted under forested and clear-cut conditions during spring high flow. Under normal conditions, such as those rainfall events modeled, there is low risk of adverse impacts. The area remained stable during the 1997 flood, estimated to be between a 20 and 30-year flood event, but the 1964 flood, a 100-year event, activated many areas with little or no management activity. The potential expression of altered runoff in the form of increased peak flows could be increased erosion of channel banks and/or scour of existing channel bed. Activation of the landslide in Jones Gulch would potentially create a debris torrent in the drainage and destabilize banks and scour the channel delivering material into the North Fork of the Salmon River where beneficial uses occur. Refer to Geology Section also.

Forest lands identified as AWWCs represent drainages where cumulative watershed effects are a special concern due to a combination of high disturbance levels (e.g. roads, timber harvest, and fire), potential for landsliding, and surface erosion, or poor aquatic habitat conditions. The main factor for designating the Kanaka/Olsen Drainage as an AWWC was the condition of the area after the 1977 and 1987 wildfires. The *Forest Plan ROD* directs that a cautious approach be taken with respect to future land management activities in AWWCs and that these activities be tailored to achieve watershed recovery.

The activities proposed in Alternative 2 constitute a cautious approach and would result in improving the condition and maintaining stand health to make the areas more resilient for the future. The Group Selection and Sanitation treatments in Alternative 2 are designed to remove unhealthy (mistletoe-infested, drought-stressed, beetle-infested, or dying) trees. The Thinning treatment in Alternative 2 would remove the less vigorous trees in overstocked stands allowing the remaining stand to grow faster and become more resistant to wildfires, insects, and disease.

Retaining the overstocked, unhealthy stands in Alternative 3 would constitute a fuels hazard in those areas in the future. Overstocked stands are more susceptible to mortality in a wildfire due to the many smaller, suppressed trees in the stand.

Shiltos-Kelly

Unit 258 and a portion of Unit 256 would be treated with a Group Selection/Thinning prescription, creating about 16 acres of openings. As no channels exist within the unit boundaries, no direct effects are anticipated. The prescriptions are low impact and stand structure would not be substantially altered. Any increases in runoff would be short term and minimal. All three CWE models would remain well below their inference points, reflecting the designed low impact of the actions.

SOUTH FORK SALMON RIVER 5TH FIELD WATERSHED

LOWER SOUTH FORK DRAINAGES

East Fork Knownothing Creek

Unit 113 would be thinned by helicopter within this 7th field watershed. As no channels exist within the unit boundary, no direct effects are anticipated. Other non-channel RRs would be buffered. The harvest prescription and logging method is low impact and stand structure would not be substantially altered. Any increases in runoff would be short term and minimal in the 6,382-acre watershed. For cumulative effects, the Surface Erosion and ERA Models show modeled increases that would be indiscernible on the ground. The Mass Wasting Model shows no change. All three models are well below inference points.

Methodist Creek

Either Alternative 2 or 3 would treat Units 116, 120, 121, 131, 152 and portions of Units 122, 123, 124 within the Methodist Creek 7th Field Watershed. Units 116, 122, 123, and 124 would be thinned. Unit 131 would have a salvage prescription. Units 120 and 152 would have a Group Selection prescription and Unit 121 would have a Green Tree Retention prescription; these are more intense stand treatments. All units in this 7th field watershed have helicopter logging systems, with the exception of 5 acres of tractor logging in Unit 123 that are not within the Hydrologic RR and eight acres of cable logging in Unit 124. Helicopter logging causes very little disturbance. Tractor logging is moderate intensity and cable yarding is low. Both logging systems can cause local changes in soil permeability and channel water; refer to Geology and Soil Productivity Sections.

Alternative 2 would thin within the Hydrologic RR of Unit 123; this action would help maintain and enhance the stand characteristics. With the helicopter logging, very little disturbance would occur within the Unit 123 Hydrologic RR. In Alternative 3, the Hydrologic RR in Unit 123 would not be thinned. Direct effects are highly improbable in any of the units, as the channels would not be disturbed in either alternative.

Seven of the unit prescriptions are low impact and stand structures would not be substantially altered. Only Green Tree Retention in Unit 121, which represents .07% of the 7th field, would have a high impact. Any change in runoff would be short term as there would only be a minute increase in drainage area from the 6-acre unit; this is minimal within the 8,130-acre 7th field watershed.

All three models are well below the inference points for cumulative adverse effects and would remain so with only minor modeled increases.

Cody-Jennings

Either Alternative 2 or 3 would treat Units 119, 126, 128, 130 and parts of Units 122, 123, 124. Only Unit 126 would moderately alter the stand structure with a Group Selection/Thinning prescription. The other units would be thinned from below with no substantial alteration of the stand structure. The helicopter and cable harvesting methods would also be relatively low impact. To maintain and enhance stand characteristics, Alternative 2 proposes helicopter thinning within Geologic RRs, which would cause very little disturbance, so direct effects to channels would be highly improbable. With Alternative 3, none of the RRs would be entered, so no disturbance or direct effects are anticipated. As only Unit 126 would have a moderate impact, any increase in runoff would be short term and minimal. All three CWE models are well below the inference points and would remain so with only minor increases from either Action Alternative.

Negro-Hotelling

Unit 114 would be cable thinned in this 7th field watershed with either Action Alternative. In the headwaters of Hotelling Gulch, it is the only stand that did not succumb to stand-replacing wildfire in 1987. The thinning treatment would maintain stand health in the long term and retain the stand's old growth characteristics. As there are no channels within the unit boundaries, no direct effects are anticipated. Since the prescription is low impact and stand structure would not be substantially altered, the increase in runoff, if any, would be short term and minimal.

Negro-Hotelling Watershed is an AWWC that has been significantly affected by the 1977 and 1987 wildfires. AWWCs represent drainages where cumulative watershed effects are a special concern due to a combination of high disturbance levels, the potential for landsliding and surface erosion, or poor aquatic habitat conditions. The *Forest Plan ROD* directs that a cautious approach be taken with respect to future land management activities in AWWCs and that these activities be tailored to achieve watershed recovery.

The Surface Erosion and Mass Wasting Models would remain below the inference points with the addition of the one thinning unit. The ERA model reflects the high level of long-term disturbance that has occurred in the 7th field watershed. Either Action Alternative would show an insubstantial increase of 1.0 in the ERA value with no change to the 1.85 risk ratio. This increased amount of disturbance would not lead to a noticeable decline in water quality nor affect beneficial uses.

UPPER SOUTH FORK DRAINAGES

St. Claire Creek

Units 69, 70, and 71 would be helicopter thinned, which is low impact. Unit 68 would use helicopter with a prescription of Green Tree Retention/Thinning. The Green Tree Retention

area consists of 4-acres of diseased trees. As there are no channels within any of the units, no direct effects would occur. As the units would be designed to avoid the Hydrologic RRs and the Hydrologic RRs adjacent to the units are properly fulfilling their sediment filtering function, no indirect effects of sediment delivery to streams are anticipated. As the one small opening created in Unit 68 would be along a ridge, no changes in slope hydrology and no in-channel effects are anticipated. All three CWE models are well below inference points and would remain so. Of the three models, only the ERA risk ratio shows a change, a minor increase from 0.49 to 0.50 in either Action Alternative.

Crawford Creek

Three units are planned along a ridge. Unit 82 would be a low impact Group Selection helicopter unit. Unit 84 would be cable thinning, also low impact. Unit 83 is a tractor Group Selection that would result in moderate impacts for stand alteration. As there are no channels within any of the units, no direct effects would occur. Because activities would cause only low to moderate alterations of stand structure, no elevated runoff or indirect effects are expected. The risk ratios for all three CWE models would remain the same as in the current situation. The models support the conclusion that negligible impacts are anticipated due to the location of the units and the type of activities proposed.

Rays-Gibson

Units 85, 133, 138 would be thinned. Unit 86 would have a Group Selection/Thinning prescription. There would be only low alterations of stand structure in these four units. Unit 139 would be Seed Tree, a prescription with a high impact for stand structure, but the unit is only 5 acres in size. Unit 141 would be a combination of Green Tree Retention/Thinning, a moderate stand alteration prescription; however, the Green Tree Retention would only create an opening approximately 6 acres in size.

As no Hydrologic RRs would be entered in these units, no direct effects would occur. Approximately 100 acres of low impact thinning dispersed across 5 unconnected units would not result in any indirect effects. The Group Selection and Green Tree Retention prescriptions would create approximately 17 acres of openings (total of 5 distinct openings) causing high and moderate stand alteration within this 10,288 acre 7th field watershed, which would not result in an elevated runoff or cause any offsite degradation issues. The moderate to high alteration is only 0.16% of the watershed and would not be substantial for indirect effects.

For cumulative effects, the Surface Erosion and Mass Wasting Model risk ratios would remain the same as in the current condition. The ERA model would increase slightly from 0.36 to 0.37, which is well under the inference point for potential cumulative effects that would affect water quality or channel conditions. The upslope disturbance levels for the 7th field watershed would remain in the low to moderate range.

Gooey-Ketchem

Unit 77, a thinning unit, is adjacent to County Road 1CO2 and has a private ditch contouring through it. Alternative 2 would apply the forest health prescription to the portions of the unit within Hydrologic RRs as well as thin in the Matrix portions of the unit. Alternative 3 would only thin in the Matrix portions of the unit. As neither Alternative would treat the area between the county road and the river, no direct effects are anticipated. Trees would be yarded across the private ditch in both alternatives. Design standards would be incorporated

into the contract to avoid or minimize potential disturbances to the ditch and impounded water flow. The ditch goes to private land where it is part of a power plant operation for the landowner. Direct effects on water quality would not be substantial.

The thinning would be in three distinct areas with Alternative 2 and in four distinct areas with Alternative 3, not a contiguous 21-acre area. The unit also has a low gradient slope and the county road below it. These three factors would severely limit any off-site effects to the river downslope, so no indirect effects on water quality are anticipated.

The risk ratios of all three CWE models would remain the same as in the current condition, as the action is very low intensity. The low risk ratios reflect the low disturbance history in the 7th field watershed. Due to the location of the unit and the type of activities proposed, negligible impacts are anticipated in either Action Alternative.

Cecil Creek

Unit 134 would be thinned and the portion of Unit 137 in Cecil Creek would have a Group Selection/Thinning prescription. Unit 137 does not have any channel features, so no direct effects would occur. Unit 134 has an intermittent channel that runs through a broad gentle flat at the bottom of the unit, which would be buffered by a 170 foot wide RR. With Alternative 2, the Hydrologic RR would be thinned within this buffer on the flat to provide for long-term stand health, however, no trees would be removed in a 20-foot strip along the channel feature to protect it. Unit 134 would be helicopter logged and no heavy equipment would be permitted within the RR. As no disturbance would occur in the channel, no direct effects are anticipated with Alterative 2. With Alternative 3, there would be no activity within the Hydrologic RR buffer, so no direct effects would occur.

The prescriptions and harvesting methods would be low impact and stand structure would not be substantially altered in either Action Alterative. The increase in runoff, if any, would be short term and minimal. No degradation of water quality is anticipated.

The risk ratios for all three CWE models would remain the same as in the current condition. The models support the conclusion that the location of the units and the type of activities proposed would only generate negligible effects. No new long-term disturbances would result from the project.

Timber-French

The remainder of Unit 137 would be thinned using helicopter logging. As the unit does not have any channel features, no direct effects would occur. As the prescription and harvest method would be low impact and stand structure would not be substantially altered, no degradation of water quality is anticipated. The risk ratios for the Mass Wasting and ERA models would remain the same as in the current condition. The Surface Erosion risk ratio would show a slight increase from 0.28 to 0.29, but still be well below the inference range for adverse effects.

5TH FIELD EFFECTS

There is no difference in risk ratios in any of the models at either the North Fork or South Fork 5th field watershed scale between the Action Alternatives, the No Action Alternative, and the Current Condition. Risk ratios at the 5th field scale are shown in **Table 16**. This supports the assessment that either Action Alternative would have minimal watershed effects on water quality with no significant impacts. With implementation of Alternative 2, there is a

low to moderate magnitude of effects but the probability of the moderate effects occurring is estimated to be low, and the relative risk of altering the stream temperatures or flow/erosion/mass wasting regimes is considered to be low. Alternative 3 has an even lower relative risk, as no units would be harvested in Jones Gulch or in RRs. The Garden Gulch Fuels Reduction Project, which was approved on April 19, 2004 after the Draft EIS was circulated to the public, would increase the Surface Erosion for the North Fork by 0.01 to 0.24; all other values remain the same.

Cumulative effects for the overall 5th field areas are all below the inference point ranges for all models. Implementation of BMPs, coupled with the majority of the actions in the Action Alternatives being low intensity result in a low probability of effects that would alter stream temperatures, flow rates, erosion regimes, or mass wasting regimes within the 5th fields. No significant impacts to water quality that would affect beneficial uses would result from implementation of either of the Action Alternatives as designed.

Table 16. Risk Ratios for 5th Field Watersheds			
5th Field Watershed	**Surface Erosion**	**Mass Wasting**	**ERA**
North Fork	0.23 (0.24**)	0.55	0.51
South Fork	0.27	0.35	0.66
Lower South Fork *	0.39	0.46	1.37

* Lower South Fork is displayed to indicate where the highest disturbance history has occurred within the South Fork 5th field. The less impacted Upper South Fork area does offset effects over the entire 5th field and the level of disturbance of the lower area is masked.
** With Garden Gulch Fuels Reduction Project

The main concern in assessing cumulative project effects at the 5th field scale are projects that might possibly be implemented at the same time. The CWE models reflect projected effects of the individual projects, but not the timing of implementation. For instance, if Knob and Meteor units were to cut at the same time, there could be an additive effect. While the Kanaka-Olsen watershed has six units in the Knob Timber Sale pending implementation, none of them are located in Jones Gulch drainage, so there would not be an additive effect in that area. If the implementation of projects is spaced apart in time, there is recovery time between activities and cumulative effects are reduced. Currently the Knob Timber Sale is scheduled to sell in 2004 and the Meteor Project in 2006; so they are not expected to overlap.

Models run at the Lower South Fork scale do not show any effect from either of the Action Alternatives as shown in **Table 16**. The Lower South Fork portion of the South Fork 5th Field was more intensely affected by catastrophic fires in 1977 and 1987 than the upper portion of the 5th field watershed. The areas have recovered to some extent, but not fully. There is also a higher road density for the Lower South Fork area of 2.42 miles per square mile, compared to the 1.84 miles per square mile of the total 5th field. The Upper South Fork portion has a distinctly lower long-term disturbance history than the Lower South Fork.

An overall improving trend is expected in the Lower South Fork resulting from the Yoakumville Roads Project, which will decommission some roads and stormproof others to minimize long-term effects in the most impacted portion of the watershed. Watershed restoration is being actively implemented in recognition of the watershed's cumulative impacts. Implementation of BMPs coupled with the majority of the Meteor actions being low intensity result in a low probability of effects that would alter stream temperatures, flow rates, erosion regimes, or mass wasting regimes within the Lower South Fork. No significant impacts to water quality that would affect beneficial uses would result from implementation of either of the Action Alternatives.

SALMON RIVER 4TH FIELD EFFECTS

Table 17 displays the CWE Model values at the Salmon River 4th Field Sub Basin Scale for Alternative 2, which proposes the largest number of activities of the Action Alternatives. The effects for Alternative 3 would be similar or very slightly less. The Surface Erosion and Mass Wasting models reflect an overall reduction in the respective sediment budgets, which represents an improving trend at the 4th field scale. The small net increase in the ERA model is insignificant in the 480,435-acre 4th field sub basin, and would be offset by the ongoing Yoakumville Roads Project, which results in an overall decrease in ERAs and reflects an improving trend in the long term.

Table 17. Modeled Values at Salmon River 4th Field Scale for Alternative 2	
Surface Erosion	
Projected total modeled sediment production from harvest actions	17.53 cubic yards per year
Projected total modeled sediment reduction from road actions	-18.31 cubic yards per year
Net Surface Erosion sediment	-0.78 cubic yards per year
Mass Wasting	
Projected total modeled sediment production from harvest actions	74.2 cubic yards per decade
Projected total modeled sediment reduction from road actions	-1272.0 cubic yards per decade
Net Mass Wasting sediment	-1197.8 cubic yards per decade
ERA	
Projected total modeled ERA production from harvest actions	42.8
Projected total modeled ERA reduction from road actions	-6.0
Net ERA disturbance	36.8

Summary

As designed, neither Action Alternative is expected to have a detrimental effect on the water quality objectives of suspended sediment, settleable material, turbidity, or temperature; refer to Fisheries Section for discussion on temperature. The North Coast Water Quality Control Board Basin Plan standards set for each parameter would not be exceeded and adverse affects to beneficial uses is not anticipated. It was determined that there would not be significant actions or significant cumulative effects with the implementation of either Alternative 2 or Alternative 3 under average climatic events. Alternative 3 would have fewer actions and result in less risk under more extreme climatic conditions.

With Alterative 2, RRs would show an improvement of conditions in the long term. With either Action Alternative, water quality would be maintained so that domestic water users and the Wild and Scenic River Outstandingly Remarkable Value of anadromous fish would not be adversely impacted by the proposed activities.

Fisheries

Affected Environment

The Salmon River Subbasin has some of the highest anadromous fisheries values in the Klamath River basin. It is part of a network of Key Watersheds that serve as refugia for at-risk salmon and steelhead stocks in the Pacific Northwest due partly to its remarkably high habitat quality. The Salmon River still retains viable runs of anadromous salmonid species that have disappeared from much of their historic range within the state.

The Southern Oregon/Northern California Coasts (SONCC) coho salmon (*Oncorhynchus kisutch*), is listed as Threatened under the Federal and State Endangered Species Acts. Klamath Mountain Province steelhead (*O. mykiss*), and Upper Klamath-Trinity Chinook salmon (*O. tshawytscha*) are listed as Region 5 Sensitive Species. Designated Critical Habitat for SONCC coho salmon and Essential Fish Habitat for Chinook and coho salmon are initially identified with the Forest steelhead distribution map, and refined through field surveys and biologist knowledge. The mainstem Salmon River, East Fork of Knownothing Creek, and Methodist Creek are known SONCC coho habitat, as well as Essential Fish Habitat.

Of the 159.5 miles of perennial stream and 323.4 miles of intermittent stream within the fourteen 7th field watersheds, there are 57.9 miles of anadromous fish habitat (which is also resident fish habitat) and an additional 11 miles that provide habitat for resident fish only. However, only 17.3 miles of intermittent and perennial streams (primarily perennial) are downstream of proposed units and therefore have the possibility of being affected by the alternatives being considered. In addition, there are approximately 16.1 miles of the North Fork Salmon River and 25.5 miles of the South Fork Salmon River that could possibly be affected by the alternatives being considered.
All of the 7th field watersheds provide habitat for anadromous fish. Eight of the 14 contain sections of the mainstem North Fork Salmon, South Fork Salmon, or East Fork of the South Fork Salmon River that provide habitat for steelhead, Chinook salmon, coho salmon, and resident trout. The small face drainages within these eight 7th fields do not support fish. The remaining six 7th fields are tributaries that provide mainly steelhead habitat, although Methodist Creek provides habitat for Chinook and coho salmon. Knownothing Creek also provides habitat for Chinook and coho salmon; however they have not been confirmed in the East Fork Knownothing Creek 7th field watershed. The mainstem reaches of South Fork (19.2 miles) and North Fork (10.7 miles) within the affected 7th fields also support SONCC coho salmon. Knownothing Creek is an important refugia to SONCC coho salmon, but none have been observed in the East Fork Knownothing 7th field watershed. Refer to **Table 12** for additional information.

