Chapter 4
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Chapter 4: Environmental Consequences

Introduction

This chapter discloses the potential effects of each of the alternatives described in Chapter 2, including the scientific and analytical basis for the comparison of the alternatives (Table 2.10). A discussion of incomplete and unavailable information, the potential effects of the proposed action and its alternatives on area resources, and compliance with other laws and regulations is included. The effects discussion is generally organized in the same order as the issues listed in Chapter 1:

- Forest Vegetation
- Soil Productivity
- Recreation
- Areas Without Roads
- Visual Quality
- Fish and Aquatic Habitat
- Water Resources
- Aspen
- Fuels/Air Quality
- Heritage Resources
- Transportation
- Non-Forest Vegetation (includes noxious weeds and threatened, endangered, and sensitive species)
- Wildlife Habitat (includes threatened, endangered, and sensitive species, management indicator species, and species of interest)
- Economics and Social
- Range

Effects are shown as being direct (occurring at the same time and place as the triggering action), indirect (separate in time and space from the action that caused them), or cumulative (the incremental effect of the project when added to effects from other past, present, and reasonable foreseeable actions). These effects are described in terms of increases or decreases, intensity, duration, and timing. The chapter ends with a discussion of compliance with the Forest Plan, various laws, and executive orders. For more detailed information, see the individual resource reports found within the analysis file for this proposal.

Incomplete or Unavailable Information

Incomplete or unavailable information was sometimes encountered in the process of preparing this EIS. The purpose of the environmental analyses contained in this EIS is to *"present the environmental impacts of the proposal and the alternatives in comparative form, this sharply defining the issues and providing a clear basis for choice among options by the decision-maker and the public"* (40 CFR 1502.14).

Forest Vegetation

Alternative 1

Direct and Indirect Effects: This alternative would allow the areas identified for treatment at this time to progress through natural successional patterns at their own rate with no outside manipulation. Current biological and ecosystem functions would continue as they are in the present condition. On-going management direction and activities such as grazing, fire protection, monitoring, and road maintenance would continue.

Untreated, the proposed areas would remain at high risk from insect infestations (Wall Ecosystem Analysis 1995). Conditions favorable for large-scale western spruce budworm defoliation (high stocking levels, multiple-storied mixed conifer species etc.) would continue. Bark beetle invasions following an outbreak would be expected to occur. As stated previously the area has recently experienced high levels of defoliation from Douglas-fir tussock moth. The tussock moth outbreak of 2000 and 2001 has ended, but other insects are expected to continue attacking and killing the trees weakened by the outbreak over the next several years (Scott 2002). Mortality from mountain pine beetle and western pine beetle outbreaks would increase, especially in the overstocked stands of ponderosa pine. Mortality from secondary invaders such as the fir engraver and pine engraver beetles would also intensify.

The current Douglas-fir dwarf mistletoe infestations in the areas would continue (71% of the analysis area is identified as moderate to high risk of additional infection). Existing levels of western dwarf mistletoe in the ponderosa pine would also proliferate (81% of the area is at moderate or high risk of infection). Douglas-fir and ponderosa pine with moderate-high mistletoe infections experience a marked reduction in growth and vigor and frequently develop substantial growth deformities such as brooming or severely twisted branches. Typically, smaller understory infected trees never reach maturity, succumbing to the parasitic plant or accompanying insect mortality agents. These abnormalities also result in the creation of a ladder fuel component. These ladder fuels can cause normally low intense ground fires to spread into the canopy of trees, increasing the potential for large-scale stand-replacing crown fires. Root diseases associated with mixed conifers that were identified within the project areas would also increase, producing additional mortality across large portions of the landscape.

Cumulative Effects: The ecological processes influencing the existing forest vegetation would continue. In the absence of regular fire disturbance and insect mortality associated with the overstocked conditions, Douglas-fir and grand fir invasion would continue to escalate and the stands would move further away from historical species composition and structure. Eventually, the stands would develop into successional climax Douglas-fir and grand fir dominated conditions (many of the areas proposed for treatment are exhibiting these conditions already). The establishment of these pest-susceptible, fire intolerant species would make meeting the objectives of restoring and maintaining long term ecologically sustainable, healthy forest stands unattainable. As stands continue to degrade, tree boles and litter would continue to accumulate on the forest floor. Continuity of available fuel would extend over a much larger area. Tree boles would form layers upon the forest floor and suspend fuels off the ground, facilitating drying and inhibiting the decomposition process. The longevity of the fuelbed would persist over time.

Stands would thin as disease, insects and weather effects continue to eliminate the number of standing trees. As the canopy opens, forbs, shrubs, and tree regeneration would exhibit greater vigor, increase in number, and grow up through the mat of fuels. Fire intolerant and shade tolerant species such as Douglas-fir and grand fir would continue to dominate, as conditions would remain unfavorable for the establishment of early seral species.

The risk of high intensity wildfires would continue to increase with the accumulation and continuity of fuels. Widespread torching, crown fires, and cambial damage to trees would produce high levels of mortality due to increased fire intensity and residence time (the time it takes for the fire to burn down). Residence time would also increase the risk of significant damage to soils. The

ability to control the fire through suppression activities would be low because of the heavy fuel accumulation and mat-like nature of the fuelbed compounded by the large material and by short to moderate range spotting produced by the fire. In the absence of regular low-intensity fire return intervals, these ecological processes would continue to perpetuate.