Methodology

Two significant issues were identified related to Fisheries. One significant issue is that logging in RRs could cause erosion and result in sedimentation in streams. This issue is discussed in the Riparian Reserve Section. The other significant issue is that timber harvest, fuel reduction, and road activities could affect the habitat of anadromous fish. The key indicators used to analyze this issue are as follows:

- A discussion of the habitat indicators of Temperature, Turbidity/Sediment, Large Woody Debris, and Peak/Base Flow.
- A discussion of compliance with ACSOs.

The CWE models are used to determine current conditions and post-action conditions of the aquatic environment in relation to sediment delivery; refer to Water Quality Section for more details on these models. Stream surveys and personal knowledge are used to determine current conditions for other habitat indicators.

The Fisheries Specialist Report, prepared by Brenda J. Olson, provides the basis for these discussions. The Fisheries Specialist Report provides more detailed information on streams, distances to fish habitat, habitat conditions, and aquatic habitat indicators. It also evaluates the direct, indirect, and cumulative effects for each alternative using a full set of habitat indicators. Additional information is available in the Management Indicator Species (MIS) Project Level Assessment, Parts I and II. This assessment documents the process used to determine which Management Indicator Species should be analyzed. It includes an environmental baseline and documents the analysis of direct, indirect, and cumulative effects on the Management Indicator Species in the selected associations using habitat indicators. A summary of the effects on River/Stream Management Indicator Species can be found in the Wildlife Section. The Biological Assessment/Biological Evaluation For Threatened, Endangered, Proposed, Petitioned and Sensitive Species That may be affected by the Meteor Timber Sale (Fish BA), prepared by Brenda J. Olson, dated January 28, 2004, provides detailed information on listed species and the effects of Alternative 2 on those species. It also documents the consultation with NOAA Fish. Consultation was completed on receipt of NOAA Fish's letter of concurrence dated April 5, 2004. All these documents are incorporated by reference and on file in the project record.

Environmental Consequences

Alternative 1

The No Action Alternative would not add any additional direct or indirect effects to the current conditions of the 7th field and 5th field watersheds, so would not contribute to cumulative effects for any of the habitat indicators. Geologic and Hydrologic RRs would remain overstocked, suppressing the vigor of the dominant overstory trees and fuel would continue to build up, increasing the risk of high intensity fire; refer to Fire and Fuels and Riparian Reserve Sections.

Alternatives 2 and 3

Alternative 2 differs from Alternative 3 in that it proposes harvesting and associated activities on six units within the Jones Gulch area of the Kanaka-Olsen 7th field watershed and thinning in some RRs. The proposed restorative road-related actions in the Jones Gulch area are the same for either Action Alternative. The effects of the two alternatives are discussed together with the differences highlighted for the Kanaka-Olsen 7th Field Watershed and for RRs where treatment would vary between the two alternatives.

Temperature

Direct Effects

Alternative 2 would maintain at least 80% shade along streams, where shade is currently 80% or greater. Alternative 3 would not enter any RRs, so would have no direct effect on existing shade or stream temperatures.

In Alternative 2, thinning is proposed within Hydrologic RRs in Units 123, 134, and 77. Only Unit 77 is within a fish-bearing RR and it is more than one tree height from the East Fork of the South Fork Salmon River at its closest point. As the trees removed in Units 123, 134, and 77 would be suppressed understory trees that do not contribute to shading or affect water temperature, there would be no direct effect on water temperature. Removal of the very few, if any, hazard trees in these units would not directly affect water temperature either.

Other activities such as mastication, precommercial thinning, release, gopher baiting, prescribed burning, and roadwork would occur within Hydrologic RRs in either Action Alternative. Project design standards contained in the Biological Assessment and Evaluation for Pre-commercial Thin and Release Actions and Fuel Hazard Reduction Actions on the Klamath National Forest (USDA FS 2001a) would be followed to protect the aquatic resource. No direct effects would occur from precommercial thinning and release or prescribed fire as shade would be maintained wherever it currently exists, and only cool backing fires would be allowed within RRs.

Indirect Effects

Indirect effects on stream temperatures could result from landslides removing vegetative stream cover or from changes in peak flow causing channel scouring with a corresponding increase in water temperature; however, due to geologic resource protection measures, delineating Geologic RRs in the field, and no road or landing construction, there is a low likelihood of increasing landsliding rates in either Action Alternative. In Alternative 2, the removal of suppressed and dying trees from Geologic RRs to maintain stand health and vigor would occur only where it can be accomplished with minimal ground disturbance or disturbance to residual trees, so there is little risk of triggering mass wasting. Stormproofing and decommissioning roads in either Action Alternative would reduce road-related landslide potential; refer to Geology Section. Resource Protection Measures would minimize the initiation of mass wasting and channel scour that can affect width-to-depth ratios and, therefore, water temperatures. With the implementation of Resource Protection Measures, no increases in water temperature would occur in the short or long term with either Alternative 2 or 3.

Changes in peak flow could scour the channel causing it to become wider and shallower, with increased water temperatures in each of the 7th and 5th field watersheds. Because any change in runoff due to either of the Action Alternatives would be minimal, short-term, and have negligible, if any, effects on the stream channel, no indirect effects on stream temperature are projected.

Cumulative

With no direct or indirect effects on water temperature from either Action Alternative, there would be no contribution to cumulative effects.

Turbidity/Sediment

Direct

There would be no direct effects from turbidity or sediment with either Action Alternative as logging and associated silvicultural activities would not occur within streams.

Pool frequency, pool quality, and stream substrate are all tied to the sediment regime of the system. No direct effects to pool frequency, pool quality, or substrate are anticipated with either Alternative 2 or 3 due to the minor direct effects from sedimentation.

Indirect

Indirect effects would occur if soil material generated by project activities reached fish steams and the sediment were delivered to redds (fish nests of gravel) and eggs and/or alevins (very young fish that remain buried in the gravel) were smothered. Other potential indirect effects include the eroding of gills or mortality due to heavily turbid water.

Indirect effects on fish habitat could be generated by sediment production related to ground disturbance. The primary means of ground disturbance are yarding (cable and tractor), hauling, prescribed burning, skid trails, and roadwork. Both positive and negative effects are identified at the 7th and 5th field watershed scales. Refer to Water Quality Section for a discussion of the sediment estimates from the Surface Erosion and Mass Wasting Models of the CWE Analysis and for more information on the CWE Analysis.

The largest risk of indirect effects from sediment delivery in Alternative 2 would occur from the harvesting of Unit 77. Although portions of this unit are within the East Fork of the South Fork RR, Unit 77 is between two roads, above the County Road and below Road 39N26.The County Road may catch a portion of any soil material from Unit 77. The Surface Erosion Model predicted that there is a 50% chance that 0.44 cubic yards of sediment would be delivered within the first 12 months following the completion of project activities. No sediment was predicted with the Mass Wasting Model, due to the type of geomorphic terrane and the disturbance history. Due to the location of the County Road and the minor amount of predicted sediment delivery, there would be very negligible indirect effects to aquatic species with Alternative 2. The risk of indirect effects with Alternative 3 would be even lower than with Alternative 2, as RRs would not be harvested. Refer to Water Quality Section for additional information.

For either Alternative 2 or 3, resource protection measures would minimize surface erosion; refer to discussion in Soil Productivity Section for details. Because hand piling and burning, jackpot burning, and underburning would meet soil cover standards, effects to the stream system from fuel treatment in Hydrologic RRs would be negligible. No increase in sediment delivery is expected for fuels treatments outside of Hydrologic RRs due to buffering (Spence and others 1996, page 226). The resource protection measures for the masticator in Hydrologic RRs would minimize the introduction of sediment into the stream, so effects would be negligible. Timber hauling would be restricted by the WWOS, which were developed for water quality protection and proper implementation of BMPs. A Period of Operation to protect aquatic resources would also be required with either Action Alternative. Operations would be permitted from April 15 to October 15. With a long-term dry weather forecast and the ability to winterize nightly, a Fisheries Biologist and/or Hydrologist may authorize an extension of the operating period. No new operations would be allowed to start outside the Aquatic Period of Operations.

Road decommissioning and stormproofing might have discountable short-term negative indirect effects, but would result in a long-term reduction in landslide initiation and chronic

surface erosion. Streambanks might be disturbed when culverts and associated fills are upgraded, replaced, or removed; however, none are within anadromous fish habitat. The resulting accelerated surface erosion would occur during implementation or the first storm event after completion (USDC NMFS 1997a) and persist until vegetation is established at the disturbed sites.

Forest monitoring has found sediment generated by road improvement work to be minor. Monitoring of "in-channel construction" and "road decommissioning" projects on the Forest between 1997 and 2002 indicates that activity-generated sediment delivered the first year averaged 0.34 cubic yards per site (values for the 80 samples ranged from 0 to 3.0 cubic yards); 67% of the sites monitored exhibited no measurable signs of sediment delivery. Channel incision and bank erosion were the most common forms of post-treatment erosion at crossings and are often attributed to (1) failure in restoring adequate active channel width; (2) inadequate excavation of channel to original longitudinal profile; and (3) retention of oversteepened side-slopes or channel banks (Elder 2003b).

To minimize the risk of sediment entering streams, project activities in perennial channels would dewater the stream in conformance with applicable BMPs. Specific dewatering methods (pipe, pump, coffer dam) would be determined on a site-by-site basis by the District and/or Forest Engineer. Intermittent streams provide an opportunity to remove activity-related material before flows return to the stream, since stormproofing and decommissioning occur when intermittent streams are typically dry.

Project design standards for roadwork include: (1) dewatering and diverting flows around stream crossing sites during construction activities; (2) stabilization, mulching, and seeding of treated areas; (3) removal (decommissioning) or reduction of fine fill material (stormproofing); (4) armoring of unstable channel banks (in granitic channels if they exist within proposed road treatment areas); and (5) reestablishment of natural drainage patterns. Implementation of BMPs, RR standards and guidelines, and project design standards increase the likelihood that activity generated sedimentation would remain less than in the existing condition and be minor, localized, and of limited duration. Reducing chronic sediment delivery to the stream channel would be a beneficial indirect effect on anadromous and resident fish habitat.

Existing borrow pits and quarries would provide rock for road surfacing activities. As no sediment would be transported from borrow pits and quarries to streams, no change to sediment-related habitat elements is expected from this activity.

Dust abatement would require drafting from streams at established sites including Ray's Gulch, Cecil Creek, an unnamed tributary to lower Cecil Creek, St. Clair Creek, two sites on Methodist Creek, Crawford Creek, Jones Gulch, and a tributary to Jessups Gulch. Maintenance, such as rocking the entry/exit, may occur where needed to minimize the input of sediment to streams. Straw bales, rocking, and containment dikes would be used as needed at water drafting sites to capture any spilled water and prevent runoff to streams. WWOS and BMPs would be implemented and enforced to minimize effects to water quality.

Due to the probability of actual delivery (based on modeling and field review), resource protection measures, distances to anadromous habitat, and minor changes in risk ratios at the 7th field watershed scale, there would be negligible effects on turbidity/sediment with either Alternative 2 or 3. There would be a negligible effect at the 5th field watershed scale. Other activities associated with the Action Alternatives cannot be modeled due to their

minimal effects as discussed in the Water Quality Section; they would also have negligible effects on turbidity/sediment at the 7th field, 5th field, or larger watershed scale.

Pool frequencies would be maintained in all 7th field, 5th field, and larger watersheds in the Action Alternatives. As there would be minimal risk of large sediment inputs to reduce pool frequencies from either mass-wasting or surface erosion, pool frequencies should not change. The risk to individual pool reaches is insignificant. Although sedimentation of pools can reduce quality for holding and rearing fish life stages, the Action Alternatives should have negligible effects on pool quality. As shown in the Water Quality Section, the sediment delivery produced by the project is minimal and spread over fourteen 7th field and two 5th field watersheds.

Cumulative

With Alternative 2, only three 7th field watersheds would show an increase in the Surface Erosion Model. Timber-French, Cody-Jennings, and Kanaka-Olsen would all increase by 0.01, remaining well below the 1.0 inference point. With Alternative 3, Timber-French and Cody-Jennings would each increase 0.01, while Kanaka-Olsen would remain the same. The addition of Garden Gulch Fuels Reduction would raise the Surface Erosion risk ratio another 0.01, still well below the inference point. With either Alternative 2 or 3, Tanner-Jessups 7th risk ratios would decrease 0.04 due to road decommissioning and stormproofing actions. All others would remain the same. All 7th fields are well below the inference point in the current condition, but Eddy Gulch and it would remain the same at 1.02. Negro-Hotelling is moderate with a current value of 0.85 and would be reduced to 0.80.

For the Mass Wasting Model, only Kanaka-Olsen 7th field watershed is currently over the inference point at 1.68. There is a higher risk of landslides occurring with rainfall events larger than a 40 to 50 year recurrence interval. However, implementation of either Action Alternative would not change the risk ratio for mass-wasting in Kanaka-Olsen. Garden Gulch Fuels Reduction Project does not increase the risk ratio for Kanaka-Olsen either. None of the 7th field watersheds show an increase in risk ratio for the Mass Wasting Model with either Action Alternative, and Tanner-Jessups would be reduced from 0.78 to 0.73. The actual risk of increasing landslide production of the ground would be minimized to the extent possible through the use of resource protection measures.

The Yoakumville Roads and Summerville Roads Projects will reduce the amount of chronic sedimentation from roads in the South Fork Salmon 5th field. Roads produce 80 to 90% of the sediment in streams. In addition, the roadwork associated with the Action Alternatives in Meteor would also reduce chronic road caused sedimentation in the North Fork 5th field and associated 7th fields. Other actions such as mining and grazing may also introduce sediment into the stream, however the amounts are minimized through the implementation and enforcement of BMPs and Standards and Guidelines developed for these activities.

There would be no contribution to cumulative effects on pool frequency with either Action Alternative. The contribution to cumulative effects on pool quality and substrate would be negligible in the affected 7th field, 5th field, and larger watersheds for either Action Alternative. Yoakumville Roads Project may actually help in increasing pool frequencies in some 7th field watersheds where chronically high sedimentation rates from roads would be reduced.

Large Woody Debris

Direct

Current large woody debris within channels would not be removed in either Action Alternative. Prescribed burns would not be ignited within RRs, but would be allowed to back into them. Because back burns are relatively cool, there is minimal risk of losing current large woody debris in the RR. A no harvest buffer of one site potential tree height on westside streams is needed to fully protect riparian function related to large woody debris (Spence and others 1996, pages 218, 226, 228).

No large woody debris would be removed from channels with either of the Action Alternatives. While Alternative 2 proposes harvesting in the Hydrologic RR of Units 77, 123, and 134; only Unit 77 is within a fish-bearing RR. The trees to be removed in Unit 77, including hazard trees, are above the County Road and more than one tree height from the river, so would not reach the East Fork of South Fork Salmon River. As they are not recruitment trees for large woody debris in a stream, there would not be any direct loss of large woody debris to a fish-bearing stream due to harvesting this unit in Alternative 2. No treatment is planned below the County Road in either Action Alternative. Full recruitment of large woody debris will generally occur if no-harvest riparian buffers of one site-potential tree height are retained (Spence and others 1996, pages 226, 228). As Alternative 3 does not propose harvest in any RRs, there would be no direct effects to large woody debris in fish-bearing streams.

Indirect

The commercial thinning from below in the Hydrologic RR of Units 77, 123, and 134 with Alternative 2 would remove trees in the smaller size classes and some sick and dying trees. There would be no adverse impacts to large woody debris recruitment as the smaller trees to be removed do not contribute to current recruitment for anadromous habitat. The Hydrologic RR treatments are located beyond a tree height from the stream for Unit 77 and within the entire RR of intermittent channels for Units 123 and 134. The Fisheries Biologist and/or the Hydrologist based the buffer widths on terrane, intensity of proposed treatment, and current channel stability after field review. Narrow buffers of 20 feet were determined sufficient to protect the channel in flat areas along an intermittent stream, yet get the most beneficial effect on future large woody debris recruitment to the stream.

The removal of the smaller trees in the Hydrologic RRs would increase the amount of moisture and nutrients available to the remaining dominant and codominant trees. These larger trees would increase in size at a faster rate than if no thinning took place. One component of the desired condition for Hydrologic RRs is to have large trees for future large woody debris recruitment with a better chance of staying within the stream channel and not floating through the system at less than flood flows. Alternative 2 fosters production of large wood for recruitment, providing beneficial effects in the Methodist, Cecil, and Gooey-Ketchum 7th field watersheds and in the South Fork Salmon 5th field in the long term. No indirect effect to large woody debris would occur in the remaining 7th field watersheds or the North Fork Salmon 5th field watershed with Alternative 2 or in any of the watersheds with Alternative 3.

Cumulative

There would be negligible effects on large woody debris with either Action Alternative when combined with other actions in the area. Projects are designed to minimize the removal of

current large woody debris and future recruitment to the channel. Thinning and release projects are designed to keep the best trees and promote growth and vigor. A beneficial effect to large woody debris recruitment within RR would occur from these projects, when combined with the Action Alternatives. The effect would be slightly larger with Alternative 2 than with Alternative 3 as it also has a beneficial effect on future recruitment in Hydrologic RRs.

Change in Peak/Base Flow

Direct

Water drafting from existing sites for dust abatement would have a direct effect on the fisheries and aquatic habitat in eight streams in either Action Alternative. The streams are Cecil Creek, an unnamed tributary to Lower Cecil Creek, Rays Gulch, St. Claire Creek, Methodist Creek (2 sites), Crawford Creek, Jones Gulch, and a tributary to Jessups Gulch. The Rays Gulch, Jones Gulch, and Jessups Gulch sites are above fish bearing range. The Cecil Creek, St. Claire Creek, lower Methodist Creek site, and Crawford Creek site are within anadromous range. All the anadromous fish range has steelhead, however only Methodist Creek has confirmed coho salmon utilization and possible Chinook salmon utilization. While there is potential for direct effects to SONCC coho at the lower Methodist Creek site, such effects are unlikely with the use of National Marine Fisheries Service *Water Drafting Specifications* (USDC NMFS 2001). The unnamed tributary on Cecil Creek is small and has no confirmed fish species present. However this tributary may have a resident fishery down low where the drafting site is located. All drafting would be done in accordance with the *Water Drafting Specifications* in anadromous fish bearing streams. These specifications would prevent adverse effects on flows, so there would be no adverse effects on coho and Chinook salmon or steelhead or their habitats from water drafting.

Indirect

Either Action Alternative would have a short-term negligible effect on runoff in the individual fourteen 7th field watersheds and two 5th field watersheds; refer to Water Quality Section. Although 5 7th fields would show an increase in their ERA/TOC risk ratios with Alternative 2 and four with Alternative 3, it would be a negligible increase of 0.01. The current risk ratios of these 7th fields are well below the inference point of 1.0.

Cumulative

The cumulative effects on Peak/Base Flow would be beneficial with either Action Alternative. With Yoakumville, Summerville, and the road decommissioning in either Action Alternative, ERAs would be reduced.

5th and 4th Field Effects

No effects to anadromous fish, their habitat, SONCC Critical Habitat, or Essential Fish Habitat are expected in the Mainstem Salmon River, the 5th field watershed below the Forks of Salmon. This is because project effects would become indistinguishable from impacts occurring in the absence of the either of the Action Alternative, due to the magnitude of stream power and flow once the North Fork and South Fork merge. Changes would be insignificant at the Salmon River 4th field Sub Basin scale as discussed in the Water Quality Section. Only 875 acres in Alternative 2 or 691 acres in Alternative 3 within the 480,435-acre 4th-field Sub Basin (0.18% or 0.14%) would have any management activities.

ACS

All information included in the EIS and supporting documents was available for this discussion of ACSOs. Heavy reliance was placed on the information in the Geology, Soil Productivity, Water Quality, Riparian Reserve, and Fisheries Sections, especially the information regarding multiple scales. **Table 18** provides a discussion of how alternatives would contribute to maintaining or restoring the 5th-field watershed over the long term. Response 64 in Appendix F includes a discussion of the relationship of projects to ACSOs.

Table 18. Consistency with Aquatic Conservation Strategy Objectives

Aquatic Conservation Strategy Objective	No Action Alternative	Alternatives 2 and 3
1) Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.	There would be no additional effects than those already occurring to affect distribution, diversity, and complexity of watershed and landscape features.	No adverse affects are anticipated with either Alternative 2 or 3. Thinning in RR would make riparian vegetation more resilient to wildfire, disease, and insect attack. It would help trees achieve a larger size sooner. Under normal weather patterns, no adverse effects are anticipated from sediment production. All habitat indicators would be maintained.
2) Maintain and restore spatial and temporal connectivity within and between watersheds.	Currently spatial and temporal connectivity within and between watersheds exists and would be maintained.	Neither Alternative 2 nor 3 would affect current spatial and temporal connectivity with and between watersheds for aquatic dependent species. This indicator would be maintained.
3) Maintain and restore the physical integrity of the aquatic system, including shorelines,	Current condition would be maintained until the next catastrophic event.	Either Alternative 2 or 3 would have negligible to no effect on the physical integrity of the aquatic system. Model results displayed little change from current

Table 18. Consistency with Aquatic Conservation Strategy Objectives		
Aquatic Conservation Strategy Objective	**No Action Alternative**	**Alternatives 2 and 3**
banks, and bottom configurations.		conditions. Implementation of Standards and Guidelines, Project Design Standards, Resource Protection Measures, and BMPs minimize effects to negligible. All indicators would be maintained.
4) Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.	Current condition would be maintained until the next catastrophic event.	Either Alternative 2 or 3 would have negligible to no effect on the water quality of the aquatic system. Model results displayed little change from current conditions. Implementation of Standards and Guidelines, Project Design Standards, Resource Protection Measures, and BMPs minimize effects to negligible. All indicators would be maintained.
5) Maintain and restore the sediment regime under which aquatic ecosystems evolved.	Implementation of Yoakumville Roads would reduce current chronic sedimentation in the Lower South Fork Salmon for beneficial effects.	Either Alternative 2 or 3 would have negligible effect on the sediment regime. Model results displayed little change from current conditions. Implementation of Standards and Guidelines, Project Design Standards, Resource Protection Measures, and BMPs minimize effects from the action to negligible. All indicators relating to the sediment regime would be maintained.
6) Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats, and to retain patterns of sediment, nutrient, and wood routing.	Current conditions would be maintained until the next catastrophic event.	There would be a short-term negligible effect on peak flow from either Alternative 2 or 3 in the individual affected 7th and 5th field watersheds. All indicators related to instream flows would be maintained. No long-term effects on peak flow are expected in the individual 7th and 5th field watersheds.
7) Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.	Meadows and wetlands will continue to function as they currently are.	Neither Alternative 2 nor 3 would affect any meadows or wetlands.
8) Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands.	Species composition and structural diversity in riparian areas and wetlands would continue their current progression.	With Alternative 2, trees in treated Hydrologic RRs would grow faster reaching recruitment size sooner. The trees would be more resilient to insect attack, disease, and wildfire, increasing the probability of them becoming large woody debris. Using helicopter yarding to thin commercial trees would minimize damage to the remaining trees. Alternative 3 would be similar to Alternative 1. All indicators relating to RRs would be maintained in either Alternative 2 or 3.
9) Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.	The current distribution of riparian-dependent native plants, invertebrates, and vertebrates would remain.	Either Alternative 2 or 3 would have no to negligible effect on the current distribution of riparian-dependent native plants, invertebrates, or vertebrates. With Alternative 2, the treated Hydrologic RRs would be more resilient to insect attack, disease, and wildfire, increasing the probability of the riparian-dependent species distribution staying intact. Resource Protection Measures would be applied to minimize the potential of introducing noxious plants and animals that may impact species distribution with either Alternative. The Action Alternatives have a low risk of spreading and/or introducing noxious weeds to the area.

Summary

Either Action Alternative would have a negligible effect on fisheries habitat, based on the effects identified for the habitat indicators and ACSOs, as discussed above and in the supporting documents. Endangered Species Act determinations are “May Affect and is Not Likely to Adversely Affect” SONCC coho salmon, SONCC coho salmon Critical Habitat, and “not adversely affect” for Chinook and coho salmon Essential Fish Habitat. Either Action Alternative may affect individuals but is not likely to trend towards Federal listing or loss of viability of Klamath Mountain Province steelhead or Upper Klamath-Trinity Chinook salmon. A Biological Assessment/Evaluation has been prepared for anadromous fish species and consultation with NOAA Fish was completed on receipt of their letter of concurrence dated April 5, 2004.

Riparian Reserves

Affected Environment

RRs include stream courses, springs, wetlands, and unstable areas. They are identified in the *Forest Plan* in Standard and Guideline MA10-2. Standards and guidelines in the *Forest Plan* and the NW ROD direct that vegetation in RRs be managed to enhance slope stability.

Except for the portion of Hydrologic RR immediately adjacent to stream courses, which has riparian vegetation in the larger RRs, the vegetation in RRs is similar to that in the surrounding Matrix portion of the stands, as described in the Vegetation Section. Many of these areas support a high stocking density of conifers and hardwoods, which has led to severe inter-tree competition for limited resources needed for growth and survival. This high density causes stress, susceptibility to insect and disease infestation, and mortality. The desired condition for RRs, as described in more detail in the Vegetation Section, is for healthy, vigorous vegetation with good root systems that is resistant to stand-replacing fires.

Fire frequency in RRs is likely similar to that in the surrounding Matrix portion of the stands with the exception of Hydrologic RRs for perennial streams, which have a lower frequency (Skinner 2002a); refer to Fire and Fuels Section for a discussion of fire history in this area.

Riparian structure and condition affect water resources in terms of channel stability and water quality. Bank conditions, large wood component for sediment storage, riparian vegetation for sediment filtering, and stand structure for shade, are all riparian features that influence and regulate water quality.

Streams within the Meteor project area 7th field watersheds were scoured during the 1964 flood, burned in 1977 and 1987, and again subjected to flood effects in 1997. Despite this history, recruitment of large woody debris in the smaller tributaries is occurring. In several of the 7th field watersheds, County and Forest Service roads are within the Hydrologic RR (340 feet) and in several intermittent stretches within one tree height of the stream, which is the distance where large woody debris can be recruited to the stream. Along the North Fork Salmon, South Fork Salmon, and the East Fork of the South Fork Salmon, the County Road parallels the stream. Eddy Gulch, Crawford Creek, Cecil Creek, and Methodist Creek also have roads paralleling the stream within the Hydrologic RR of 340 feet in the lower portions of the streams. Aerial photos show evidence that the road may interfere with recruitment on the North and South Fork Salmon, where the vegetation is very scarce naturally. South and west aspects appear to have a significantly lower vegetation density than north or east aspects. A large portion of the two County Roads along the two main forks lie on the north side of the river on south and southwest facing slopes.

Fire, in either 1977 and/or 1987, burned through the St. Claire, Cody-Jennings, Methodist Creek, Negro-Hotelling, East Fork Knownothing, and Kanaka-Olsen drainages, thereby reducing large woody debris levels and trees available for recruitment in their headwater areas.

Floodplain connectivity exists for all 7th field and 5th field watersheds and they are considered to be functioning properly. Although the main South Fork Salmon that transverses through the Rays-Gibson 7th field watershed may be adjusting its channel, the influx of bedload is

coming out of the wilderness and is therefore considered within the natural range of variability. Although channel adjustment is occurring, floodplain connectivity is maintained.

During the summer of 2002, the Geological RR and part of a Hydrologic RR burned in a small man-caused wildfire in a portion of Unit 137. The burned area is approximately 5 acres in size. The portion of the fire in the Hydrologic RR burned with a moderate to low burn intensity, but the 1-acre portion in the Geologic RR, which is on an active slump, burned at a high intensity. Loss of tree cover as a result of the fire will increase the likelihood of movement on this landslide in the future.

Many of the ACSOs in the *Forest Plan* are pertinent to management of RRs; refer to page 4-6 of the Forest Plan. Hydrologic RRs are an important feature of connectivity within and between watersheds. These network connections provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species. Healthy Hydrologic RRs are essential for providing habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species. The species composition and structural diversity of plant communities in the riparian zones of Hydrologic RRs are important for providing summer and winter thermal regulation, nutrient filtering, minimizing surface erosion delivered to streams, as well as for supplying coarse woody debris sufficient to sustain physical complexity and stability. Maintaining the physical integrity of banks and bottom configurations is important to the aquatic system as a whole. Geologic RRs are important for maintaining stability in unstable areas.

Methodology

A significant issue was identified that logging in RRs could cause erosion and result in sedimentation in streams. The key indicators used to analyze this issue are as follows:

- A discussion of increased landslide risk.
- A discussion of the likelihood of large woody material reaching streams.
- A discussion of floodplain connectivity.

The Hydrology, Geology, and Fisheries Reports contain supporting data for the discussions in this section.

Environmental Consequences

Alternative 1

With the No Action alternative, no new short-term management disturbances would take place as a result of this proposal. RRs would develop as described in the Vegetation Section, including poor growth rates, high mortality, and heavy levels of insect and disease. Tree mortality would cause fuel loading to increase over time, resulting in increased risks of high intensity, stand-replacing fire as described in the Fire and Fuels Section.

With no treatment in the Hydrologic RRs in Units 77, 123, and 134, stand deterioration and/or replacement in these areas through wildfire would have a direct effect on water quality by decreasing shade and the buffering/filtering capability of the RRs for upslope disturbances. Within Geologic RRs, stand-replacement may result in the activation of landslide features when the root support and transpiration function of trees are lost. In the 1-acre of the Geologic RR in Unit 137 that burned at a high intensity, the active slump would remain at an elevated risk of movement on this landslide until the area revegetates naturally.

There would be no change in the rates of large woody debris recruitment to streams or in channel connectivity.

Alternative 2

The RRs would be consistent with the interim widths identified in Standard and Guideline MA 10-2 of the *Forest Plan*. They are 340 feet on each side of fish-bearing streams, 170 feet on each side of permanently flowing non-fish-bearing streams and intermittent streams (with annual scour or deposition), and include the extent of the feature for wetlands, waterbodies, and unstable features.

RRs would be flagged on the ground and/or designated on sale area maps, and avoided during harvesting with the exception of those selected for the forest health prescription discussed below. With the exception of Unit 77, no tractor yarding equipment would be allowed within a Hydrologic RR buffer or the feature it protects. Cable yarding corridors would not be placed through RRs, unless a field assessment by an Earth Scientist and Logging Systems Specialist determines that this can be accomplished without damage to residual trees.

A forest health prescription would be applied to Hydrologic RRs in 3 units (Units 77, 123, 134) and Geologic RRs in 14 units (Units 68, 85, 86, 88, 119, 120, 121, 124, 132, 133, 137, 141, 152, 256). Tree removal from Geologic RRs would occur in toe zones and active landslides. The objective in the selected RRs would be to maintain or improve the health and growth of the vegetation. Removal of trees from RR areas would occur only where this can be done with minimal ground disturbance, and residual trees can be protected. Trees in the lower crown classes and some scattered sick and dying trees would be removed from RRs. All dominant and codominant trees would be left, unless they were sick or dying. The trees that would be removed are small understory trees, the trees in the lower crown classes in dense stands, and diseased trees with a life expectancy of less than one year. No trees would be marked which would likely enter the stream. These would be left on site to provide large wood in the future when they fall naturally, or are taken down by landslides. The treatments in Hydrologic RRs were designed on a site-specific basis in order to achieve the long and short-term objectives for large woody material, shade, and channel conditions.

The forest health prescription would maintain vigorous native vegetation, providing root support and actively transpiring soil water in the long-term. The short-term reductions in root support or transpiration capability immediately after logging would be minimized. The largest trees in the dominant and codominant crown classes would be maintained, which would provide a mature structure to the landscape. The RRs would be comprised of a variety of species, which would help reduce the spread of insects and diseases that are adapted to a single species. The residual trees would have fewer incidences of insect and disease, less mortality, and a less rapid buildup of fuels. The decreased fuel buildup along with treatment of fuels would lead to a reduced chance of catastrophic fire destroying the vegetation. The decreased stand density would allow for the maintenance of shade intolerant species such as hardwoods. The thinning would improve stand vigor in the long term, and reduce fire hazard.

All tree removal from RRs would use helicopter yarding, with the exception of the Hydrologic RR in Unit 77, which would be tractor and cable yarded. Helicopter yarding entails minimal ground disturbance and minimal disturbance to residual vegetation, so no

direct effects to stream channels are expected. Thinning reduces the density of the vegetation, but does not create openings in the tree canopy, so only a minor reduction in evaporation and transpiration rates in the short term are anticipated. Any indirect effects of increases in runoff would be short term and minor. No degradation of water quality is anticipated.

The Hydrologic RR proposed for treatment in Unit 77 is within a 340-foot wide RR along the East Fork of the South Fork Salmon River. The forest health prescription would only be applied to the portion of the RR that is between the County Road and Road 39N26, away from the riparian area. With the County Road to catch any soil that might be mobilized, it is very unlikely that any material would reach the stream as discussed in the Water Quality and Fisheries Sections, so no degradation of water quality is anticipated.

Precommercial thinning, release, and prescribed fire would occur within the RRs. Project design standards specifically designed for these types of actions would be implemented (USDA FS 2001a).

When underburning in all RRs, those treated and those not treated by the forest health prescription, fire would be backed into the RRs and only in conditions that result in an overall low burn intensity. No ignition would be permitted within the RRs. Unstable lands, particularly active landslides as well as inner gorges and toe zones, would be identified and evaluated during preparation of the burn plan, and the prescription would be adapted where necessary to achieve site specific objectives for Geologic RRs.

Fire-killed trees on the active landslide in Unit 137 would be salvage logged by helicopter. Those within the Hydrologic RR buffer along the South Fork Salmon that burned at a low to moderate intensity would not be logged. The logging slash would be hand piled and burned. The active slump would remain at an elevated risk of movement on this landslide until the area is revegetated with the trees; planting the area should accelerate this recovery by several years as compared to the natural regeneration in Alternative 1.

Direct effects would include small, scattered openings left where trees are removed, and piles of associated slash. Thinning in Geologic RRs would have an indirect effect of a very small to negligible increase in landslide risk due to a short-term reduction in root support and evapotranspiration. In the longer term (10 to 20 years), the increased vigor of the residual trees would have a positive effect.

There would be negligible direct effects to both Hydrologic and Geologic RRs. Tree vigor would increase due to the additional water and nutrients available to the remaining dominant overstory trees thereby insuring future stability of Geologic RR. In addition, large trees would be available sooner for recruitment to the streams within the two intermittent Hydrologic RR; refer to discussions in Fisheries Section on Large Woody Debris and Sediment/Turbidity habitat indicators, including discussions of pool frequency and pool quality. The RRs would also be more resilient to wildfire due to the fuels reduction activities.

All streams within the 7th fields potentially affected by the proposal are connected to their bankfull floodplains. These streams, the North Fork Salmon River and South Fork Salmon River, are relatively confined. There are instances where roads are within the flood terraces (those areas above bankfull) that restrict access, however these are isolated and very short stream reaches. Alternative 2 would not affect connectivity as roads within the floodplain of streams would not be removed nor would new ones be constructed. The harvesting within the three Hydrologic RRs would not affect floodplain connectivity, as a buffer of 20 feet or more would protect the channel form. No activity would occur within a channel. The harvesting in

the Hydrologic RRs of Units 123 and 134 would use helicopters. The RR in Unit 77 would be tractor and cable yarded; the County Road would be between harvesting activities and the stream. As no equipment would be allowed in Hydrologic RRs and the activity is one or more tree heights from the East Fork of the South Fork Salmon River, no channel alteration would occur.

No cumulative effects on channel form or floodplain connectivity would occur as all projects are designed and implemented to minimize effects. Past roads projects, such as Summerville and Yoakumville, reduce chronic sediment delivery from roads, thereby restoring channel function.

Alternative 3

RRs would be flagged on the ground and/or designated on sale area maps, and avoided during harvesting, using Standard and Guideline MA 10-2 interim widths. No tractor yarding equipment would be allowed within a Hydrologic RR buffer or the feature it protects. Cable yarding corridors would not be placed through RRs, unless a field assessment by an Earth Scientist and Logging Systems Specialist determines that this can be accomplished without damage to residual trees.

Precommercial thinning, release, and prescribed fire would be permitted within the RRs under the same conditions described for Alternative 2.

RRs would continue to develop as described in the Vegetation Section, including poor growth rates, high mortality, and heavy levels of insect and disease. Tree mortality would cause fuel loading to increase over time, resulting in increased risks of stand-replacing fire as described in the Fire and Fuels Section. Some existing fuels would be consumed by allowing fire to back into the RRs in the units proposed for underburning; this would reduce fire risk in these areas until future mortality increased fuel loading. In the 1-acre area in the Geologic RR in Unit 137 that burned at a high intensity, the area would be planted as best it could given the material on the ground and the material that would continue to come down from trees killed in the burn of 2002. The active slump would remain at an elevated risk of movement on this landslide until the planted trees revegetate the area. Revegetation would likely be more rapid than with Alternative 1, but take slightly longer than with Alternative 2.

There would be no change to recruitment of large woody debris in streams or channel connectivity with Alternative 3.

No cumulative effects on channel form or floodplain connectivity would occur as all projects are designed and implemented to minimize effects. Past roads projects, such as Summerville and Yoakumville, reduce chronic sediment delivery from roads, thereby restoring channel function.

Wildlife

Affected Environment

Pertinent information necessary for understanding the effects analysis is provided below for the special interest species that have habitat in the analysis area and where there is the potential for effects to habitat components or individuals. Species of special interest include TES, S&M, and MIS. Species of special interest that do not occur in the project area or that are not affected by the project are not addressed.

Critical Northern Spotted Owl Habitat in the Matrix

Background Information on the Northern Spotted Owl

The assessment for the alternative selected in the NW ROD determined that there was an 80% or greater likelihood of providing sufficient habitat for a well-distributed population of NSOs on Federal lands over the next 100 years (FEMAT 1993). This will be met by the application of a network of Late-Successional Reserves (LSRs), including 100-acre LSRs, and standard and guidelines for Matrix lands. An assessment of the ability of LSRs to conserve and recover populations of NSOs within the Klamath Province, which focused largely on abundance and distribution of habitat within the LSRs, determined the four LSRs adjacent to the project area (Taylor, Eddy Gulch, Bowerman, and Little North Fork/Crapo) are providing sufficiently for NSOs, and hence concerns for owls are reduced on the surrounding Matrix lands.

The NSO is associated with mature and older mixed conifer and Douglas-fir forests. As of December 31, 2002, the Forest is estimated to have 540,6620 acres of suitable NSO habitat of which 293,565 acres are considered nesting/roosting habitat, while the remaining 247,097 acres are considered foraging habitat.[2] Twenty-seven percent or 144,876 acres occur on the Salmon River Ranger District with 46,498 acres within the analysis area, which consists of fourteen 7th field watersheds. Currently there are 21,601 acres of NSO nesting/roosting habitat, 24,897 acres of foraging habitat, and 12,336 acres of dispersal habitat in the analysis area.