Alternative 2

Direct and Indirect Effects: The proposed action includes precommercial and commercial thinning on 4,989 acres. Stocking levels would be reduced to promote a more vigorous and sustainable stand of trees. The thinnings would discriminate against shade tolerant, invading climax species such as Douglas-fir and grand fir, where it is determined they are outside their historical range, and favor seral species that are more resistant to fire, drought stress, and insect attacks. Fuel loadings would be reduced, lessening the potential threat of a high intensity wildfire that could destroy most of the remaining live trees.

Generally, the existing stocking would be reduced to approximately 60-80 sq.ft basal area per acre (approximately 75-90 trees/ac. at an average dbh of 12") (Powell, 1999). All proposed treatment acres would have enough residual live trees to leave an adequately stocked stand which would not require planting after harvest. Figure 4.1 shows a unit of the Tamarack Commercial Thin timber sale that was logged in 1997. The stand is located within the Rimrock Planning area and was thinned according to a marking prescription very similar to what is proposed under this alternative.

WHILE NO CHANGE IS EXPECTED IN the existing structural stages, all of the proposed thinning treatments would move the stands toward a more open, single-story condition, with higher percentages of ponderosa pine and western larch. Douglas-fir and grand fir would remain significant components of the forested stands, although the percentage of those species would be reduced relative to the more insect, disease, and fire resistant ponderosa pine and western larch. With the exception of hazard trees in Bull Prairie campground, no live trees 21 inches dbh would be removed, retaining the late/old structural composition across the landscape.

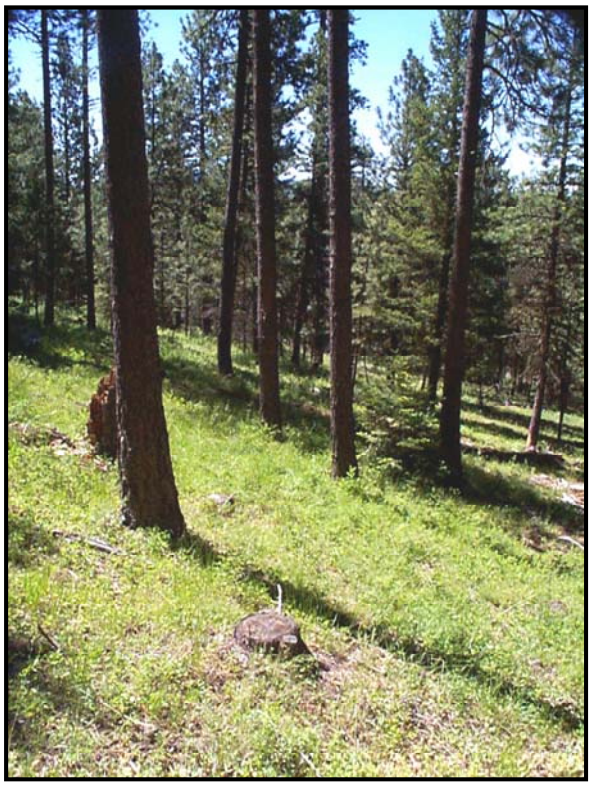


Figure 4.1 Tamarack Commercial Thin, Unit 1. Photo by Don Justice

The thinnings would greatly diminish the mortality caused by insect and disease agents, reduce future susceptibility to widespread damage, and leave stands in a more vigorous condition by:

- Discriminating against western spruce budworm host species, where appropriate, and returning stands to a more historical species composition and structure
- Lowering the stocking levels within stands below the zone of imminent susceptibility from beetle attacks
- Removing trees infected with dwarf mistletoe and other diseases
- Thinning from below around larger trees to allow for improved availability of site resources and promote longer health of larger trees

- Favoring disease resistant species within identified infected areas
- Permitting the reintroduction of low-intensity, regular interval underburning with its many associated ecosystem benefits

Wildfires would be of decreased intensity due to limited amounts of fuel available for combustion. There would be greater amounts of grass, forbs, and light litter with less amounts of heavy tree residues such as limbs and boles. Areas where fuels are concentrated would be isolated and readily contained within the treated area and torching would occur on a limited basis.

Stands within the Indian Creek subwatershed that have been left below recommended stocking levels due to the Douglas-fir tussock moth outbreak would remain understocked. The stands would eventually seed in to a mixture of Douglas-fir and ponderosa pine similar to the conditions prior to the tussock moth outbreak. As the trees killed by the defoliation and ensuing insect attacks deteriorate and fall, the fuel levels would put the stands at risk of a high intensity wildfire.

Aspen stands are considered unique habitats. Aspen stands have been declining in abundance in recent decades. The 12 aspen stands in the Rimrock are generally in poor health with little reproduction. The fencing and other aspen restoration activities proposed for this and other action alternatives would stimulate new growth and protect both the new and existing aspen trees and sprouts. Fencing has been successful in reinvigorating aspen stands on the Heppner Ranger District. Figure 4.2 shows the results after 2 years of fencing an aspen stand on the Heppner Ranger District near the Rimrock planning area.

Figure 4.2. Long Prairie Aspen Fence

Cumulative Effects: As previously discussed, a comparison of historical and existing vegetation conditions for the Rimrock Project Area revealed a substantial decline in ponderosa pine forest over the last 60 years both in species composition and structural stages (Wall Watershed Analysis 1995). Implementing the thinning proposals included in the proposed action, in conjunction with future reintroduction of low-intensity prescribed fire at regular intervals, would reverse this departure from historic ecosystem functions. Thinnings also respond favorably to the

following vegetation trends identified in the scientific assessment for the Interior Columbia Basin: substantial declines in single-layer old forest structures; increased structural complexity in the absence of natural disturbance regimes; increased stand density and forest stocking; increased homogeneity in both forest composition and structure; and substantial increases in the amount of lethal fires (Quigley and others 1996).