There is high variability within individual forest stands in the Salmon River drainage. Stands can contain both high and moderate quality habitat in small patches in a mosaic within the context of a larger classified stand. Areas of non-habitat occur naturally throughout the watershed on south and west facing slopes where dry conditions and poor soils result in low vegetative cover and wider spacing between trees. These slopes may be used by NSOs for foraging and dispersal but are not regarded as suitable nesting/roosting habitat. Wildfires occurring over the past several decades have reduced the amount of suitable habitat in the analysis area. Wildfires in 1977 and 1987 and subsequent salvage logging have resulted in an area of roughly 11,000 acres that is dominated by early seral vegetation within the analysis area.

Connectivity (contiguous mature forest habitat across the landscape) and dispersal opportunities between the Salmon River NSO population and adjacent drainages may be limited by burned areas and by high, barren ridges that border the analysis area on three sides. It has been observed by Forsman and others (2002) that high elevation areas dominated

[2] These figures have been updated since the Wildlife BA was prepared.

by mixtures of subalpine forest and alpine tundra inhibit dispersal, but do not completely stop it. Terrain gaps, such as Etna Summit, would allow access to neighboring drainages. Maintaining dispersal habitat over at least 50% of the area (assessed by watershed) between large blocks of habitat in reserves (LSRs and Wilderness) is expected to provide adequate connectivity across the landscape for species such as NSOs (50-11-40 principle from Thomas and others 1990). In addition to maintaining 50% of the area in dispersal habitat, other reserved land allocations provide dispersal habitat, such as RRs, 100-acre LSRs, Sensitive Species reserves, and scenery corridors. Mature forest, also described as dispersal habitat, occurs over 65% of the analysis area. All of the 7th field watersheds in the analysis area are over 50% dispersal habitat with the exception of Negro-Hotelling, which was heavily impacted by the Hog Fire in 1977 and the Glasgow Fire in 1987. Overall, the analysis area provides an adequate level of connectivity for NSOs dispersing through the landscape between LSRs and Wilderness.

NSO surveys have been conducted in the analysis area since 1980 in support of various management activities. Even though the majority of habitat outside of remote wilderness has been repeatedly surveyed, new owl locations have been discovered as recently as 1997. Based on historic and recent surveys, there are a total of 46 known NSO activity centers on the Salmon River District. Of the 46, nine home ranges (1.3 mile circles around known activity centers) overlap the project area. Four of the activity centers are centered within large LSRs (Eddy and Bowerman), two are centered within 100-acre LSRs, and three are centered within Matrix land (located since January, 1994).

Critical Habitat for the Northern Spotted Owl

Critical Habitat for NSOs was designated by the FWS on January 15, 1992. Designation of Critical Habitat identified lands that may be necessary for the conservation and recovery of NSOs. In April of 1994, the decision was made in the NW ROD to adopt Alternative 9 of the FSEIS (USDA FS and USDI BLM 1994), which included designating LSRs to maintain functional, interactive, late-successional and old-growth forest ecosystems for NSOs and other late-successional forest related species. The Biological Opinion for Alternative 9 of the NW ROD FSEIS (USDA FS and USDI BLM 1994a) concluded that Alternative 9 will accomplish or exceed the standards expected for the Federal contribution to recovery of the NSO and assurance of adequate habitat for its reproduction and dispersal. At that time, the FWS intended to re-examine the need for Critical Habitat given the adoption of Alternative 9 and its system of reserves. The FWS has yet to conduct that analysis, therefore, the Forest Service continues to manage designated Critical Habitat for NSOs. LSRs on the Forest overlap with designated Critical Habitat by over 90%. Critical Habitat that occurs outside of large LSRs is called “Critical Habitat in the Matrix.“ To address Critical Habitat in the Matrix on the Forest, the interagency (Forest and FWS) Klamath Level 1 Consultation Team conducted an assessment of the importance of individual pieces of Critical Habitat in the Matrix to the functioning of associated LSRs and for the recovery of NSOs. The Klamath Level 1 Team Assessment and Interim Recommendations for Critical Habitat in the Matrix on the Klamath National Forest, September 8, 2000 is incorporated by reference and on file in the project record.

Critical Habitat on the Salmon River District occurs mostly within LSRs, with some overlap into the adjacent Matrix. Within the analysis area, Critical Habitat is located within the Eddy Gulch and Little North Fork LSRs and extends outside the boundaries of the two LSRs in Jessups Gulch, Crawford Creek, and Shadow Creek. More specifically, Critical Habitat Unit

(CHU) CA-22 extends to the south and west of the Little North Fork LSR, and CHU CA-25 extends north into Jessups Gulch, and south into Crawford and Shadow Creeks from Eddy Gulch LSR (refer to Figure 3). There is a high degree of overlap between the CHUs and the associated LSRs on the Salmon River District. CHU CA-25 overlaps 93% with Eddy Gulch LSR and other reserved land allocations as displayed below in **Table 19**, which displays the acres of NSO Habitat in CA-25 by Land Allocation. This information was taken from the Klamath Forestwide LSR Assessment (USDA FS 1999a).

Table 19. Acres of NSO Habitat in CA-25 by Land Allocation

Land Allocation	Nesting/ Roosting Habitat	Foraging Habitat	Other	Total	Percent
LSR	11,910	12,010	28,330	52,250	91%
Other Reserves	390	290	510	1,190	2%
Matrix	920	900	2,310	4,130	7%
Total	13,220	13,200	31,150	57,570	

The project area includes 37 acres of Critical Habitat in the Matrix in the small southern portion of CHU-25, near Crawford Creek (refer to Figure 3). The area has a mosaic of stand characteristics. The landscape to the south is comprised primarily of open stands of pine, hardwoods, and brush. The habitat within the project area (potential Units 82, 83, and 84) was field verified by Marc Williams, Forest Service, and Jan Johnson, FWS, (Williams and Johnson, personal communication with Sue Stresser, 2003) and, although the habitat database identified them as suitable nesting and roosting habitat for NSOs, they were found to provide only foraging or dispersal habitat. Two of the stands can be characterized as containing scattered large, dominant conifers with a dense under-story of small sized hardwoods and conifers ranging from 8 to 18 inches in diameter. The third unit is a uniform stand of mid-mature conifers with high canopy closure. None of the proposed units contain the structural diversity typically found in stands used by NSO for nesting and roosting. The Forestwide analysis of CHU in the Matrix, completed by the Klamath Level 1 Consultation Team, concluded that the Matrix portion of CHU CA-25 (the southern piece) is negligible in size, amount, and spatial distribution of nesting/roosting habitat. The Level 1 Team rated the piece as not critical to the functioning of the associated Eddy Gulch CHU/LSR and recommended fuel reduction treatments to protect the large CHU/LSR from stand-replacing fire. The Klamath Forest-wide LSR Assessment concluded that LSRs associated with CA-25 meet the intent of the original Critical Habitat designation due to high degree of overlap between Critical Habitat and LSRs, and due to close proximity of LSRs (within 1 mile of each other).

The ability of the Eddy Gulch LSR to support the biological functions intended by designation of CHU CA-25 has already been determined. The LSR network on the Forest was assessed in the Forest-wide LSR Assessment (USDA FS 1999a). The Eddy Gulch LSR, which overlaps with CHU CA-25, was described as "performing the intended function of CA-25". An interagency team of Biologists (USFS, USFWS, and BLM) in the Klamath Province also assessed the LSR network (LSR Network Assessment, in press) and concluded that the Eddy Gulch LSR "was sufficient in providing for NSOs". In addition, as stated above, The Klamath Level 1 Consultation Team assessed the Critical Habitat in the Matrix surrounding the Eddy Gulch LSR and concluded that Critical Habitat in the Matrix, that may be affected by the Meteor Project, is not critical to the function of the LSR/CHU.

In addition, the FWS Biological Opinion for the Knob Timber Sale (USDI FWS 2002), which is located in the same area, documented the conclusion that with the implementation of Knob Timber Sale, the …"CHUs where harvest is proposed will continue to provide habitat for reproductively capable owls by retaining large amounts of suitable habitat, and will maintain connectivity between CHUs on the local scale by continuing to provide dispersal habitat. Also, the amount of NRF (nesting/roosting/foraging) habitat removed from CHUs within the KNF (Klamath National Forest) is not significant enough to alter the stability of the CHU network within the California Klamath Province. Therefore, the proposed action will not preclude the ability of CHUs to maintain connectivity between the physiographic provinces and thus will not compromise the function of critical habitat in the conservation and recovery of the NSO."

Threatened, Endangered and Sensitive Wildlife Species

Northern Spotted Owls are covered in the previous section.

Bald Eagle

There are no known bald eagle nest sites on the Salmon River District. Nesting of bald eagles has never been recorded within the analysis area. The two nearest nest sites are located along the Klamath River more than 25 miles from the area. Although bald eagles have not been documented nesting on the Salmon River, they have been seen foraging on the main River during the fall and winter. The area provides transitory habitat for this species during the fall and winter seasonal migrations. It is expected that fall salmon runs and movement of waterfowl attract migrating eagles into the area.

Northern Goshawks

Goshawks on the Salmon River District typically nest in mature stands of mixed conifer and true fir forest. Results of radio telemetry studies on goshawks in California and elsewhere in the west, suggest that foraging goshawks avoid dense young forest stands and brush, and concentrate their foraging in more open, mature stands, forest openings and meadows. Habitat for goshawks in the analysis area is widespread and abundant. Goshawks and NSOs use very similar habitat in the Salmon River area. Goshawk sightings have been reported on the Salmon River District for many years. These sightings are a result of both incidental observations by forest workers and systematic protocol surveys. Fifteen goshawk territories have been located on the District, 5 of which are located in proximity to the project area.

Wolverine

Wolverines have been observed in Douglas fir and mixed conifer habitats. Habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness, rather than in terms of particular types of topography or plant associations. The analysis area provides over 58,000 acres of mid-mature, mature, and late-successional forest habitat potentially suitable for denning, resting, and wintering by wolverines, using NSO habitat as a proxy. Approximately 34% of the suitable forest habitat is located within more remote areas such as wilderness and LSRs. In addition, there are over 36,000 acres of brush, oak, and early seral habitat (especially areas burned in the fires of 1977 and 1987) suitable for deer and elk, wolverine prey species. Sightings of wolverines have occurred within the Marble Mountain Wilderness to the north, but none within the analysis area. Due to the large home ranges used by wolverines and the proximity of remote, rugged habitats in wilderness, it is expected that wolverines may occur in the analysis area, either as part of individual home ranges or dispersing through the area.

Pacific Fisher

Habitat for the Pacific fisher is characterized as multi-storied Douglas fir, conifer, hardwood, and mixed conifer vegetation types with a minimum tree size of 24 inches diameter at breast height and a canopy closure of 80%. Mature and late-successional, mixed conifer habitats used by fisher are similar to habitats used by NSOs. On the Forest, fisher observations have generally been recorded below 5,000 feet. There have been numerous incidental sightings within the Salmon River drainage, although none within the project area. It is expected that fisher occur within the analysis area.

Pallid Bat

Throughout California the pallid bat is usually found in low to middle elevation habitats below 6000 feet. Day roosts may vary but are commonly found in rock crevices, tree hollows, mines, caves and a variety of human-made structures. Cavities in broken branches of black oak are very important and there is a strong association with black oak for roosting.

No identified winter or brooding roost sites for pallid bats are known within the project area. Habitat components including human made structures, large snags, and hollows in live trees occur within or near the project area.

Prophysaon coeruleum, Trilobopsis tehamana, and Plethodon stormi
The project area is not within the range of these three species.

Survey and Manage Animal Species

Since the Draft EIS was circulated to the public, the Record of Decision To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines was approved on March 22, 2004, and the decision became effective on April 21, 2004. This Forest Plan amendment removes the Survey and Manage Mitigation Measure Standards and Guidelines (USDA FS, USDI BLM 2004c). The Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines identified Survey and Manage animal species that met the criteria for inclusion on the Regional Forester's Sensitive Species List (USDA FS and USDI BLM 2004a, Table 2-5). The Regional Forester issued a letter on April 26, 2004, and an amendment on May 12, 2004, designating additional species as Region 5 Sensitive. Three of the animal species were added for the Forest and are discussed in the previous section. A supplemental Biological Evaluation of the effects of the Meteor project on the animal species added to the Region 5 Sensitive Species List was completed on June 4, 2004.

Management Indicator Species

Forestwide Standard and Guideline 8-21 of the *Forest Plan* requires an analysis of project effects on the habitat of Management Indicator Species. Hardwood, River/Stream, and Snag species associations were selected for analysis, based on the presence of habitat that may be affected by either of the Action Alternatives. Marsh/Lake/Pond, Grassland/Shrub-Steppe, and Mature Ponderosa Pine Species Associations were not analyzed, as there is no habitat that would be directly or indirectly affected by the Action Alternatives.

Methodology

One significant issue relating to wildlife was identified for this EIS. Timber harvest and underburning could reduce the quantity and quality of habitat providing for NSO nesting, roosting, foraging, and dispersal activities in Critical Habitat in the Matrix. The key indicator used to analyze this issue is as follows:

- Change in quality and quantity of nesting, roosting, foraging and dispersal habitat within Critical Habitat.

It has already been determined that the loss of suitable habitat within Critical Habitat in the Matrix surrounding CHU CA-25 would not affect the CHU/LSR's ability to function, however, site-specific effects to Critical Habitat are assessed in this analysis.

A discussion of the effects to special interest wildlife species to demonstrate consistency with law, regulation, and policy is also included in this section. None of these potential effects were identified as significant issues for this proposal. The analysis area for all wildlife species includes fourteen 7th field watersheds within the Salmon River drainage.

Supporting information for the discussions included in the Wildlife Section of this EIS can be found in the Biological Assessment/ Evaluation for Wildlife Species for the Meteor Project (Wildlife BA) dated April 14, 2003 and its Supplement dated June 4, 2004. The Wildlife BA and its supplement address the direct, indirect and cumulative effects of the project on species listed as Threatened, Endangered, or Sensitive. It includes baseline information, including survey data and sightings for each listed species. It documents the effects of harvesting, road decommissioning, fuel treatment, habitat improvement, gopher baiting, and cultural treatments. Meteor Project EIS Wildlife Input by Susan Stresser, May 6, 2003, provides resource protection measures and analysis of Critical Habitat in the Matrix, and discussions of non-significant issues. The Biological Assessment for Wildlife Species for Garden Gulch Fuels Reduction, by Karen West, September 25, 2003, contains an analysis of the Garden Gulch Fuels Reduction Project (Garden Gulch Wildlife BA). The Fork Hazard Tree Abatement Project Wildlife Tiering Form by Fred Schmalenberger, April 16, 2004, contains information and project design standards for the project. Additional supporting information can be found in the Management Indicator Species (MIS) Project Level Assessment, Parts I and II. This assessment documents the process used to determine which Management Indicator Species should be analyzed. It includes an environmental baseline and documents the analysis of direct, indirect, and cumulative effects on the Management Indicator Species in the selected associations. The Fauna Survey and Manage Specialist's Report by Karen West and Fred Schmalenberger documents the evaluation of compliance with current management direction for S&M species and provides the rationale for the management recommendations. These documents are on file in the project record and incorporated by reference.

Environmental Consequences

Alternative 1

Critical Northern Spotted Owl Habitat in the Matrix

With the no action alternative, 0 acres of NSO Critical Habitat would be affected by timber harvest and associated fuels treatments. Stands within Units 82, 83 and 84 would provide foraging and dispersal habitat for NSOs. High stand densities, particularly in Unit 84, would continue to experience poor growth rates, high mortality, and insect and disease problems. Mortality would cause continued fuel buildups, increasing the risk that a fire in these stands would be stand-replacing, threatening the adjacent LSR. Drought conditions over the past few years have also contributed to high mortality levels. Large amounts of dead trees provide breeding areas for bark beetles, which leads to additional high mortality in the stands and potential loss of foraging/dispersal habitat.

Without treatment the stands proposed for regeneration harvest would die out, infecting surrounding stands with insects or diseases and reducing available foraging/dispersal habitat for NSO. These stands would not provide good forest cover, the dead trees would lead to an increase in the amount of fuels and associated fire danger, and insect and disease vectors would remain to infect the succeeding stand. These stands would eventually re-establish themselves as a younger successional stage consisting of brush, hardwoods, heavy fuels, and a scattered mix of diseased conifers.

As no acres of Critical Habitat would be affected with Alternative 1, there would be no contribution to cumulative effects. There would be no change to habitat connectivity with the No Action Alternative, unless intense fire, catastrophic insect infestation, or widespread disease destroyed substantial amounts of mature forest.

Threatened, Endangered and Sensitive Wildlife Species

Vegetation in the project area would continue developing, unless stand-replacing fire, widespread insect infestation, or widespread disease outbreaks occurred in the area. Stands within the CHU in the Matrix as well as stands containing nesting habitat for NSO and goshawk would remain suitable. In the short term, these stands would continue to have high canopy closure and to increase in decadence. The amount and quality of habitat would be similar to the current condition with slight increases occurring over time. In the next 50 to 100 years, stands would mature and pockets of nesting/roosting habitat would develop. In the long term, these stands would eventually begin to die out, losing canopy closure and suitability as nesting habitat. Stands containing foraging habitat would remain so in the short term. In the long term, foraging stands would become too dense for foraging, but would eventually develop into nesting habitat. Habitat for wolverine, fisher, and pallid bats would follow a similar progression, barring catastrophic events such as intense fires, insect infestation, or widespread disease.

Management Indicator Species

With the No Action Alternative, there would likely be no change in the amount or quality of hardwood habitat or in the rate of recruitment or quality of snags and coarse woody debris in the project area, barring catastrophic events such as intense fires, insect infestation, or widespread disease. There would be no direct or indirect effect on Rainbow trout or steelhead habitat. There would be no direct or indirect effect on aquatic habitat elements associated with tailed frogs, Cascades frogs, or American dippers. There would be no change in the

amount or quality of riparian vegetation in the project area. Watershed improvement and any associated habitat improvement would occur very slowly over a long period of time.

Alternatives 2 and 3

Alternatives 2 and 3 would have the same effect on wildlife habitat for all species of concern, so are discussed together.

Critical Northern Spotted Owl Habitat in the Matrix

NSO Critical Habitat within large LSRs in the landscape would not be affected by either of the Action Alternatives. A portion of CHU CA-25 in the Matrix, the southern piece associated with Crawford Cree, would be affected by timber harvest in Units 82, 83, and 84. This 37-acre portion of Critical Habitat, including 31 acres of foraging/dispersal habitat, would be harvested using three prescriptions.

Thinning would reduce crown closure in Unit 83 from approximately 75% to 50% in the majority of the stand. The Group Selection prescription in Units 82 and 83 would create small patch openings scattered throughout the stand and totaling about 2 acres and 3 acres, respectively. Thinning would reduce crown closure in Unit 84 from approximately 95% to 65%. Thinning in Unit 84 may have long-term beneficial effects by creating a more vigorous, resistant stand. Group Selection in Units 82 and 83 would promote the growth and health of the stand by reducing competition and mortality. Healthy, more vigorous stands would be more sustainable as foraging and dispersal habitat for the long term. This portion of CA-25, including all three units, has been identified as important for dispersal and it would continue to fulfill the function of dispersal habitat post-harvest. No suitable nesting or roosting habitat would be removed. There would be a degradation of 26 acres of foraging/dispersal habitat and a loss of 5 acres of dispersal habitat in small patches. Overall, the stands would continue to provide dispersal and foraging habitat after harvest, so effects to the NSO would be negligible.

The piece of Critical Habitat in the Matrix, in which Units 82, 83 and 84 are located, is insignificant to the larger CHU protected within the Eddy Gulch LSR. It has been determined, through the Wildlife BA that the action alternatives are not likely to adversely affect Critical Habitat. Effects to the CHU/LSR and to NSOs are negligible.