This alternative would not increase the 1,323 acres (approximately 3%) of existing created openings in the project area since all proposed units would be more than adequately stocked after treatment.

About 12% (4,989 acres) of the Rimrock project area would have a significantly decreased risk of density induced insect and disease mortality for several decades. An ecologically sustainable condition would be restored and maintained by promoting seral species composition and accelerating progression towards the desired late/old structural stage.

Underburned areas would provide suitable sites for natural regeneration of early seral species such as ponderosa pine, which through time would predominate. Grasses, forbs, and shrubs would also increase in vigor due to decreases in canopy closure. Underburning as proposed in this alternative would not, by itself, alter any stand structural stage. However, underburning would help maintain an open, single-story stand structure by killing some of the seedlings and saplings in the treated areas. Since a relatively high percentage of the seedlings and saplings are grand fir and Douglas-fir, the underburning would tend to favor the larger ponderosa pine and western larch that are more resistant to fire, insects, and disease.

The thinning treatments described in the proposed action are also designed to minimize the risk of another stand replacement fire similar to the Tower and Wheeler Point fires of 1996. The recommendations are also consistent with several of the 11 points contained in the Oregon Governor's Proposed Eastside Forest Health Strategy (Kitzhaber 1997).

Alternative 3

Direct and Indirect Effects: Under this alternative, 45 fewer acres would be commercially thinned than in Alternative 2 so the effects would be similar except for the amount of area disturbed. The objective of this alternative is to minimize the hydrologic impacts of utilizing existing closed roads located within RHCA's as haul routes. Areas where access required the construction of temporary roads across RHCA's were eliminated from harvest consideration if they could not be mitigated. In this alternative, all ground based logging would be accomplished using harvester/forwarder equipment. This would substantially reduce the impact of harvest activities on soil disturbance and compaction within the treated units. One study conducted in the Blue Mountains 15 miles southwest of Ukiah, Oregon, examined the effects of harvest on soils using a harvester/forwarder logging system. The study demonstrated that the erosion hazard from exposed or compacted soil is low and the very localized soil displacement and small increases in soil bulk density would be expected to have little or no effect on site productivity (Kellogg, L. and others 1995). Another study revealed a 53% reduction in soil compaction on main skid trails using a harvester/forwarder system versus a conventional whole-tree harvest and skidder system with a 26% reduction in soil disturbance (Understanding and Managing Soil Compaction to Maintain Ecosystem Productivity 1997). For the Rimrock Project, an estimate of the area of soil disturbance produced by logging activities for each alternative was determined. Approximately 109 fewer acres were estimated to be not disturbed under alternative 3 as compared to alternatives 2 and 4. All harvester/forwarder units were analyzed assuming 6% soil disturbance compared to 12% soil disturbance for tractor/skidder units. Helicopter units were assumed to have negligible disturbance (assumptions were made using references from McIver, 1998 and from personal conversations with Craig Busskohl, Soil Scientists, U.S.D.A. Forest Service, Umatilla National Forest). Non-use of the RHCA closed roads would promote hydrologic stability and long-term temperature decreases by vegetation establishment and propagation (shading).

Cumulative Effects: The potential for short-term erosion and sedimentation deposits into RHCA's from the temporary road construction accessing the 45 acres would be eliminated.

Additionally, existing vegetation established on the closed roads not being utilized would be permitted to continue to grow, obliterating the road in a more natural pattern. The degree of soil disturbance and compaction using the harvester/forwarder system would be significantly reduced. However, the untreated stands would remain at elevated stocking levels, leaving them at high risk for attack by insects and pathogens and subsequent stand replacement fires. The areas would continue their departure from a more natural, historical ecosystem composition and function. Excluding the untreated 45 acres, other effects would be the same as Alternative 2.

Alternative 4

Direct and Indirect Effects: Under this alternative, 500 fewer acres would be treated than in Alternative 2. Units were evaluated according to their economic feasibility (logging cost vs. timber volume, road costs, etc.). Units determined not to be economically viable were excluded from treatment consideration. The direct and indirect effects on the untreated 500 acres would be the same as in Alternative 1.

Cumulative Effects: The effects on vegetative sustainability would be the same as in Alternative 2, with the exception of the 500 acres not treated. Those areas not treated would progress the same as in the no action alternative.

Alternative 5

Direct and Indirect Effects: The effects of Alternative 5 would be the same as Alternative 3 with the following exceptions:

Approximately 122 acres of heavily defoliated stands in the Indian Creek subwatershed would be regenerated by removing dead and severely defoliated trees. Those stands would be planted with species that have shown greater resilience on dry sites. That treatment would move the stand more quickly toward the desired condition of a fully stocked stand of relatively open trees dominated by ponderosa pine.

Cumulative Effects: The effects on vegetative sustainability would be the same as in Alternative 3.

Soil Productivity

Introduction

The Umatilla Forest Plan Standards and Guidelines for soil productivity are designed to maintain a minimum of 80 percent of a project area (or cutting unit) in a nondetrimental soil condition with respect to the effects of compaction, displacement, and erosion (Forest Plan 4-43). This section will focus on evaluating the effects of the proposed action and other alternatives on those three components of detrimental soil conditions. A fourth component, soil stability or susceptibility to mass wasting, is often a concern in evaluating timber harvest practices. However, soils in the Rimrock area are generally stable. No timber harvest or related activities have been proposed on any soil rated as unstable. For that reason, soil stability is not a concern in this project, and will not be evaluated any further in this section.

Many of the proposed activities have the potential to affect soil productivity in some way. Timber harvest and prescribed burning would take place over large areas and, as a result, could affect soils in varying amounts and intensities across the landscape. The amount and intensity of soil impacts would depend on type of logging system, amount and location of road building and maintenance, timing and intensity of prescribed burning, and the mitigation measures attached to those activities. Stream crossing improvements, fish structure maintenance, and road obliteration take place over much smaller areas, but can be of concern due to the location or intensity of soil disturbance. The effects of each of these activities are discussed in more detail below.

Direct and Indirect Effects:

Timber Harvest

Timber harvest and related activities can contribute to compaction, displacement, and erosion of soils. The most severe compaction and displacement would occur in temporary roads and landings constructed for the timber harvest operations. Compaction, displacement and increased potential for erosion would also occur throughout harvest units, depending on the type of logging system used. Four types of logging systems are proposed in the alternatives. Forwarder, helicopter, and horse logging systems are proposed in alternatives 2 through 5 and tractor logging is proposed in some units in alternatives 2 and 4. The monitoring and evaluation reports for the national forests of the Blue Mountains for fiscal years 1999 and 2000 describe the results of monitoring of the impacts of forwarder, tractor and helicopter logging practices on the Umatilla National Forest. According to those reports, Forest Plan standards and guidelines for soil productivity were achieved with all three logging systems. The following sections compare the expected impacts from the different logging systems.

Tractor Logging System

Tractor logging refers to skidding logs with either crawler tractors or rubber-tire skidders. Logs are dragged along the ground behind the tractor or skidder. Of the types of logging systems proposed in this EIS, tractor logging has the most impact on the soil. With repeated trips over a skid trail, the entire trail receives some amount of disturbance and compaction. The amount of compaction and disturbance depends on the amount of area included in landings and skid trails. A mitigation measure included in all alternatives states that skid trails would not cover more than 15% of the harvest units. The most common way to accomplish that requirement is by restricting the distance between skid trails. Experience on the Umatilla National Forest has been that the amount of soil disturbance has been approximately 10% to 14% when skid trail spacing has been restricted to a minimum of 100 feet.[1]

Forwarder Logging System

Forwarder logging systems would have less impact on soils than tractor systems. Forwarders carry the logs in a bunk rather than dragging them along the ground. The soil beneath the tracks or wheels would be compacted, but the amount of surface disturbance and displacement would be much less. In one study in eastern Oregon, the area disturbed with a forwarder logging system was approximately 6% (McIver 1998). The 1999 and 2000 monitoring and evaluation reports for the national forests of the Blue Mountains found similar results during monitoring of timber harvest activities on the Umatilla National Forest.

Helicopter Logging System

Helicopter logging systems generally have the least impact on soil compaction and soil disturbance of any logging system. Logs are lifted off the ground and carried directly to the landing with the helicopter, so that heavy equipment is not used anywhere except at the landings. Helicopter landings are typically larger than tractor or forwarder landings, but are spaced wider apart due to the longer travel distance possible with helicopters.

Horse Logging System

Soil disturbance caused by horse logging would be less than that caused by tractor logging systems. The units proposed for horse logging in all Rimrock alternatives would be required to be logged over snow. Logging over a snow pack would eliminate most impacts to the soil.

[1] Descriptions of the amount of soil disturbance for timber sales on the Umatilla National Forest can be found in the 1998, 1999, and 2000 Monitoring and Evaluation reports for the Blue Mountains.

Effects of timber harvest on soil productivity

Alternative 1

No new activities affecting soil productivity would take place. Soil conditions would remain essentially as described in Chapter 3 of this document.

Alternatives 2 – 5

Table 4.1 through Table 4.3 compare the alternatives in terms of potential for compaction, displacement, and erosion and by type of logging system. Soils with high susceptibility to compaction, displacement, or erosion are of most concern when looking at the effects of the proposed timber harvest. Figures 4.3 through 4.5 show the relative percentages of each logging system in the areas of high concern.

Compaction

Table 4.1 shows that over one-half of the acres proposed for treatment in alternatives 2 through 5 are rated as highly susceptible to compaction. This is not unexpected, since volcanic ash soil are the most susceptible to compaction, and volcanic ash soils are also the most likely to support the densely stocked fir understory stands targeted for treatment in the Rimrock timber harvest proposals.