Cumulative Effects

Upper South Fork and Glassups Timber Sales do not affect NSO Critical Habitat. Fork Hazard Tree, a foreseeable action, would not result in a measurable alteration of suitable habitat. Garden Gulch Fuels Reduction Project does not remove any suitable habitat. It may degrade 99 acres of habitat in the short term. Habitat degradation is intended to occur on up to 180 acres in the long term. Habitat within the matrix portion of CA-22 will be degraded, but this lobe of the Critical Habitat unit will still provide its intended function. There will be long-term benefits to NSO habitat from improved habitat resiliency. The Garden Gulch Fuels Reduction Project may affect, but it not likely to adversely affect NSO or its Critical Habitat (Garden Gulch Wildlife BA).

The Knob Timber Sale has six timber harvest units within three different pieces of Critical Habitat in the Matrix in the Salmon River Watershed (refer to Figure 3). Units 73, 74, and 75 are within CHU CA-22, which is associated with the Little North Fork LSR to the north of the Meteor analysis area. Units 86 and 252 are located on the north edge of CHU CA-25 associated with the Eddy Gulch LSR. Only Unit 85, located in the southern piece of Critical Habitat in the Matrix, is near the three Meteor Critical Habitat units in the Matrix.

The Knob units within the Little North Fork CHU CA-22 consist of 59 acres of group selection, thinning, and sanitation harvest. This harvest will remove some potential nest trees from these stands. Crown closure in the stands will be reduced from between 70 and 75% to about 60%. Group selection will reduce about 18% (or 11 acres), in small 2-acre patches, to 0% crown closure. Suitable NSO habitat will be diminished, but will remain suitable post project. This CHU was identified by the Klamath Level 1 Consultation Team as important for dispersal of owls between LSRs; it will continue to provide dispersal after harvest is complete. NSO nesting and roosting habitat occurs in this CHU and will be degraded, but still present, after harvest.

Knob units within the north piece of Eddy Gulch CHU CA-25 consist of 27 acres of group selection, thinning, and sanitation harvest. The area currently provides dispersal habitat and a small amount of moderate quality nesting/roosting habitat. Nine acres of moderate quality nesting/roosting habitat will be degraded to foraging and dispersal habitat.

Knob Unit 85 within the south piece of Eddy Gulch CHU CA-25 consists of 39 acres of group selection, thinning, and sanitation harvest. The stand currently provides 5 acres of moderate quality nesting/ roosting and 34 acres of foraging/dispersal habitat. After harvest the stand will no longer provide nesting and roosting habitat, but would continue to provide foraging and dispersal habitat.

Figure 3 displays the spatial arrangement of Knob Timber Sale and Meteor Project units within Critical Habitat. Knob Units 73, 74, and 75 are associated with a separate CHU, CA-22, and are located more than 11 miles from the Meteor units within Critical Habitat. The effects of timber harvest in those units, as described above, are removed from and will not impact CHU CA-25; therefore they are not cumulative with the effects of timber harvest in the Matrix associated with the Meteor action alternatives.

Knob Units 85, 86, and 252 combined with Units 82, 83, and 84 in either Alternative 2 or 3 of Meteor would reduce 14 acres of NSO nesting/roosting habitat to foraging/dispersal (Knob) and reduce 5 acres of dispersal habitat to non-habitat (Meteor). Affected acres are scattered throughout the stands in small 2 to 3 acre patches. All of the units would continue to provide NSO dispersal habitat upon project completion. Affected acres are located on the edge of the large CHU/LSR and represent less than 0.2% of the total CHU/LSR area. The effects of the Knob Timber Sale on Critical Habitat were determined to be “inconsequential” by the FWS in the Biological Opinion for that project (USDI FWS 2002). The additional reduction of 5 acres of dispersal habitat due to either of the Meteor alternatives would also be inconsequential to Critical Habitat; cumulative effects on the NSO would be inconsequential.

Threatened, Endangered, and Sensitive Wildlife Species

The Endangered Species Act requires that the Forest consult with the FWS to insure that any action carried out is not likely to jeopardize the continued existence of any Federally listed species or result in the destruction or adverse modification of critical habitat. Critical Habitat for the NSO is discussed in the previous section. The effects on listed species have been analyzed and consultation has been completed. The Endangered Species Act determination for Alternatives 2 and 3 is not likely to adversely affect NSOs or NSO Critical Habitat. The determination for bald eagles is no effect. The Letter of Concurrence from the FWS is dated June 6, 2003, concurs with these findings, is filed in the project record, and is incorporated by reference. The project is outside the range of marbled murrelets.

Forest Service Manual 2670.32 (USDA FS 1995d) requires a review of proposed activities as part of the NEPA process to determine the potential effect on Sensitive species. Neither Alternative 2 nor 3 would have an effect on peregrine falcons, great gray owls, willow flycatcher, American martens, Sierra Nevada red foxes, Townsend’s big-eared bat, Northwestern pond turtles, foothill yellow-legged frogs, Cascade frogs, or Southern torrent salamanders because habitat does not occur within the project area or the proposed activities would not affect existing habitat. Neither Alternative 2 nor 3 would have an effect on *Prophysaon coeruleum*, *Trilobopsis tehamana*, and *Plethodon stormi* because the project area is not within the species range. Supporting data for these and the following conclusions related to TES species can be found in the Wildlife BA and supplement.

Bald Eagles

There are no bald eagle nest sites within the analysis area, which includes the fourteen 7th field watersheds with proposed units in them, so neither of the action alternatives would affect nesting. Foraging habitat would not be affected, as only individual trees that do not have the structural requirements for perching habitat would be removed in the Units 77,119, 128, and 137, which are within ¼ mile of the South or North Fork Salmon.

Northern Spotted Owl

The proposed harvesting in either Alternative 2 or 3 would result in the removal of eight acres of NSO nesting/roosting habitat and 42 acres of foraging habitat, which is a minor reduction in habitat within the analysis area, only 0.1%. Habitat would be removed within four historic home ranges and would be degraded in three others, but would have timing restrictions to avoid adverse effects to individual NSOs. Hand-piling, tractor-piling, jackpot burning, and post-harvest silvicultural activities would have no effect on the amount of suitable habitat in the analysis area. The effects would be limited to noise disturbance from use of mechanized equipment and smoke disturbance from burning. Seasonal restrictions would be implemented on activities within ¼ mile of suitable nesting/roosting habitat to minimize potential effects of noise and smoke. Silvicultural activities would have long-term beneficial effects on habitat in that establishing and tending plantations would produce forested stands more quickly than natural regeneration; these stands could reach a size and density that provides suitable NSO habitat more quickly.

Due to the small amount of mature forest that would be converted to an early seral stage in either Action Alternative, the effects to connectivity would be negligible.

Gopher baiting would not affect the amount of suitable habitat in the analysis area. The effects of gopher baiting are limited to the indirect effects of secondary poisoning (consuming a poisoned animal). Gopher baiting on the Forest was monitored from 1996 through 2001. During that time period 15 to 25% of all treated acres were monitored resulting in 1243 acres checked for spilled grain and above ground carcasses. In 1996 four carcasses were found during monitoring, since that time no carcasses have been located during monitoring efforts. Monitoring has resulted in improved gopher baiting techniques, such as more careful application, and increased use of the probe method of application over the spoon method, which entails less spilled grain (Cuenca 2003). Monitoring results indicate that the likelihood of NSOs, goshawks or furbearers encountering above ground carcasses is very low (Cuenca 2003, Bulkin and others 1997, Nolte and Wagner 2001). In addition, monitoring for spilled grain and carcasses would continue with either of the action alternatives. Therefore, it is not expected that gopher baiting would adversely affect NSOs in the analysis area. Gopher baiting may have long-term beneficial effects on NSO habitat in that minimizing damage to seedlings by gophers would promote development of forested stands.

Northern Goshawk

Units 258 and 259 in either of the Action Alternatives would result in a loss of 5 acres of foraging habitat in a Northern goshawk territory that is above the threshold for habitat, causing only a minor effect on the amount of habitat or ability of goshawks to nest or forage. Thinning Unit 130 would reduce the crown closure to between 50 and 55% in another goshawk territory with negligible effects on the ability of goshawks in that territory to nest or forage. Thinning may have beneficial effects on goshawks due to their preference for more open stands and would create a more vigorous, resilient stand. A loss of an additional 8 acres of nesting habitat and 30 acres of foraging habitat scattered through 7 units would occur outside of known territories; this habitat removal would be subject to seasonal restrictions. Across the analysis area, there would be a 0.1% reduction in available nesting and foraging habitat; the effects are expected to be negligible to the local population and not result in a loss of viability. When the effects of Alternative 2 or 3 are combined with the estimated 727

acres that would be removed in the Upper South Fork, Glassups, and Knob Timber Sales, habitat would be reduced by 1% in the analysis area. All four projects include resource protection measures to minimize direct effects. Habitat loss from the four projects would be dispersed rather than concentrated and would have minimal effects on individual territories. The effects of logging, fuels projects, and watershed restoration projects in occupied habitat may include disturbance, displacement, or injury of individual birds, and although individuals may be harmed, it is expected that the population will not be measurably affected and there would be no loss of viability.

Wolverine and Pacific Fisher

Either of the Action Alternatives would result in the removal of up to 55 acres of suitable wolverine and Pacific fisher habitat scattered within 7 watersheds. The area affected by timber harvest represents 0.1% of the forested habitat within the analysis area and the likelihood of it being occupied by wolverines or Pacific fisher, where they could be harmed or killed, is very low. Timing restrictions to avoid adverse effects to individual NSOs would also reduce disturbance effects to fisher and wolverine in the early breeding season. Due to a minimal loss of habitat in the analysis area, the short duration of disturbance effects from noise, the minor reduction of habitat components important for prey species, and the system of reserved lands (LSRs, RRs, Wilderness), the Action Alternatives would have no effect on local populations of fisher and wolverine. The cumulative effects to forested habitat of either of these alternatives plus the other 3 sales in the assessment area are as described above for goshawk and would result in a 1% reduction in the amount of forested habitat in the analysis area. Cumulatively, timber harvest may impact one wolverine reproductive unit and up to three fisher reproductive units in the analysis area based on home range sizes as published in the literature; however, the loss of forested habitat is expected to be negligible and would not affect the ability of wolverines or fisher to breed, feed or shelter. The cumulative effects of all silvicultural activities, roadwork, and watershed restoration activities may be beneficial by developing vigorous stands resilient to fire, insect attack, and disease.

Pallid Bat

Mines and caves suitable for roosting bats do not exist in the analysis area; so potential habitat for pallid bats is most likely associated with tree hollows and snags. Direct effects on habitat may occur through the harvesting of large, decadent trees and through hardwood felling. Individual trees would be removed in all units in either Action Alternative, and small openings would be created in 13 units in Alternative 2 and in 11 units in Alternative 3. Hardwood felling would remove individual hardwoods; it would not remove all trees from the stands. Less than 1% of the available habitat would be affected. Effects to the overall population would be negligible given that habitat within LSRs and Wilderness would not be affected. The cumulative effects of removal of mature forest habitat for the 4 projects are as described above for goshawk. Hardwood felling would occur on approximately 185 acres of mixed conifer forest in Upper South fork, Glassups, and Knob Timber Sales. That acreage combined with either of the Action Alternatives would result in 0.5% of the available habitat being affected by removal of individual trees. Given the pallid bat's preference for open habitats, removal of individual trees would not render habitat unsuitable. The effects of habitat loss would be dispersed rather than concentrated and would have negligible effects on overall habitat availability. Direct effects of logging and burning in occupied habitat may include disturbance, displacement, death, or injury of individual bats. Although individuals

may be lost, it is expected that the population would not be measurably affected and there would be no loss of viability.

Management Indicator Species

Either Action Alternative would result in minor effects to Management Indicator Species habitats in the Hardwood, River/Stream, and Snag species associations within the analysis area. They would reduce habitat elements such as individual hardwoods, snags, green recruitment trees, and small patches of mature forest habitat scattered throughout the landscape for species in the Hardwood and Snag Associations. Impacts could result in the loss or shifting of individual nest sites, home ranges or animals, but would have negligible effects on the overall amount of habitat in the analysis area and on local populations. LSRs, RRs, Wilderness and other reserved land allocations are expected to provide adequate habitat to maintain viable populations of forest-related species.

For the River/Stream Association, neither alternative would remove instream woody debris nor change channel conditions. Water drafting in either Action Alternative may remove water from the stream where Tailed frog, Cascades frog, and American dipper may occur when dust abatement is required. To avoid adverse direct effects to habitat elements, the amount of water removed to fill a tank is not more than 25% of the current stream flow. A screen is used during water withdrawal that avoids direct effects to fish and frogs. Timber harvest, mechanical fuel treatments, and wildlife habitat improvements would be excluded from riparian habitats and would not occur within streams. With Alternative 2, thinning would only occur in the upland portion of Hydrologic RRs in Units 77, 123, and 134. Underburning in either Action Alternative might affect River/Stream habitats, as fire would be allowed to “back into” Hydrologic RRs until it extinguishes naturally in the moist vegetation. No active ignition would occur in Hydrologic RRs and fire intensities would be maintained at a low level. The buffering effects of surrounding RRs and the adherence to Forest Plan soil cover standards and guidelines would prevent adverse effects from underburning. Watershed improvement projects associated with roads, such as culvert replacement, stream-crossing improvements, and road decommissioning could also affect river/stream habitats. The effects from both underburning and roadwork would be short term in nature, as riparian vegetation is expected to re-grow to pre-project levels within a year. Habitat elements, including instream woody debris, substrate, flows, channel condition, and streamside riparian vegetation would not be affected to any measurable degree by these activities. There would be no effect on the overall amount of suitable habitat or on the local population for any of these species. Overall there will be a negligible effect to the aquatic habitat and therefore to rainbow trout and steelhead. Spawning, adult holding, incubation, and juvenile rearing lifestages should have little to no effect as the habitat is negligibly affected. Refer to Fisheries Section for additional discussion of rainbow trout and steelhead, species in the River/Stream Association. There would be no effect on the overall amount of suitable habitat or on the local populations for any of the River/Stream Management Indicator Species.

Klamath Shoulderband and Del Norte Salamander

Although these species are no longer S&M and no requirements exist to protect their habitat, known sites for Klamath shoulderband and Del Norte salamander would be managed to protect key habitat features; refer to Chapter 2, Resource Protection Measures for Alternatives 2 and 3. The application of these resource protection measures and mitigations would assist in maintaining the ecological framework on which these species depend.

Wild and Scenic Rivers

Affected Environment

In 1968 the Wild and Scenic Rivers (WSRs) Act was established to protect American rivers, including their free-flowing conditions, water quality, and many other values "for the benefit and enjoyment of present and future generations." As of 1998, 155 rivers encompassing 10,902 miles had been included in the National WSR System. Rivers or sections of WSRs must be free-flowing and possess at least one "outstandingly remarkable" value, such as fish, wildlife, recreation, scenery, geology, history, or cultural features. WSR corridor boundaries vary in width to include key river features, averaging about ½ mile across.

The Meteor WSR analysis area, which is the Salmon River Ranger District, contains over 45 miles of National WSRs, designated in 1981 by the Secretary of the Interior for their "outstandingly remarkable" anadromous fish values. These are along the Main, North, and South Forks of the Salmon River. In addition, 10 more river miles in the Meteor project area along the South and East Forks of the Salmon River were recommended for WSR designation in the *Forest Plan* to recognize and protect their outstandingly remarkable fish, wildlife and historic values. These Recommended WSRs are extensions of the currently designated South Fork of the Salmon River WSR.

WSR segments displaying varying degrees of human alteration are classified as Recreational, Scenic, or Wild. Recreational segments display the most alterations, including prominent roads, bridges, buildings, and agricultural or forest clearings. Scenic segments display less alteration, such as occasional road segments or structures. Wild segments display very little if any development and alteration. Segment 4 of the South Fork from St. Claire Creek to Matthews Creek is classified Scenic, all other segments within the analysis area are classified Recreational. Rivers classified as Wild exist upstream from the project area within wilderness.

Public use of WSRs is permitted to the degree it does not conflict with conservation requirements for the river conditions and values listed above. Typical public uses involve development of structures, bridges and access roads to support communities, recreation and mineral extraction, and vegetation manipulations such as removal of timber, brush, and forest woody debris.

Wild and Scenic Rivers Conservation Standards

Section 10 of the WSR Act provides the following river conservation criteria: "Each component of the national wild and scenic rivers system shall be administered in such manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting its aesthetic, scenic, historic, archaeological, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area." WSR Act direction can be summarized as "protect and enhance" free-flowing conditions, water quality, and the formally identified "outstandingly remarkable" river values; this applies to both Designated and Recommended Rivers.

For Designated WSRs, the intent of the *Forest Plan* is that river values be protected primarily through limiting the degree of human alteration within the river corridor to approximate their conditions at the date of the WSR's designation in 1981. The "outstandingly remarkable" value for the Designated WSRs within the assessment area is anadromous fish.

For Recommended WSRs, the intent of the *Forest Plan* is that the river's eligibility for WSR designation and classification be preserved is it existed at the date of the *Forest Plan*'s WSR Recommendation in 1995. The "outstandingly remarkable" values within the project area's Recommended WSR segments include Anadromous Fisheries, Wildlife, and Cultural History.

The National Wild and Scenic Rivers System; Final Revised Guidelines for Eligibility, Classification and Management of River Areas published in the Federal Register, Volume 47, No. 173 on September 7, 1982 provides guidance on the management of designated rivers and those recommended for inclusion in the National WSR System. For Scenic River segments: "Evidence of past or ongoing timber harvest is acceptable, provided the forest appears natural from the riverbank. Accessible in places by road." For Recreational River Segments: "Lands may have been developed for the full range of agricultural and forestry uses. May show evidence of past and ongoing timber harvest. The existence of parallel roads or railroads on one or both banks as well as bridge crossings and other river access points is acceptable."

Methodology

A significant issue was identified that units located along segments of the WSR System could adversely affect WSR values.

- The key indicator used to analyze this issue is a narrative discussion of the effects on the "outstandingly remarkable" values.

Wild and Scenic Rivers Evaluation by Jerry Mosier, Forest Landscape Architect, provides the basis for this discussion, is incorporated by reference, and is on file in the project record. It relies heavily on the analysis included in other sections of this chapter such as the Water Quality, Fisheries, and Scenery and Recreation Sections.

Environmental Consequences

Alternative 1

The No Action Alternative would not affect the free-flowing conditions of any WSR segment. WSR values would be maintained in the short-term. Alternative 1 would perpetuate existing crowded and unhealthy forest canopy conditions of widespread areas irregularly scattered throughout the WSR corridors, their viewsheds, and watersheds. Poor stand conditions would make these areas and their surroundings vulnerable to disturbance events that can seriously degrade water quality, aquatic and terrestrial habitat, and diminish scenic character as well as the resilience of recreational and historic settings.

Alternatives 2 and 3

Alternatives 2 and 3 are similar in their effects on WSRs, so are discussed together with any differences highlighted. Neither of the Action Alternatives would affect the free-flowing conditions of WSRs, since no activities are proposed within any WSR bed or bank.

Unit 119 is the only proposed unit that lies within a **Designated** WSR corridor in either Action Alternative. A small portion of Unit 119 is within the South Fork Salmon River

corridor in a segment designated as **Recreational**. This unit is proposed for helicopter thinning with hand piling and burning of slash. About 30 units, in both forks of the Salmon River, are proposed for various silvicultural activities and located upslope from Designated WSR corridors, ranging in distance from a few feet from the corridor as in the case of Unit 183, to as much as 3.0 miles to Unit 190. There are no activities proposed within or near the Main Stem of the Salmon River.