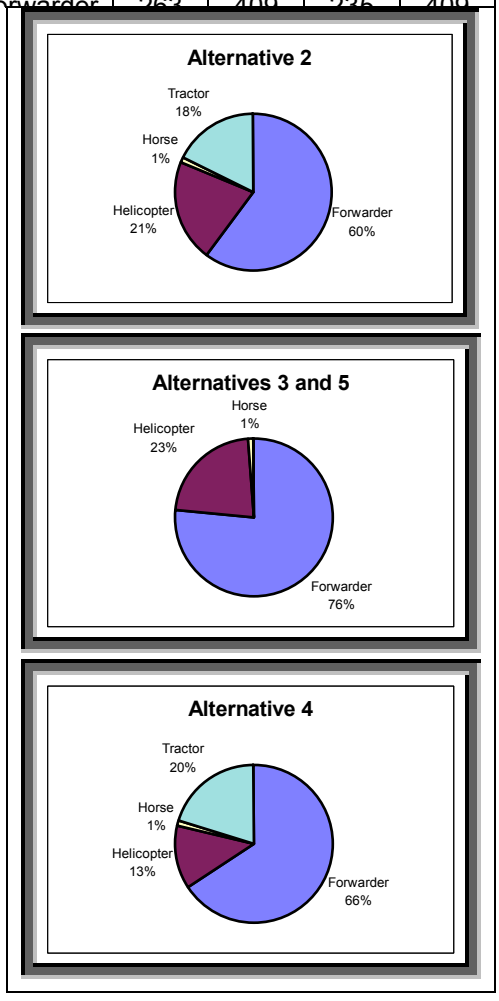
Alternative 4 would have the greatest potential to cause detrimental soil compaction since it has the most acres of tractor logging on highly compactable soils.

Alternatives 3 and 5 would have the lowest risk of detrimental compaction because of the higher percentage of helicopter logging and by prohibiting tractor logging.

Table 4.1. Susceptibility to compaction

Susceptibility Rating	Logging System	Acres			
		Alt 2	Alt 3	Alt 4	Alt 5
High	Forwarder	1,676	2,110	1,676	2,110
	Helicopter	592	623	334	623
	Tractor	500	0	520	0
	Horse	29	29	29	29
	Subtotal	2,797	2,761	2,558	2,761
Moderate	Forwarder	291	1,004	291	1,004
	Helicopter	58	81	19	81
	Tractor	737	0	723	0
	Subtotal	1,086	1,085	1,033	1,085
	Forwarder	263	409	235	409

Figure 4.3. High susceptibility to compaction.

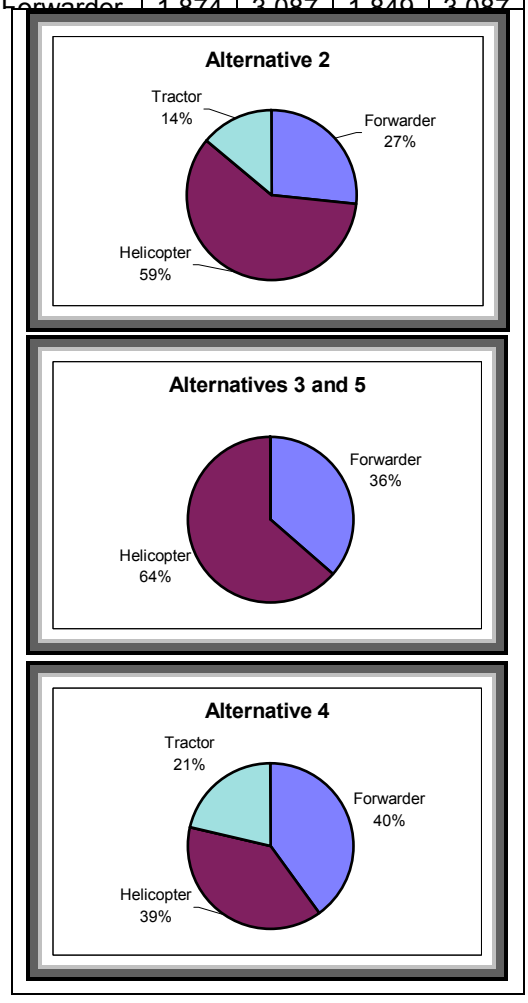


Alternative 2 would log the most high susceptibility acres, and Alternative 4 would log the fewest high susceptibility acres. However, alternatives 3 and 5 would have the fewest acres of detrimental compaction due to the higher percentages of helicopter and forwarder logging systems. Under alternatives 3 and 5, 99% of the proposed harvest units would be logged using those two systems.

Table 4.2. Susceptibility to displacement

Susceptibility Rating	Logging System	Acres			
		Alt 2	Alt 3	Alt 4	Alt 5
High	Forwarder	236	319	232	319
	Helicopter	522	556	225	556
	Tractor	122	0	124	0
	Horse	1	1	1	1
	Subtotal	880	875	582	875
Moderate	Forwarder	121	116	121	116
	Helicopter	100	118	48	118
	Tractor	13	0	29	0
	Subtotal	234	234	198	234
	Forwarder	1,874	3,087	1,849	3,087

Figure 4.4. High susceptibility to displacement.



Displacement

For all alternatives, less than 20% of the acres proposed for timber harvest are rated as highly susceptible to displacement. More than 75% are rated as having low susceptibility to displacement.

Alternatives 3 and 5 would have the fewest high susceptibility acres affected due to the higher percentages of forwarder and helicopter logging systems, and Alternative 4 would have the most high susceptibility acres affected.

Alternative 4 would have the greatest potential to cause detrimental soil displacement since it has the most acres of tractor logging on soils with a high susceptibility to displacement.

Alternatives 3 and 5 would have the lowest risk of detrimental displacement because of the higher percentage of helicopter logging and by prohibiting tractor logging.

Erosion

Approximately 40% of the proposed treatment acres in each alternative are rated as highly susceptible to erosion. Only about 5% of the acres are rated as having low susceptibility to erosion.

Once again, alternatives 3 and 5 would have the least impact on high susceptibility units. All high susceptibility units would be logged with either helicopter or forwarder systems, which produce little soil disturbance relative to tractor logging. The biggest risk of erosion with helicopter logging would be the landings near streams. The extra precautions described under mitigation measures in Chapter 2 would reduce most of the erosion from those landings by stabilizing the soil or by providing barriers to prevent the soil from moving off the landings.

Alternative 4 would have the greatest potential to cause detrimental erosion since it has the most acres of tractor logging on soils with a high susceptibility to erosion.

Alternatives 3 and 5 would have the lowest risk of detrimental erosion because of the higher percentage of helicopter logging and by prohibiting tractor logging.

Table 4.3. Susceptibility to erosion

Susceptibility Rating	Logging System	Acres			
		Alt 2	Alt 3	Alt 4	Alt 5
High	Forwarder	575	1,187	546	1,187
	Helicopter	687	762	300	762
	Tractor	699	0	715	0
	Horse	0	0	0	0
	Subtotal	1,961	1,950	1,562	1,950
Moderate	Forwarder	1,466	2,126	1,466	2,126
	Helicopter	246	256	158	256
	Tractor	672	0	658	0
	Horse	28	28	28	28
	Subtotal	2,412	2,410	2,310	2,410

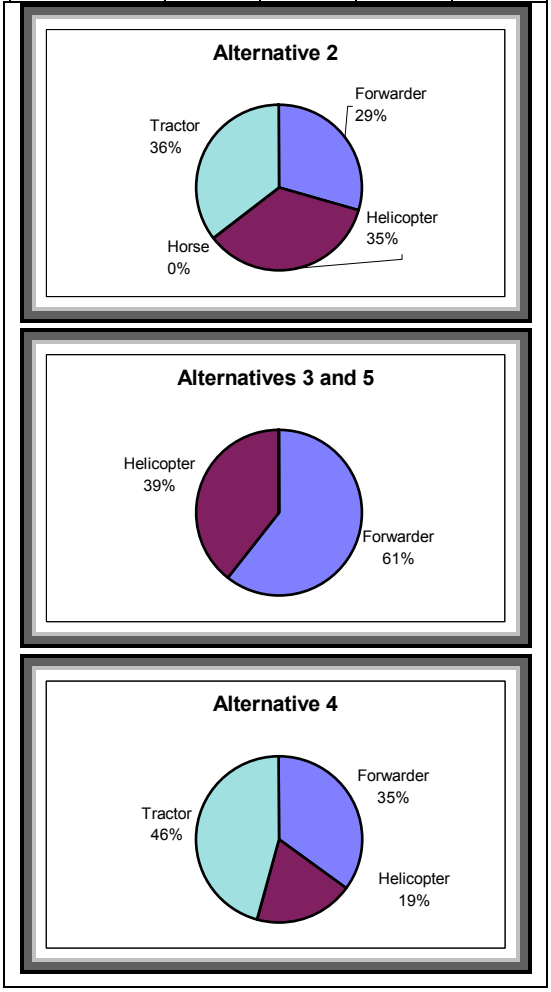


Figure 4.5. High susceptibility to erosion.

Temporary roads

Temporary road construction is the harvest related activity that would have the most impact on soil productivity. Displacement and compaction would be expected wherever new temporary roads are constructed. Assuming an average temporary road width of 12 feet, the total area affected by temporary roads would be approximately 15 to 20 acres, which is approximately 0.05 of the total planning area. However, roads have a disproportionate effect on the amount of erosion that could potentially take place because roads tend to accumulate and channel sediment during runoff.

Most of the temporary roads proposed for the Rimrock project would be located on ridges or distant from streams where the risk of erosion would be low. Mitigation measures of subsoiling, revegetation with native species, construction of erosion control cross-ditches, and obliteration would control most of the potential erosion from the area.

Cumulative Effects of Timber Harvesting: As discussed in Chapter 3, proposed harvest units were reviewed in the field to estimate the current conditions of the soils with regard to detrimental soil conditions as defined by the Forest Plan. Approximately 98% of the area was rated as low level of concern with regard to detrimental soil conditions based on those surveys. Most of the units proposed for harvest have had only one previous entry, and most of them have not had a timber harvest entry during the past 30 years. Considering the low level of existing detrimental soil conditions and the design, including mitigation measures, of the proposed alternatives, all alternatives would be able to meet the Forest Plan standard of maintaining a minimum of 80% of the soils in the proposed harvest units in an acceptable productivity level.

Prescribed burning

The season of burning would have some influence on fire's effect on soils and plants. Spring burning would generally have less impact as the soil and duff are moister and fewer fuels are available to burn. Fires are generally low intensity. The large down woody materials usually have too high of a moisture content in the spring for complete combustion. Fall burning generally leads to more complete combustion of the larger materials and may have a greater soil impact due to reduced soil moisture, lower duff moisture, and more fuel availability. Fall burning generally takes place after some moisture has been received, but before the fall rains and snow. In this manner, it differs from a wildfire during the fire season, which occurs when conditions are driest and has the greatest impact on the soil and soil microorganisms. Burning during either spring or fall is expected to reduce the understory of shade tolerant trees, have a slight impact on the overstory trees, and would reduce the fine fuel and shrub layers.

Fire, natural or prescribed, often results in increased microbial activity in the soil and increased nutrient availability for plants and microbes. Soil temperatures rise after fire due to decreased plant cover and decreased litter layers. Carbon, in the form of dead plant tissue, is increased in availability for soil microorganisms (Woodmansee and Wallach 1978). Increased nitrate nitrogen availability is caused by the interruption of plant growth and increased nitrification. In central Washington, nitrification was increased six-fold and available phosphorus increased two-fold after a wildfire for a period of up to 4 years (Wright, 1978).