Units 77, 85, 86, 137, 138, 139, and 141 lie partially or wholly within WSR corridors on the South Fork and the East Fork of the South Fork of the Salmon River in segments **recommended** as **Recreational**. These units are proposed for various silvicultural and fuels reduction activities. Two other units, proposed for various silvicultural activities, are located in the watersheds upstream from Recommended WSR corridors, ¼ to 1 mile distant.

Water Quality within the assessment area's WSRs is valued for its many beneficial uses, including contributions to aquatic habitats, domestic uses, and recreation settings. Both Action Alternatives are designed to maintain and enhance water quality and meet standards including the Water Quality Control Plan for the North Coast Region. Proposed logging to sustain healthy forest canopy conditions, underburning and brush clearing, and road improvements have been modified in location, design, and intensity to protect sensitive geologic, hydrologic, and riparian settings where water quality could be adversely influenced. Alternative 3 was specifically designed to produce optimal water quality outcomes. Where project activities are proposed, a beneficial long-term stabilization of the ecosystem would be realized, through greater resistance to disturbance events. This increases the opportunity for enhanced water quality in the future; refer to Water Quality Section.

Anadromous Fisheries is the primary outstandingly remarkable value of the WSRs within the project area. Important fish species include coho salmon, steelhead, Chinook salmon, and rainbow trout. Key WSR fishery values were analyzed for several indicators of aquatic habitat as described in the Fisheries and Riparian Reserve Sections. Effects to the indicators were none or negligible for either Action Alternative, resulting in a finding of negligible effects upon anadromous fish and their habitat. Either Action Alternative would protect WSR fishery values through project design to fully satisfy all pertinent management direction including the Clean Water Act, NW ROD, Forest Plan, and ACS. Resource Protection Measures, important to the WSR fisheries value, that would be applied in either Action Alternative include BMPs, WWOS, the retention of coarse woody debris, slope restrictions for equipment, tractor piling operational restrictions, reuse of skid trails and landings rather than new construction, yarding of unmerchantable material to reduce prescribed burn intensities, and riparian area and unstable area protections or avoidance. Either Action Alternative would also enhance WSR fishery values through the use of vegetative treatments that provide long-term habitat protection by increasing resilience to wildfire and other disturbance events within the watershed.

Wildlife values in and near the WSRs are primarily focused on habitat protection for the bald eagle, pacific fisher, northern goshawk, peregrine falcon, pileated woodpecker, and northwestern pond turtle. Wildlife is identified as an outstandingly remarkable value within Recommended WSR segment East Fork of the South Fork Segment 03, encompassing portions of the East and South Fork of the Salmon River, where peregrine falcon, goshawk, fisher and pileated woodpecker are known to either visit or reside. Conservation requirements for wildlife are contained within the *Forest Plan*, the Pacific Bald Eagle Recovery Plan, and the Recovery Plan for the Peregrine Falcon. Wildlife protection measures

that would be applied in either Action Alternative include the retention of large trees and snags within the river canyon activity areas (*Forest Plan* Forestwide Standards and Guidelines 8-22, 8-23, 8-24, 8-25), and seasonal restrictions on timber harvesting within TES wildlife habitat locations; refer to Design Features Common to Alternatives 2 and 3 Section in Chapter 2. These species are afforded protection to the extent that no adverse effects are expected or likely, and while some unknown individual animals or habitats may be affected, no loss of species viability or downward trend is predicted. Direct habitat improvement from underburning in key oak woodland sites would further enhance habitat. Cumulatively the proposed activities within and around the WSRs would result in a more vigorous, disturbance-resistant ecosystem and correspondingly more enduring wildlife habitat conditions. Refer to Wildlife Section.

Cultural and Historic values within portions of the South Fork of the Salmon River Recommended WSR segment 02 have been identified as outstandingly remarkable. The *Forest Plan* and the National Historic Preservation Act of 1966 provide management direction for protection and enhancement of cultural and historic values. The Action Alternative's strategy for protection of historic sites and artifacts is to locate, identify (flag on the ground), and avoid any impact to them through exclusion, or reduction of intensity, of proposed activities. No adverse effects would be imposed upon these cultural and historic resources. Due to field reconnaissance and documentation of these values in the WSR, more information about the Petersburg mining era is available to better conserve these cultural and historic features.

Recreation values in and near the WSRs are primarily river recreation opportunities for viewing scenery and wildlife, fishing, picnicking, camping, hiking, whitewater boating, nature study and gathering forest products. Conservation requirements focus on providing a range of recreational activities, enjoyable settings, and facilities (*Forest Plan* Forestwide Standards and Guidelines 12-1 through 12-26). There would be some short-term, widely dispersed traffic and noise disturbance from logging and the transportation of workers, equipment, and timber. Either Action Alternative would cumulatively enhance the WSR settings through subtle changes to the forest canopy that produce healthier, more enduring forest conditions.

Scenery viewed from in and around the WSR corridor is highly valued for its steep, forested river canyon character and dominantly natural appearance. The *Forest Plan* provides direction for perpetuating the unique character of the WSR canyons and viewsheds, and defines limits of noticeable alteration through Visual Quality Objectives. Scenery protection measures in the Action Alternatives were designed to limit vegetative alterations by ensuring that the size, shape, and intensity of actions reflect and blend with natural landscape patterns. Other scenery protections include requiring unobtrusive site preparation and slash removal, low stump heights, and location of roads and landings away from recreational and community access routes in key locations. Either Action Alternative would fully meet Visual Quality Objectives, retain a dominantly natural appearance, and perpetuate WSR scenic character by increasing average tree size, forest vitality, and resilience to disturbance events that could degrade scenery in the future. Refer to Scenery and Recreation Section.

Potential effects on all WSR values vary moderately between the Action Alternatives. Alternative 2 would enhance conditions by focusing activities in a moderate portion of the area on developing more healthful, viable ecosystem conditions. Alternative 3 would better protect WSR values; it would enhance most areas similar to Alternative 2, but exclude some

activities with a very small risk to water quality and aquatic habitat (Jones Gulch drainage); refer to Geology Section. Either Alternative 2 or 3 would fully meet the protection standards established for the area's WSR values.

Cumulative effects of either of the Action Alternatives plus substantial past and current events, such as the 1977 and 1987 wildfires, and the Knob, Glassups, and Upper South Fork Timber Sales would not alter the assessment area's suitability. All actions taken together would be fully compatibility with the WSR Act, and its requirements to protect and enhance river values. All established standards would be satisfied.

Scenery and Recreation

Affected Environment

Viewing high quality scenery is the single most sought after recreational activity in the National Forest. Pleasing scenery contributes substantially to the American quality of life, tourism, and economic vitality. Views of the project area can be seen from the analysis area's 45 miles of WSRs, three wildernesses, numerous river canyon communities, residences, and recreational areas. The *Forest Plan's* desired scenery conditions for the area are to perpetuate the established aesthetic image and identity (landscape character) and conserve the natural appearance (scenic integrity). The scenery of the Meteor project area contributes a small but important part to America's National Forest scenic heritage. Recreational use of the project area includes activities such as white water rafting and kayaking, fishing, hiking, camping, recreational driving to view scenery and wildlife, hunting, recreational mining, and gathering of forest products.

Existing and Desired Landscape Character

The scenic quality of the analysis area is very expansive, including essentially the entire Salmon River Ranger District. Landscape Character describes the unique aesthetic image and identity of a place, in terms of socially valued scenery and other sensory attributes. The Landscape Character can be summarized as a diverse mosaic of narrow, winding river canyons enclosed by steep, dissected ridges, and high-elevation glaciated landscapes. The vegetation consists of mixed conifer, oak woodland, and true fir forests. Valued scenic vegetative attributes include individual large trees; vigorous, largely continuous forest stands displaying large tree character; views into the forest; and a variety of species, sizes, and spatial patterns consistent with naturally-established patterns.

Existing and Desired Scenic Integrity

Scenic Integrity describes alterations to the valued landscape character. Scenic Integrity is measured within a range of six possible levels that correspond to Visual Quality Objectives in the *Forest Plan*. In the Meteor analysis area, current Scenic Integrity as viewed from inventoried sensitive viewpoints, is as follows:

Salmon River Canyons (roadways, communities, recreation sites, WSR corridors) – alterations from roads, logging, and mining range widely in magnitude, but cumulatively alterations are either unnoticed or minor, and a natural appearance remains dominant (meets Retention or Partial Retention Visual Quality Objectives).

High Elevation Viewpoints (Marble Mountain/Russian/Trinity Alps Wildernesses, Pacific Crest Trail, Eddy Gulch Lookout) – road, logging, and mining alterations range widely, cumulatively the alterations are evenly split between minor contrasts where natural appearance dominates, and moderate contrasts which attract attention and dominate natural appearance (meets Partial Retention and Modification Visual Quality Objectives).

Recreational Access Routes (to Eddy Gulch Lookout, China Springs and Timber Camp Trailheads) – roads, logging, and mining alterations range widely, cumulatively the scenic integrity appears as minor alterations where the natural appearance remains dominant (meets Partial Retention Visual Quality Objective).

The Forest Plan desired conditions for scenic integrity are an unaltered appearance. The minimum acceptable conditions are identified by the Forest Visual Quality Objectives.

Methodology

Two indicators, Landscape Character and Scenic Integrity, are used to describe the aesthetic setting and effects of the alternatives in this document. The effects on recreational use are discussed in a narrative.

Meteor EIS Scenery Evaluation by Jerry Mosier, Forest Landscape Architect, dated March 27, 2003, provides the basis for this discussion, is incorporated by reference, and is on file in the project record. The evaluation uses national landscape management methodologies in conjunction with existing *Forest Plan* direction to assess the effects of the alternatives. The evaluation was largely based upon field studies and photography from sensitive viewpoints and proposed activity areas. Photographs were taken of recently completed projects, which were judged to be similar to those proposed for the Meteor alternatives, so post-treatment Landscape Character attributes could be studied. Photographic simulations were then performed and used to refine and validate the Meteor scenery evaluation. These photographs and simulations are located at the Klamath National Forest Supervisors Office.

Environmental Consequences

Alternative 1

The No Action Alternative would result in a gradual decline in valued **Landscape Character**, where overly dense stands of small, suppressed or decadent trees would remain in poor health. These areas typically lack most if not all of the valued vegetative attributes of Landscape Character identified above. These stands and the surrounding scenery are at risk of future impairment due to disturbances such as wildfire, drought stress, wind-throw, insect infestation, and disease. The direct effects on Landscape Character would be both immediate (0 to 5 years) and long term (5 to more than 25 years). Indirect effects of this alternative would be a reduction in sustainability of the valued Landscape Character, which could adversely affect recreation experiences, local quality of life, tourism, and economics.

Scenic Integrity within the project area would not directly be affected by this alternative; however, the increasing risk of severe disturbances may cause future adverse scenic integrity alterations associated with fire fighting, salvage logging, and forest restoration.

The recreation values of the project area would not be expected to change substantially with the Alternative 1. The ambient noise in the area would be similar to the current condition, as no project would be implemented.

Alternatives 2 and 3

Alternatives 2 and 3 are similar in their effects on scenery and recreation, so they are discussed together with any differences highlighted. The primary difference is that Alternative 2 would include some vegetative treatments that enhance landscape character in the Blue Ridge Peak area and within Hydrologic and Geologic RRs. Blue Ridge Peak is prominent from the Marble Mountain Wilderness. With Alternative 2, there would be a moderate, short-term adverse alteration in Scenic Integrity in the Blue Ridge Peak area, accompanied by a long-term perpetuation and enhancement of Landscape Character. Alternative 3 would be slightly more favorable from a cumulative scenic integrity standpoint as viewed from the project area's sensitive viewing locations. However, the differences between Alternatives 2 and 3 are minor as viewed from sensitive viewpoints. Either of the

Action Alternatives would include numerous site-specific scenery conservation measures to perpetuate or enhance landscape character, and to minimize the extent and duration of adverse effects upon scenic integrity. Either one would achieve Visual Quality Objectives. Either one would create short-term, moderately adverse reductions to Scenic Integrity, which would be offset by a moderate short- and long-term perpetuation and enhancement of Landscape Character.

The proposed activities in either Alternative 2 or 3, 875 acres and 691 acres respectively, would sustain or enhance valued **Landscape Character** in and around the treatment areas. Cumulative scenery effects would be somewhat minor across the vast project area. However, there would be beneficial effects in and around each activity area. Proposed activities would most typically increase the visual prominence and longevity of existing attractive large trees, and increase the vigor and large tree character of the forest canopy. The openness within the forest canopy, as well as forest floor vegetation diversity, would be increased. Thickets of stunted and dying trees would be thinned. Thinning or removal of portions of the forest canopy would perpetuate the valued Landscape Character attributes by reducing the risk of future scenery impairment from common disturbance events such as wildfire, drought, wind, or biological infestation.

The strongest direct effects of either of the Action Alternatives upon **Scenic Integrity** would include minor to moderate changes noticeable from the Marble Mountain Wilderness (Units 190, 256, 261 for Alternative 2, or Unit 256 for Alternative 3) and the South Fork of the Salmon River (Unit 141 in both alternatives). These effects, and those viewed from other inventoried sensitive views, would not dominate the existing natural appearance. Typically, these effects include disturbances such as exposed soil from forest cover removal and logging equipment, concentrations of vegetative debris and stumps, and patches of scorched forest floor vegetation and tree boles. Proposed forest canopy openings in Units 86, 141, 190, 256 and 261 in Alternative B and in Units 86 and 141 in Alternative C may create minor visible alterations, but the area would retain a dominantly natural appearance. The minor alterations would reflect the size, shape, and edge characteristics of the naturally-established vegetative pattern in the area. The scenery conservation measures designed for the Action Alternatives would widely distribute and minimize the alterations. Within three years of project completion, activity areas would most often be unnoticeable, or appear as minor alterations, fully satisfying the *Forest Plan's* Visual Quality Objective of Partial Retention. This includes Scenic Integrity as viewed from the Salmon River canyons, local communities, wilderness, the Pacific Crest Trail, and Eddy Gulch Lookout.

The direct minor adverse effects on Landscape Character and Scenic Integrity from either of the Action Alternatives would last approximately 5 years. There would also be a long-term beneficial effect on Landscape Character that would occur within 5 years and likely persist more than 25 years. These enhanced and more stable valued Landscape Character attributes are expected to support enjoyable recreational experiences, local quality of life, and tourism. Past and current actions within the Meteor area include the Glassups, Upper South Fork, and Knob Timber Sales. The cumulative effects of either Action Alternative plus these other projects pose no risk of exceeding *Forest Plan* Scenery standards, which were designed to perpetuate the ecologically established Landscape Character and to conserve the Scenic Integrity through achievement of Forest Visual Quality Objectives.

Either Action Alternative would help achieve *Forest Plan* desired scenery conditions for the area, perpetuating landscape character and conserving scenic integrity. The improvement of

ecosystem vitality through vegetative change is very important to people's enjoyment, since certain vegetation attributes are highly valued and worthy of protection and development.

The recreation value of the project area would not be expected to change substantially with either Action Alternative. There would be some minor, short-term reductions in scenic quality as discussed above, but a long-term beneficial effect. Timber sale design features would minimize any impacts on recreational activities using the Salmon River and its tributaries including the associated fisheries and the WSR corridor. Refer to Fisheries and Wild and Scenic Rivers Sections.

There might be a short period of time, during the logging, when recreationists may choose to avoid the area and use other parts of the Forest, due to noise or traffic delays. This would be a short-term effect. Refer to Social Section for a discussion of the effects of helicopter noise.

Economics

Affected Environment

The economic area of influence for the Forest includes the seven surrounding counties: Siskiyou, Shasta, Humboldt, and Del Norte in California as well as Jackson, Josephine and Klamath in Oregon. Siskiyou County traditionally had a high degree of dependence on lumber and wood product manufacturing. The reduction in timber offered from National Forest System lands in the last decade has had a considerable impact on the counties; particularly communities within the counties.

For information on the regional social and economic environment, refer to the *Forest Plan* EIS, pages 3-130 to 3-139 and *pages* 4-159 to 4-165 (USDA FS 1995b). A detailed assessment of social and economic conditions within communities that have traditionally been dependent on timber resources is contained in the report of the Forest Ecosystem Management Assessment Team, Chapters VI and VII (FEMAT 1993).

Methodology

A Financial Efficiency Analysis was conducted, as required by Forest Service Handbook 2409.18 (USDA FS 2002), to provide a comparison of anticipated costs and revenues and is summarized below. This proposal was not found to have major economic or social impacts, so an Economic Efficiency Analysis as described in Forest Service Manual 1970.45 is not required (USDA FS 1992).

Key indicators for Economics include the following:

- Harvest volume for proposed activities.
- Present Net Value, which is a comparison of short-term costs and benefits to the Federal government discounted at a 4% rate to present day values.
- Number of jobs generated by proposed activities based on harvest volume.

A brief discussion of some values that are difficult to quantify and of payments to counties is also included.

The economic effects of the alternatives, including timber harvest, can be expressed in monetary terms, while other effects are not easily quantifiable. The assumptions used to estimate the monetary values for the key indicators are discussed in the Economic Report. The Economic Report, by Dan Blessing, is incorporated by reference, and is on file in the project record.

Predictions of project receipts and costs, even for short periods into the future, may prove to be inaccurate due to variables such as inflation, market supply and demand, and the accuracy of the timber cruise. While these forecasts may not predict actual product values, receipts and costs, most deviations from these figures would likely remain constant with other general economic indicators, i.e. rate of inflation. This makes it possible to conduct a reasonable analysis of the relative values and costs.

If revenues would not cover the costs of implementing action alternatives, an assumption was that the Forest budget would be adequate to support essential activities proposed in each alternative. Appropriated funding would cover the cost of timber sale planning and administration, analysis, wildlife surveys, and may be available to accomplish other proposed projects, as well.

This analysis describes the economic effects associated with the alternatives including silvicultural treatments, timber harvest, fuel treatment, and roadwork. It is not intended to give an inclusive summary of the many possible environmental values or costs, although it is recognized that such factors do exist. Rather, the analysis provides some information about the amount of revenue that would be generated if the timber were to be harvested and sold. The economic impacts of timber harvest are generally quantifiable, while corresponding effects on non-commodity resource values are not generally quantifiable in monetary terms. Therefore, a qualitative, in-depth assessment of other resource values is found earlier in this section under the various resource areas.

Environmental Consequences

Alternative 1

This alternative would not produce any economic benefits from timber harvest. Timber would not be available to regional markets, and demands for between 5.1 and 6 million board feet of lumber and other wood products would be satisfied by timber cut from other sources, either domestic or foreign. Other resource values for this alternative are discussed qualitatively earlier in this chapter. The No Action Alternative would not provide management opportunities as outlined in **Table 1** of the EIS and would not further improve stand conditions to meet the purpose and need of the proposed project. Fire management conditions would remain as they now exist for the short term, and conditions would deteriorate over time.

Alternative 2

This alternative would produce approximately 6 million board feet of timber for regional markets, approximately .9 million board feet more than Alternative 3. Corresponding with the higher volume, it would produce 9 more jobs Statewide. Timber receipts to the Forest Service under this alternative are estimated to be $684,060, resulting in a Present Net Value of $187,975. The Present Net Value is the difference between the revenue generated for the government by the sale of timber in an alternative and the government costs required for essential reforestation. A positive Present Net Value means that the amount collected from the sale is greater than all the essential costs for reforesting proposed harvest units, including some site preparation, planting and cultural treatments to assure seedling survival. Present Net Value includes short-term costs and benefits (short term was assumed to be a period of 5 years). The money to fund the pre-sale activities, analysis, and sale administration would not come directly out of the revenue from this sale, and is not included as a cost.