Prescribed fire can have neutral effects on soil water and watershed hydrology. Generally there is more water available for runoff due to decreased evapotranspiration after a wildfire. There is anecdotal evidence of increased mass wasting after some wildfires. Peak flows often increase in magnitude and there may be some changes to the timing of snowmelt runoff (Swanson, 1978; Wright 1978). Low intensity fires generally least affect water storage capacity of the soil as they have little impact on soil organic matter and the duff layer. Hydrophobicity resulting from soil heating is generally not a problem with low intensity fires as hydrophobicity most often occurs when the soil is dry, there is a high thermal gradient within the soil, and the fire is of high intensity, typical of late summer wildfires (Swanson, 1978).

Cumulative effects: Most of the timber harvest units would also be underburned following harvest. There would no additional compaction or displacement from the combined treatments. There is some risk of increased erosion if substantial portions of the timber harvest units are burned with sufficient intensity to cause soil exposure. Experience on the Umatilla National Forest has been that prescribed fires in stand conditions such as those in the Rimrock area are generally of low to moderate intensity and are very patchy in nature. There would be areas where the soil surface has been exposed by the underburning, surrounded by areas where the soil litter and duff layers have had little or no disturbance. Under those conditions, the risk of additional detrimental soil conditions from the combination of timber harvest and prescribed burning would be low.

Where tractor logging takes place, burning of landing piles would cause more severe soil damage directly under the piles. The effects would be limited to the location of the piles. The typical size of a landing pile would be approximately one-fiftieth of an acre.

In-stream structure maintenance

There would be a short-term, localized increase in erosion risk due to having soil exposed by heavy equipment operation. The risk would be reduced in intensity and duration by the design feature of prompt revegetation of disturbed soil with native species.

Road reconstruction, closure, and maintenance

There would be a short-term, localized increase in erosion risk due to having soil exposed by heavy equipment operation. The long-term effect on soil productivity would be largely beneficial. Much of the soil productivity would be restored over time due to reduced compaction, increased water infiltration, improved root penetration, and reduced erosion risk as the areas revegetated.

Recreation

Alternative 1

Direct and Indirect Effects: This alternative represents the existing condition and little or no change would occur to the character of Bull Prairie Campground. Hazard tree removal would continue to take place and though it is not as effective as the proposed commercial thinning, it is adequate to maintain the current standard of the campground. Fishing opportunities would remain the same as no activities proposed in the Rimrock EIS change the lake or it's characteristics. The lake is a stocked fishery and would continue to be stocked. Dispersed camping sites would remain in their current condition; however, any wildfires resulting in the large-scale loss of overstory trees would negatively affect camping areas and aesthetics as well as present safety concerns to the public (of wildfires). Hunting and OHV opportunities would likely remain the same. In the short term, ecological condition of the stream systems within the Rimrock Analysis Area is not expected to change significantly, therefore, fishing opportunities would not likely be affected.

Cumulative Effects: The continued increase of fir understory within and around Bull Prairie Campground has the potential to negatively affect the open setting of the campground. Without fir thinning and landscape prescribed under burning, the increasing fuel loads elevate the threat of wildfire. This would create safety hazards, from the actual fire and after effects, to recreation users within the campground. Bull Prairie Lake is a stocked fishery; therefore, fishing opportunities would not likely be affected by the no-action alternative. Dispersed camping, hunting, and OHV opportunities would remain the same. However, fishing opportunities in streams within the project area could be reduced due to declining water quality and dilapidated fish structures. Without prescribed under burning in the general forest area, the same potential for wildlife exists as in Bull Prairie Campground. This creates safety hazards to all recreation users.

Alternative 2, 3, 4, and 5

Direct and Indirect Effects: Activities associated with commercial thinning in Bull Prairie Campground and prescribed burning in the entire Rimrock Project area would present safety issues for the public. Campground and general forest area aesthetics would be negatively affected during and shortly following the project until the slash is treated and skid trails restored. For safety reasons, a portion of the campground would be closed during harvesting and burning activities.

Hunting activities may be disturbed during thinning and burning activities. All other projects would occur during periods when hunting activities are low. Other dispersed recreation activities may notice conflicts related to increased vehicle traffic from harvest and thinning activities, in-stream structure projects, roadwork, increases in smoke and dust particles, or fencing projects. Most encounters would be minimal and short-term. Many dispersed recreation activities would be restricted during the time of project implementation, specifically harvest and prescribed burn periods. Overall, this area is not a high use recreation region, so conflict or encounters should be low.

Harvest activities during winter months often create increased access to areas that would not normally be opened to vehicles. Nordic skiers and other winter forest users can use roads that remain open due solely for the use of harvest operations. This duel use of winter roads can create congestion between recreationist and harvest activity vehicles.

Cumulative Effects: The maintenance of a healthy open pine overstory would promote long-term aesthetic qualities consistent with the plant associations for this area as well as the management objectives of Bull Prairie Campground. Large-scale removal of potential hazard trees would improve safety conditions within the campground area and a healthier tree overstory over time would result in fewer hazard tree concerns. High intensity fire would be less of a threat to the recreational use of the area. Overall, dispersed recreation opportunities would not be expected to change significantly with the proposed action alternative. Stand densities would be reduced to stocking levels appropriate for the plant association and saplings would be thinned to promote growth, restore and maintain a more sustainable species composition, which would provide a healthier, therefore, a safer atmosphere for recreational users. Big game hunting successes may be reduced (especially for elk) as a result of reduced cover and changes in elk numbers and distribution within the project area. The number of dispersed camping areas would not decline significantly. Fishing opportunities may increase as structures provide habitat and a greater survival opportunity for fish.