Funds above the amount needed for essential reforestation, as captured in the Present Net Value, would most likely become additional Knudsen-Vandenburg collections to cover the cost to complete precommercial thinning and release treatments in harvest units and existing plantations. Brush disposal deposits, which are in addition to the timber sale receipts, would be used to treat harvest fuels for the project area. Deposits for road surfacing would be added to a road surfacing account for future work in the region. Overall, monetary returns from the sale of timber with this alternative would not be expected to equal expenditures of appropriated funds for the analysis, wildlife surveys, sale preparation and administration, when combined with reforestation and stand improvement costs included in the Present Net Value and additional Knudsen-Vandenburg collections. This alternative would be expected

to fall about $450,000 short of covering the cost all of the additional projects identified in this alternative.

Impacts on resources, both positive and adverse, that could be considered tradeoffs for economic returns from timber harvest are discussed at length earlier in this chapter. Silvicultural prescriptions would generally have favorable effects on stand health and would include regeneration of some stands in a state of decline. Alternative 2 would meet fire management objectives in the short-term and foreseeable future on the acres treated.

Traditionally, counties received yield tax revenue generated through the harvesting of public and private timber. In the past, timber yield taxes were paid by the purchaser at a percentage of the assigned timber values.

Counties traditionally also received funds under the Twenty-five Percent Fund Act (1908; 16 U.S.C. 500) which provided that 25% of all money (gross receipts) received by National Forests (for grazing, permits, sales of timber, or other special uses or products) be paid to the State for the benefit of the public schools and public roads of the counties containing the National Forests.

Since 1991, amendments to the Twenty-Five Percent Fund Act have been adopted as a result of concern over reductions in timber harvest and associated receipts. These amendments replace the traditional yield tax and Twenty-five Percent Funds. These amendments established payments to the County at no less than 90% of the historical average annual payments to states, based on receipts collected during a 5-year period from 1986 through 1990. These amendments also directed that payments be reduced by 3% per year up until the year 2003. Payments for any year could not exceed the amount of gross receipts that the Forest received in the same fiscal year. The most recent amendment lasts from 2001 through 2006. This program could be extended beyond 2006 by another amendment.

Payments to the counties were generally paid from the National Forest Fund at the regional level. Receipts were tracked at the province level, so the amount each Forest was responsible for depends on the funds generated on the other Forests in that province. If not enough funds were generated to cover the 25% payments plus another 10% to cover roads and trails (*National Forest Roads and Trails Act*, 1964), additional collections could be made from timber sale receipts that were not needed to cover essential reforestation. These payments came to be considered as compensation for property taxes that would accrue if the lands were under private ownership. Since payments represent a shift of resources from the Federal government to local county government, it may not be as much of an issue to the public from what source these payments are generated, as long as the amount is somewhat stable.

Alternative 3

This alternative would produce approximately 5.1 million board feet of timber, with timber sale receipts returning approximately $581,450. The Present Net Value would be $159,780 and would be expected to cover all but around $367,400 worth of precommercial thinning and release in harvest units and existing plantations as identified in this alternative. Brush disposal deposits and road deposits would be used the same as for Alternative 2. Overall, monetary returns from the sale of timber under this alternative would not be expected to equal expenditures of appropriated funds for the analysis, wildlife surveys, sale preparation and administration, when combined with reforestation and stand improvement costs included in the Present Net Value and additional Knudsen Vandenburg collections.

Alternative 3 would have the same effects on stand health as Alternative 2, with the exception of the six units within Jones Gulch that would not be treated. Watershed impacts would be slightly less than Alternative 2. Other effects would be nearly the same as for Alternative 2.

Table 20 compares the economic indicator values for all alternatives.

Table 20. Comparison of Economic Indicators by Alternative.

Economic Indicators	No Action	Alternative 2	Alternative 3
Alternative Volume	0	6 million board feet	5.1 million board feet
Present Net Value	0	$187,975	$159,780
Jobs, Direct & Indirect	*	60	51

* No new jobs will be generated from timber harvest in the Meteor Project area. The area will continue to provide some employment (mostly indirect) from its recreational uses and other resource values, as it would under other action alternatives.

Social

Affected Environment

Background

A social analysis uses social science information to determine how proposed actions affect humans. The Multiple Use-Sustained Yield Act of 1960, the Forest and Rangeland Renewable Resources Planning Act of 1974, and the National Forest Management Act of 1976 all provide for the National Forests to supply goods and services and be managed for a broad array of resources.

Consistent with these guiding laws, the land allocations and management direction for the Forest were established in the *Forest Plan* with the signing of its Record of Decision on July 5, 1995. The Meteor proposal does not propose changes in the management policy of the Forest, but rather is a mechanism for implementing the management direction already established. Therefore, the social effects of this single proposal are limited in scope. FSM 1973 requires a social impact analysis if the potential social effects of Forest Service actions are important to the decision (USDA FS 1992). While important, social effects were not identified as a significant issue for the Meteor proposal, so an extensive analysis is not necessary (USDA FS 1988). Social impacts will only be discussed briefly in the Meteor EIS as provided in the implementing regulations for NEPA.

Social analysis at broader scales has occurred in the NW ROD FSEIS (USDA FS and USDI BLM 1994a) and the *Forest Plan* EIS (USDA FS 1995b). The Meteor social analysis is tiered to the analyses on pages 3&4-260 through 3&4-319 of the NW ROD FSEIS as well as to the analyses on pages 3-130 through 3-134 and pages 4-159 through 4-162 of the *Forest Plan* EIS. The analysis in the NW ROD FSEIS discusses the expected effects on communities of reduced timber harvest and community assistance programs. The Forest Plan EIS discusses the effects of the land allocations on selected forest user groups. The desired condition as identified in the *North Fork WA* on page 6-3 is to provide a range of human social amenities.

Areas of Influence

The North and South Forks of the Salmon River are the area of influence for direct social effects of this proposal. The area of influence for indirect and cumulative effects is the seven-county area described in the Economics Section. The area of influence for effects on values is nationwide, because these are public lands.

A study on communities in the Klamath Region examined socioeconomic status and community capacity as indicators of well-being (Doak and Kusel 1997). They assumed that higher home ownership, education, and employment indicated higher socioeconomic well-being, and higher poverty and higher percentages of children in homes receiving public-assistance income indicated lower socioeconomic well-being. Community capacity was defined as the collective ability of residents in the community to respond to external and internal stresses, to create and take advantage of opportunities, and to meet the needs of residents.

In the study, the area including the Salmon River rated medium low for community capacity and low for socioeconomic status: “This aggregation is remote and has a limited infrastructure. There are a few small stores and gas stations, access to electrical power is

limited, and there are limited employment opportunities. Salmon River and Callahan are two separate communities. Community cohesiveness is higher in Salmon River... Unemployment is 12 percent, and the poverty rate, at 27 percent, is a third higher than the next closest aggregation in the subregion. Thirty percent of children under 15 years of age live in homes receiving public assistance income. Residents have diverse skills, many with strong outdoor skills. Sixteen percent of the population over 25 years of age has a four-year college degree or more education, the third highest in the subregion. Thirty-three percent of the workers are government employees, the highest leveling the subregion. There is a cadre of residents who work well together, particularly on issues related to water rights, fish, and ecosystem health. American Indians make up 13 percent of the aggregation population."

The study states that almost every community meets around local volunteer fire departments and schools; however, the Sawyer's Bar School, kindergarten through grade 8, closed several years ago because not enough children were there for continued state support.

Another important factor in the local economy is that a highly motivated citizens group, the Salmon River Concerned Citizens, has been very successful in obtaining grants to fund employment opportunities in the local area. These citizens donate their labor as the required match to obtain these grants. The work includes such varied activities as pulling noxious weeds, mapping fire intensities, and inventorying streams.

Grants are also important in the seven-county area of influence. Since 1992, community development and similar programs intended to help build local capacity and accomplish resource goals have contributed significantly to economic stability and growth in Siskiyou and the surrounding counties. These programs include Jobs-in-the-Woods, the Rural Community Assistance program, Community Economic Revitalization Team, National Fire Plan Grant programs, and Payments to States Title II. The Forest also contributes to the job training and retraining programs that help the workforce in the seven-county area adjust to changes in resource products, markets, and skills. Refer to Forest Monitoring Reports (USDA FS 2001b, USDA FS 2002c, USDA FS 2003) for additional information; they are available on the Forest web page at the following web address:

www.fs.fed.us/r5/klamath/projects/forestmanagement/

People from the seven-county area contract for work in the Salmon River Drainage including but not limited to logging, planting, precommercial thinning, masticating, and conducting various surveys. These people spend money on gas and food, creating a small multiplier effect in Siskiyou County. People employed by environmental groups also work in the seven-county area commenting on Forest projects, preparing newsletters and web sites, filing appeals and lawsuits, and protesting Forest activities.

Values

Values are also a part of social well-being. A value is a shared standard of preference or desirability. Values, objectives, beliefs, and attitudes relating to public lands from a national survey conducted in 2000 (Shields and others 2002) were summarized, as follows: "The public sees the promotion of ecosystem health as an important objective and role for the agency. There is strong support for protecting watersheds. The public supports multiple uses, but not all uses equally. Motorized recreation is not a high priority objective, while preserving the ability to have a 'wilderness experience' is important. There is moderate support for providing resources to dependent communities. The provision of less consumptive services is more important than those that are more consumptive. There is a

lack of support for subsidies for development and leasing of public lands. Preservation of traditional uses is a somewhat important objective. Development and use of the best scientific information enjoys wide support, as does information sharing and collaboration. A national direction for the management of National Forest lands is a slightly important objective. Increasing law enforcement on National Forests and Grasslands is an important objective and an appropriate role for the agency. The public has a strong environmental protection orientation, has a moderately strong conservation/preservation orientation, and supports some development."

The project area is particularly valued for its relatively undeveloped character, water quality, and air quality. Based on comments received during the scoping process for this proposal and other public involvement efforts for Forest projects, a number of values pertinent to the project area were identified. The values identified below are not mutually exclusive; people may hold more than one of the values and a wide interpretation of each value is possible.

- Maintaining "natural conditions" in the landscape,
- Managing natural resources wisely,
- Creating job opportunities,
- Protecting spiritual and renewal values,
- Providing recreational opportunities,
- Protecting late-successional and old-growth vegetation.
- Protecting Wild and Scenic River corridors and roadless areas.

Heritage Resources and Tribal Consultation

The Cultural Resource Compliance Process, mandated by 36 CFR Part 800 of Section 106 of the National Historic Preservation Act, requires special review of undertakings that could affect properties included or eligible for inclusion in the National Register of Historic Places. Archaeological field inventories were conducted in the project area. Recognized Tribes were contacted early in project planning to identify potential concerns. Refer to Chapter 1, Public Involvement Section.

Environmental Justice

Executive Order 12898 relating to Environmental Justice requires an assessment of whether minorities or low-income populations would be disproportionately affected by proposed actions. Low-income people live in the assessment area, as do members of American Indian Tribes, who are minorities.

Methodology

All significant issues and potential effects identified and discussed earlier in this chapter have a social element and will not be repeated here. Social effects not covered previously are addressed in a narrative fashion in this section. The discussions include the effects on local community capacity, effects in the seven-county area, values, Heritage Resources, and Environmental Justice. A Social Analysis for Meteor by Lynda Karns, dated May 6, 2003, includes a discussion of the social environment, pertinent laws and regulations, and an analysis of the effects of the alternatives. An Archaeological Reconnaissance Report for the Meteor Timber Sale by David Vann, dated October 4, 2002, and appended April 3, 2003,

includes information on the heritage surveys and project. These documents are incorporated by reference, and are on file in the project record.

Environmental Consequences

Alternative 1

With the No Action Alternative, the future social situation in North and South Forks of the Salmon River would likely be similar to the present. Community capacity and infrastructure would remain limited, and unemployment and poverty would remain high. The Salmon River Concerned Citizens would likely continue to use all available means to bring funding and work to the local area. Contract work from awarded timber sales, road contracts, silvicultural work, and survey work would be on-going. Residents, including American Indians, may benefit from some of these contracts. The only new contribution to contract work in either the local communities or the seven-county area from this alternative would be the contract surveys for archaeology and S&M species completed during planning. Those employed by environmental groups would not receive work, except to comment on the project and request information.

No adverse effect is anticipated for most values; except to those who value creating job opportunities, including those in the logging industry and those who bid on service contracts. Some people may think that taking no action is not wise management of the project area, because it does not lead to the desired conditions identified in the *Forest Plan* and in the *WAs* for Matrix and RR areas. It would not implement the Selected Alternative in the *Forest Plan* that was identified as providing the highest net public benefit (USDA FS 1995c, page 11). Those who disagree with the *Forest Plan* provisions would view the No Action Alternative as wise management.

No effects on American Indian cultural use areas or spiritual values are anticipated with the No Action Alternative. Not creating any new work opportunities could disproportionately affect American Indian minorities or low-income populations in the Salmon River or seven-county area, where community capacity is limited.

The risks to human health and safety are not expected to change from the current condition with the No Action Alternative.

Alternatives 2 and 3

Alternatives 2 and 3 are similar in their potential effects on social elements, so they are discussed together with any differences highlighted. With these alternatives, the future social situation in North and South Forks of the Salmon River would likely be similar to the present. Available contract work, including logging and service contracts, would increase in the short term. The jobs attributed to logging are estimated as 60 jobs for Alternative 2, and 51 jobs for Alternative 3; refer to Economics Section. This increase could directly benefit some local residents in this line of work. Small, short-term indirect benefits might accrue to local residents if they work in support industries in the county. Some additional work might also benefit those employed to comment on, request information about, prepare newsletters and web sites, file appeals and lawsuits, and protest projects that include timber sales. None of these employment effects would be substantial enough to noticeably improve community capacity. The cumulative effects of these short-term increases combined with other work available in the community could add up to full time employment for a limited number of people.

People have various perceptions on what constitutes a natural or pleasing landscape and what constitutes wise management of natural resources. The Forest Service Scenery Management System assumes that a pleasing landscape is the proxy most often used by people to judge wise use of resources. Refer to Scenery and Recreation Section for a discussion of how these two values would be affected from a scenic standpoint. Other elements of natural conditions and wise management include maintaining air and water quality. Providing habitat for plant, wildlife, and fish species is also important. Refer to Air Quality, Water Quality, Vegetation, Fisheries, and Wildlife Sections for a discussion of these values.

Another element of natural conditions in the landscape is noise. Several local landowners were concerned that helicopter logging noise could destroy the area's tranquility, if it lasted a long time. The time needed to harvest a stand with a helicopter depends on the size of the trees being removed, the capabilities of the aircraft, and the flight time to the landings. If the timber purchaser is able to average about 60 thousand board feet per day of flight time, the helicopter logging should take about 70 days. Most of the stands proposed for helicopter removal are not near residences or recreation sites. The stands where helicopter logging is most likely to disturb private landowners or recreationists are 85, 86, 134, and 137. The residences along the County Road above the Petersburg Guard Station should notice about 9 days of helicopter activity near their property. The residences near the mouth of Cecil Creek should notice about 4 days of harvest. These estimates do not include removing trees with log trucks or using unspecified service landings for the rest of the harvest activities. Helicopter units near wilderness boundaries would have similar noise effects, limited to a few days in any one area and affecting those who are using that portion of the wilderness at that time.

Either Alternative 2 or 3 would contribute to implementing the Selected Alternative in the *Forest Plan*, which was identified as providing the highest net public benefit. Those who agree with the *Forest Plan* provisions and believe that one of these alternatives is the best means of implementing it in this area would view that alternative as wise management because it leads toward achieving the desired conditions identified in the *Forest Plan* and in the *WAs* for Matrix and RR areas. Those who disagree with the *Forest Plan* provisions would not view implementing either Action Alternative as wise management; this includes but is not limited to those who would prefer one use to prevail for the entire Forest, those who believe allowing natural processes to dominate throughout the entire Forest is the best policy, and those who do not want any trees or any large trees or any old-growth trees to be cut. Those who agree with the multiple-use provisions of the *Forest Plan*, but don't believe either of these alternatives are the best means of implementing it would likely not view the alternative as wise management. Alternatives 2 and 3 would please those who value job opportunities in the area. Alternative 2 would offer slightly more jobs than Alternative 3.

The slight alterations discussed in the Scenery and Recreation Section and the noise disturbance disclosed above could adversely affect those who use the Forest for renewal or spiritual practices. The noise disturbance would persist for several days in any local area, but could persist somewhere in the watershed over one or two seasons, especially if the harvesting of Alternative 2 or 3 overlapped with harvesting in Knob Timber Sale. Scenery and noise are important considerations for those who value recreational opportunities in the area. Refer to Scenery and Recreation Section and noise discussion in this section.

Those who value retaining adequate amounts of late-successional and old-growth vegetation to provide for habitat needs, such as habitat for listed species and connectivity between wildernesses, would likely be pleased with Alternative 2 or 3; refer to discussions in

Vegetation and Wildlife Sections. Those who wish to retain all existing late-successional and old-growth vegetation would oppose either of these alternatives.
Those who define roadless areas as those inventoried in the Second Roadless Review and Evaluation and in the *Forest Plan* that retain roadless character would likely be pleased with the avoidance of these areas in Alternatives 2 and 3. This definition is consistent with the Roadless Area Conservation Rule of January 12, 2001, which was enjoined by several lawsuits, and the Interim Directive for the Management of Inventoried Roadless Areas that went into effect July 16, 2004. Those who define roadless as areas other than inventoried roadless areas (often specifying areas less than 5,000 acres) or as any area between two roads, would not be pleased with these two alternatives. Those who believe too much area is being protected in roadless areas would not be pleased with the avoidance of Inventoried Roadless Areas by these two alternatives.

Those who believe the WSR Act and the *Forest Plan* management direction is adequate protection for WSR corridors would likely be pleased with the provisions in Alternatives 2 and 3. Refer to Wild and Scenic River Section for a discussion. Those who want WSR corridors to have no management actions in them, believe that all WSR segments should be managed as if they were Wild segments (including those segments that don't meet the criteria for Wild Rivers), and those who disagree that the actions proposed in the action alternatives are the appropriate actions would not be pleased with these alternatives.

Known heritage sites in the project area and any sites discovered during project implementation would be protected by a clause in the timber sale contract; refer to Chapter 2, Resource Protection Measures for Alternatives 2 and 3. Should unknown archaeological resources be discovered during the implementation phase, all ground-disturbing activities would immediately cease and appropriate measures be taken. The risks of disturbing undiscovered archaeological resources are very low, based on the extensive field inventories.

American Indians did not identify any potential conflicts or special contemporary uses during consultation; therefore, the risks of disturbing unknown contemporary native uses are very low. It is not anticipated that contemporary American Indian uses or values would be adversely affected by either of the action alternatives.

Local residents would be affected more than society at large by the short-term noise effects and increased road traffic during project activities with either of the action alternatives. Local residents could also benefit more than society at large if they were able to compete for some of the contract work generated by either of the Action Alternatives. Contractors in the seven-county area would benefit more than society at large by the increase in employment opportunities. Because local residents are comprised of a high proportion of American Indians and economically disadvantaged people, these groups would be disproportionately affected by this action. The seven-county area also has a large proportion of economically disadvantaged people as shown by the low community capacity and socioeconomic status identified in Doak and Kusel. Disproportionate benefits are likely for these areas.

The Action Alternatives would avoid adverse impacts to public safety through expert project design consistent with all laws and regulations. Either Action Alternative would include standard public health and safety clauses in all contracts. Actions, such as dust abatement, signing of roads identifying the area as an active timber sale, safely securing truckloads, and maintaining the haul route, are standard precautionary measures.

Alternative 2 would use strychnine poison to bait gophers on approximately 55 acres, while Alternative 3 would use it on approximately 30 acres. Strychnine is not absorbed through the skin, so this exposure route is minimal. The primary exposure route to induce poisoning from strychnine is ingestion, but it is very unlikely anyone would eat bait for three reasons. 1) The bait is placed underground in burrow systems. 2) The bait is dyed green for identification, a Siskiyou County requirement. 3) The taste is bitter. Strict standards for storing and handling bait should prevent unauthorized access. Public exposure levels are very low due to the bait formulation, underground application, remote treatment locations, and the laws and safety procedures for protection of humans, non-target species, and resources. Because the level of exposure during normal handling is low, the risk of adverse direct effects is also low, and the probability of human poisoning from bait application would be unlikely. Workers applying the bait would have the greatest exposure and, therefore, the highest level of risk. Workers wear gloves, carry grain in covered containers, and use a respirator when filling containers. Consistent with California Department of Pesticide Regulation laws, workers are told about the pesticides and the associated risks. A licensed California and Oregon Pesticide Applicator oversees operations and is required to follow label instructions, including safety standards. The risk of harm to public or workers is low, if the bait is used as intended and label direction followed. Refer to the 1998 Granite Gopher Baiting EA for more detailed information on gopher baiting.

Felling hazard trees would provide for public safety on Forest Service roads, consistent with the requirements of the Federal Highway Safety Act and the Occupational Safety and Health Administration regulations. Refer to Hazard Tree Removal under Resource Protection Measures for Alternatives 2 and 3 in Chapter 2.

The Resource Protection Measures for Alternatives 2 and 3 under Air Quality in Chapter 2 would minimize the potential for air quality effects on public health due to prescribed burning. Masticating rather than burning fuels on 131 acres in Alternative 2 or on 31 acres in Alternative 3 would also help limit potential emissions and reduce adverse effects on public health. Emissions would be consistent with State and Federal air quality standards as discussed in the Air Quality Section. Particulate emissions in treated areas during a future fire would be reduced due to the reduction in available fuels, which would also reduce adverse effects on human health.

Dust abatement plans would minimize the risk of asbestos fibers being introduced into the atmosphere during maintenance, stormproofing, decommissioning, or rocking of roads underlain by ultramafic rock. Testing rock pits, obtaining permits, and applying appropriate asbestos toxic control standards would protect human health; these measures are consistent with the state Asbestos Airborne Toxic Control Measures, Section 93105 and 93106. Refer to Naturally Occurring Asbestos under Resource Protection Measures for Alternatives 2 and 3, Geology Section, and Geologic Report for additional discussions.

Transportation

Affected Environment

The road system provides access to and within the Forest. Private landowners are dependent on it for access to their properties, access to schools and community events, and to reach goods and services available in towns. Roads are essential during emergencies for evacuation and for emergency vehicle access. During fires, roads provide a means for efficiently and safely transporting firefighters, materials, and equipment. Roads can also serve as fuel breaks. Roads provide access for recreationists and facilitate management activities.

The transportation system in the project area has been analyzed in a number of roads analysis documents. *The Klamath National Forest Roads Analysis* (USDA FS 2002b), dated June 2002, identifies access needs, environmental concerns, and maintenance level objectives for primary roads and documents the analysis of the entire road system. It is incorporated by this reference and is available on the Forest web site. The Salmon River Ranger District conducted a *Roads Analysis Process* at the watershed scale for the North Fork, Upper South Fork and Lower South Fork Watersheds to supplement the *Klamath National Forest Roads Analysis*. Identification of access needs, environmental concerns, and maintenance level objectives for all system roads on the District has been completed and is documented in a spreadsheet; this document is incorporated by reference and on file in the Project Record. System roads, also known as classified roads, are those needed for long-term motor vehicle access.

A site-specific analysis of classified and non-classified roads within the project area was conducted during the planning phase and was used to update the District supplement. Non-classified roads include unplanned roads, abandoned travelways, and roads that were not decommissioned upon termination of a permit. The information in the *Klamath National Forest Roads Analysis* and supplement provides recommendations on whether roads should be added to the permanent transportation system, decommissioned after use, improved, or if road maintenance levels should be changed. These analyses are consistent with the direction in Forest Service Manual 7700, Chapter 7710 – Transportation Atlas, Records and Analysis, Effective December 14, 2001.

The Klamath National Forest Roads Analysis provides a description of the transportation system on the Forest, including definitions of terminology. It shows that road densities for all jurisdictions in the North Fork, Upper South Fork, and Lower South Fork of the Salmon River Watershed are fairly low, relative to most watersheds in the Forest; data was taken from the Forest GIS Roads layer in 2001. Of the three, Lower South Fork has the highest road density at 2.4 miles per square mile, Upper South Fork Salmon has 1.3 miles per square mile, and North Fork has 1.1 miles per square mile (USDA FS 2002b, page 43). This information is continually changing as road inventories identify additional existing road, new roads are constructed, and roads are decommissioned.

Emphasis in the Salmon River Drainage, as a key watershed, has been on closing, improving, and decommissioning roads with very little new road construction since 1996. As discussed in the Fuels Section, projects completed since 1996 have decommissioned 22 miles of roads, while current and foreseeable future actions target up to 53 miles of additional roads for decommissioning. The majority of this work is included in the Summerville and Yoakumville Roads Projects. Summerville in Upper South Fork Watershed is under contract

and much of the work has been completed. Work on Yoakumville in the Lower South Fork Watershed began in 2003 and is scheduled for completion by the end of 2006.

Management Direction

The Forestwide goal for the transportation system is to provide an economical, safe, and environmentally sensitive transportation system for the Forest. It also emphasizes the maintenance and restoration of existing roads over the construction of new roads where appropriate.

Methodology

Effects on the transportation system are discussed in a narrative.

Environmental Consequences

Alternative 1

There would be no change in the transportation system with this alternative. Non-system roads would remain on the landscape and the decision on what to do with them would be deferred. This would not contribute to achievement of the Forestwide goal for an economical and environmentally sensitive transportation system in the project area.

Alternatives 2 and 3

These alternatives would be similar in their treatment of roads, so are addressed together. Either Alternative 2 or 3 would add approximately 0.08 miles of existing unclassified road in two segments to the system. The two short segments to be added to the system would provide long-term access to water sources. Either alternative would decommission approximately 2.26 miles of unclassified road in six short segments. As the unclassified roads to be decommissioned are in areas where other roads provide access, no adverse effects to access are anticipated. There would be a small contribution to a more environmentally sensitive road system by stabilizing these roads and restoring them to a more natural state.

System Road 39N27, which is approximately 9.25 miles, would be stormproofed, placed in a self-maintaining condition. This would reduce maintenance costs, fix drainage problems, and reduce the risk to aquatic resources, while keeping the road on the system so it could be used if a fire started in the area. Roads 39N22A and 37N02B would be changed from Maintenance Level 2 to 1. Maintenance Level 1 roads are physically closed with some type of barrier. Closing Roads 39N22A and 37N02B would reduce maintenance costs, but allow them to be used in the future when the plantations in those areas are ready for thinning or other treatments. Road 37N02B would be available for use with very little work to re-open it, if a fire occurred in the area and it was needed for access.

Either of the Action Alternatives would contribute to the achievement of the Forestwide goal for an economical and environmentally sensitive transportation system in the project area. The maintenance and restoration of existing roads would be emphasized; no new roads would be constructed.

The cumulative effects of the road actions proposed in Alternative 2 or 3 plus other road actions included in the Salmon River Watershed since 1996 all contribute towards achieving the desired transportation system as described in the Forest Plan and the *Klamath National Forest Roads Analysis.*

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Short-term uses, and their effects, are those that occur within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. Under the Multiple-Use Sustained-Yield Act, and the National Forest Management Act, all renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grown again if the long-term productivity of the land is maintained. This long-term productivity is maintained through the application of the resource protection measures described in Chapter 2, in particular those applying to the soil and water resources.

Openings would be created in regeneration stands in the short-term, but well-stocked vigorous stands would be established for the long term as discussed in the Vegetation Section. Both Alternatives would provide timber products to benefit consumers in the short-term; Alternative 2 would provide a somewhat higher yield than Alternative 3. With either Alternative 2 or 3, there would be a very short-term increase in fuel hazard in the period between harvesting and fuel treatment. This would be accompanied by a long-term increase in stand vigor, a reduction in fuel hazard, and a corresponding decrease in the risk of stand-replacing fire occurring within the harvest units. There would also be a 3 to 5 year increase in fuel hazard from post-harvest treatments and a corresponding increase in stand vigor as discussed in the Vegetation and Fuels Sections.

Road decommissioning and stormproofing would produce beneficial long-term effects to fish and fish habitat from reduced sediment delivery to stream channels with either Alternative 2 or 3 as discussed in the Fisheries Section.

In Alternative 2, trees in the smaller size classes and some sick and dying trees would be removed from the Hydrologic RR of Units 77, 123, and 134. This would increase the vigor of the remaining dominant and codominant trees, providing large trees for future large woody debris recruitment with a better chance of staying within the stream channel and not floating through the system at less than flood flows. These beneficial long-term effects would occur in the Methodist, Cecil, and Gooey-Ketchum 7th field watersheds and in the South Fork Salmon 5th field as discussed in the Fisheries Section.

There would be a short-term decrease in root support and transpiration immediately after thinning selected RRs in Alternative 2. In the long term, thinning these areas would allow the residual vegetation to become more vigorous with root support and active transpiration of soil water and a reduced fire hazard as discussed in the Riparian Reserves Section.

There would be a short-term loss of 5 acres of dispersal habitat and the degradation of 26 acres of foraging /dispersal NSO Critical Habitat within the Matrix in either Alternative 2 or 3. This would allow the development of healthy, more vigorous stands that are more sustainable for foraging /dispersal habit in the long term. There would also be a very low likelihood of secondary poisoning of late-successional species from gopher baiting with the corresponding long-term benefit that minimizing damage to seedlings would promote the development of forested stands that would become suitable habitat for these species. These effects are discussed in the Wildlife Section.

There would be moderate short-term adverse reductions to Scenic Integrity offset by moderate short and long-term perpetuation and enhancement of Landscape Character with either Alterative 2 or 3 as discussed in the Scenery and Recreation Section.

Unavoidable Adverse Effects

Implementation of any action alternative could cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of the use or condition of other resources. Some adverse effects are short-term and necessary to achieve long-term beneficial effects. Many adverse effects can be reduced, mitigated or avoided by limiting the extent or duration of effects. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen the significant adverse consequences. The application of Forest Plan standards and guidelines and resource protection measures are intended to further limit the extent, severity, and duration of potential effects. Such measures are discussed throughout this chapter. Regardless of the use of these measures, some adverse effects will occur.

Either Alternative 2 or 3 would remove a very small amount of late-successional habitat from the Matrix, well within the acceptable levels identified in the *Forest Plan* as discussed in the Vegetation Section. This would adversely affect the values of a very vocal group as discussed in the Social Section.

Either Alternative 2 or 3 would cause a reduction in visibility and unpleasant odors during the short periods in which prescribed burning occurs as discussed in the Air Quality Section.

There would be a low likelihood of increasing the on-site landslide potential in Alternative 2 as discussed in the Geology Section.

Either Alternative 2 or 3 would have a minimal short-term indirect effect of increased runoff with the potential for sediment delivery to streams, but no degradation of water quality is expected as discussed in the Water Quality Section.

Either Alternative 2 or 3 would have negligible to no effect on water temperature, turbidity and sedimentation, pool quality, large woody debris in streams, and streambank stability as discussed in the Fisheries Section.

There would be a very small to negligible increase in landslide risk due to a short-term reduction in root strength and transpiration in the thinned Geologic RRs, as well as minimal, short-term increases in runoff in all thinned RRs with Alternative 2 as discussed in the Riparian Reserves Section.

In the 1-acre area in the Geologic RR in Unit 137 that burned at a high intensity, the active slump would remain at an elevated risk of movement on this landslide until the area

revegetates. Revegetation would likely occur more quickly and successfully with Alternative 2, where logging slash would be hand piled and burned followed by planting trees, take longer with Alternative 3 where trees would be planted through the ground fuel, and take longest with Alternative 1 where natural regeneration would be relied upon as discussed in the Riparian Reserves Section.

Alternative 1 would leave high stand densities in the NSO Critical Habitat units that would continue to experience high mortality causing fuel buildups, increasing the risk of stand-replacing fire, and threatening the adjacent LSR. The stands proposed for regeneration would die out in Alternative 1, reducing the available foraging /dispersal habitat for NSO and habitat for other species. Either Alternative 2 or 3 would remove 8 acres of nesting /roosting and 42 acres of foraging NSO habitat (including Critical Habitat acres mentioned above). Either Alternative 2 or 3 would have limited noise disturbance of the NSO due to the use of mechanized equipment and smoke disturbance from burning. There is also the potential for secondary poisoning of various species from gopher baiting, although the likelihood is very low. Alternatives 2 and 3 would also have minor effects to goshawk, wolverine, Pacific fisher, pallid bats, and some Management Indicator Species. These effects are discussed in the Wildlife Section.

Minor to moderate changes to Scenic Integrity would be noticeable from sensitive viewpoints, but would not dominate the existing natural appearance with either Alternative 2 or 3 as discussed in the Scenery and Recreation Section.

No timber would be made available for local markets as discussed in the Economics Section with Alternative 1.

There would not be any new contributions to contract work with Alternative 1. With this Alternative, there would be adverse effects to those who value the creation of job opportunities and believe that achieving the desired conditions in the *Forest Plan* is wise management. With either Alternative 2 or 3, there would be a short-term increase in noise due to logging that would adversely affect residents, visitors, and those in the forest for renewal or spiritual practices. There would be adverse effects on the values of those who disagree with Forest Plan provisions, want only natural processes to operate in the forest, don’t want any trees or any large trees cut, want all old-growth retained, define roadless areas as any area between two roads, and who disagree with the Wild and Scenic River Act provisions allowing forestry activities in Wild and Scenic River corridors. These effects are discussed in the Social Section.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments are decisions affecting non-renewable resources such as soils, wetlands, cultural resources, or the extinction of a species. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or because the resource has been destroyed or removed. No irreversible commitments of resources were identified.

Irretrievable commitments apply to the loss of production, harvest or use of natural resources. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production.

An irretrievable loss of suitable habitat and timber productivity in the future is anticipated in 108 acres of regeneration stands in Alternative 1 and in 36 acres in Alternative 3 (Jones Gulch area), for the period of time it takes for these stands to regenerate naturally. A loss of timber productivity in overstocked stands is anticipated on 600 acres in Alternative 1 and on 30 acres in Alternative 3. A loss of suitable plant habitat is also anticipated on 30 acres for Alternatives 1 and 3 as discussed in the Vegetation Section.

Cumulative Effects

Cumulative effects have been discussed in the individual sections for Resource areas earlier in this Chapter, whenever applicable.

Either Alternative 2 or 3 when added to the effects of other past and current timber sales in the Salmon River would remove less than 1% of the late-successional and old growth vegetation in the North Fork and South Fork Salmon River, leaving 55.5% in late-successional vegetation in the North Fork and 47.8% in the South Fork, well above the 15% required by the *Forest Plan*, as discussed in the Vegetation Section.

The combined effects of either Alternative 2 or 3 with the other timber sales in the assessment area would have the beneficial effect of reducing overstocked stands, and reducing the acreage with high fuel loading in the landscape as discussed in the Vegetation Section.

Reducing the fire risk in individual units of multiple sales leads to a reduced fire risk across the landscape. The cumulative effects of road decommissioning in multiple projects would reduce the access for fire suppression and fuel management, but these are offset somewhat by the reduced opportunities for human-caused fire starts. The cumulative effects of road improvements in multiple projects would improve the access for fire suppression and fuel management. These effects are discussed in the Fuels Section.

The effects of prescribed burning in either Alternative 2 or 3 when combined with other actions in the air basin are expected to be similar to those of the past three years, which are minimized through coordination with the local air control pollution district and met Air Quality Standards as discussed in the Air Quality Section.

With Alternative 2, there would be a very small, localized increase in landslide potential in the headwaters of Jones Gulch. At the 7th field scale, the increase would be offset by decommissioning a short spur road, as discussed in the Geology Section.

The low intensity harvesting and fuel reduction activities in either Alternative 2 or 3 would minimize any cumulative effects on nutrient cycling and the soil's strong buffering capacity would reduce the possibility of any measurable long-term cumulative effect on soil productivity. Guidelines for maintaining soil productivity would be met as discussed in the Soil Productivity Section.

The cumulative watershed effects of either Alternative 2 or 3 in conjunction with other projects would range from none to low impact and minor, depending on the 7th field watershed. Negro/Hotelling would have an insignificant increase in runoff and sedimentation that would not lead to a noticeable decline in water quality in either Alternative 2 or 3 as discussed in the Water Quality Section.

The cumulative watershed effects of either Alternative 2 or 3 in conjunction with other projects would be negligible on water temperature, existing large woody debris in streams, and streambank condition. The effects on sediment would be as described above. With Alternative 2, there would be cumulative beneficial effects to large woody debris recruitment. With either Alternative 2 or 3, the one 7th field watershed that is above the inference point for disturbance levels, would be reduced when cumulative effects are considered as described in the Fisheries Section.

The cumulative watershed effects of either Alternative 2 or 3 in conjunction with other projects would reduce sediment delivery due to roadwork with the beneficial effect of restoring channel function as described in the Riparian Reserve Section.

The cumulative effects of either Alternative 2 or 3 in conjunction with other sales in the area would lead to an acreage reduction in NSO Critical Habitat that is inconsequential. There would also be a habitat loss for goshawk, wolverine, Pacific fisher, and pallid bats that would be dispersed across the fourteen 7th field watersheds; minimal effects on these individuals, and no loss of viability as discussed in the Wildlife Section.

The cumulative effects of either Alternative 2 or 3 in conjunction with other projects in the area would not alter the assessment area's suitability for WSRs. All actions taken together would be fully compatibility with the WSR Act, and its requirements to "protect and enhance" river values as discussed in the Wild and Scenic Rivers Section.

The cumulative effects on scenery would be minor across the vast project area, yet important around each activity area where valued vegetative attributes would be positively influenced, creating more stable and attractive recreational and community settings. Visual Quality Objectives would be achieved with either Alternative 2 or 3, maintaining scenic integrity, as discussed in the Scenery and Recreation Section.

Energy Requirements, Conservation Potential, Depletable Resource Requirements

Consumption of fossil fuels would occur with the action alternatives during logging and hauling timber and during the decommissioning of temporary roads. However, there are no

unusual energy requirements associated with this proposal nor is it the type of proposal that provides an opportunity to conserve energy at a large scale. Wood is a renewable resource. With the proper application of the *Forest Plan* standards and guidelines for soils, soil productivity would be conserved as discussed in the Soil Productivity Section.

Prime Farmland, Rangeland and Forest Land

The project area does not contain any prime farmland or rangeland. Prime forest land does not apply within the National Forest System.

Possible Conflicts with Other Land Use Plans

The proposed action and Alternative 3 are entirely on National Forest System land. Only small amounts of private land are intermingled. These alternatives are not in conflict with planning objectives for Siskiyou County or local tribes.

Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

Consultation with NOAA-Fish and the FWS has been conducted as required by the Endangered Species Act as discussed in the Fisheries and Wildlife Sections. As no water impoundments or diversions are proposed, the Forest is not required to consult with the FWS under the Fish and Wildlife Coordination Act.

As no ground disturbance is proposed in historical places, no consultation under the National Historic Preservation Act is required.