Areas Without Roads

Changes in natural integrity, apparent naturalness, solitude, remoteness, special features, and manageability, will be used to describe any potential effects proposed activities may have to the undeveloped areas within the project area. Natural integrity is the extent to which long-term ecological processes are intact and operating. Apparent naturalness is an indicator of whether an area appears natural to most people who are using the area. Solitude is defined as isolation from the sights, sounds, and presence of others and the development of man. Remoteness is the perceived condition of being secluded, inaccessible, and “out of the way”. Special features are unique geological, biological, ecological, cultural, or scientific features located in the area. Manageability relates to the ability of the Forest Service to manage an area to meet the size criteria for wilderness consideration (at least 5,000 acres) and maintain the 5 elements listed above.

Alternative 1

Direct and Indirect Effects: Alternative 1 is the No Action Alternative, thus no management actions would occur under Alternative 1. Therefore, there would be no effects to natural integrity, apparent naturalness, remoteness, solitude, special feature, and manageability to the areas

without roads and their characteristics. Any changes to the areas would be through natural processes only.

Cumulative Effects: There would be no cumulative effects to the undeveloped character of the areas with this alternative

Alternative 2, 3, 4, and 5

Direct and Indirect Effects: There is little difference between action alternatives regarding the activities planned in the areas without roads. No new road construction is planned in any of the undeveloped areas, in most cases, harvest is confined to ridge tops, and units are located along or near existing roads. The major difference between Alternatives 2, 3 and 5 and Alternative 4 is the 68 acres of harvest along the edge of the largest unroaded area. Harvest in this unit will be done using helicopter logging and will not include new road construction. Other differences between alternatives are minor and include different methods of logging within the same units.

Effects of vegetation management activities on undeveloped characteristics would be short lived and include such activities as unit flagging, painted trees, and trees left with scars from logging such as where they were bumped by a felled tree or logging equipment. Other changes to the undeveloped characteristics from the vegetation management activities would be longer lived. The changes would include cut tree stumps, skid trails (where helicopter harvest was not used), and changes in the vegetative patterns.

The natural integrity and apparent naturalness of the undeveloped areas will be only slightly reduced after harvest activities are completed. As noted previously, most harvest is located on ridgetops and all harvest is adjacent to existing roads. Within the harvest areas, the presence of man would be evident, but because of past harvest activity, the human induced change in the areas would be insignificant. Human activity in the areas is not expected to increase after harvest is complete.

All of the unroaded areas within the project area are irregular in shape and with one exception, the most isolated portions of the areas are within one-half mile of an existing system road. Consequently there is currently little opportunity for either solitude (isolation from the sights, sounds, and presence of other and the development of man) or remoteness (the perceived condition of being secluded and inaccessible) within the undeveloped portions of the area. The sights and sounds of logging would decrease the opportunities to experience solitude and recreationists seeking this type of experience would be likely to avoid the project area for the duration of the timber sale. However effects from harvest activity would be short duration; long term there would be little change from the exiting conditions.

No special features were noted in any of the undeveloped areas. All undeveloped areas are considerably smaller than 5000 acres and thus, do not meet the size criteria for wilderness designation. There are no Rare II areas located in the project area and none of the undeveloped areas are adjacent to Rare II areas.

Cumulative Effects: As noted previously, various management activities have occurred in the undeveloped portions the planning area. Past timber harvest, grazing, all terrain vehicle use, and existing non-system roads have already impacted the areas. These activities are expected to continue, and it is possible that within the reasonably foreseeable future, harvest activity may occur in other portions of the undisturbed areas. Such activities could further reduce the unroaded attributes of the areas.

Visual Quality

Alternative 1

Direct and Indirect Effects: Present viewsheds and their Visual Quality Objectives would not be altered by management activities; changes would be shaped by natural events. Scenic character would be subject to cyclical, natural disturbance processes such as insect and disease, fire, wind, drought, and vegetation succession. The current state of the forest vegetation and its related density and species composition could contribute towards insect and disease susceptibility, to a scale that would be out of proportion with a natural appearance of tree mortality. This could ultimately alter the scenic quality of the area. The desired openness of the forest trees within the viewsheds of Highway 207, Forest Road 2039, and areas around Bull Prairie Reservoir would be delayed if no manual action occurs.

Cumulative Effects: Past forest management practices have left much of the Rimrock Project area with less desirable visuals of dense stands, resulting in the lack of texture and line. Alternative 1 would continue moving stands toward this adverse vegetation. Past vegetative treatments have had minor effects on visuals.

Alternative 2, 3, 4, and 5

Direct and Indirect Effects: There is little to no difference between action alternatives regarding management activities affect on visual attributes. Within the designated viewsheds and Bull Prairie Recreation Site few differences occur between action alternatives. Of the 1,458 acres of designated viewsheds, 50 acres would be precommercially thinned and 65 to 68 acres would be commercially thinned. In the 204 acre Bull Prairie recreation site, 27 acres would be commercially harvested using draft animals.

Precommercial thinning in the foreground would occur along Highway 207 allowing for greater scenic views, open grown forest, and characteristic species diversity. Removal of saplings throughout this area would also initiate stand progression toward a healthier and a more viable forest, thus attributing to the scenic integrity of the viewshed. Hand piling and burning of the newly created slash and debris would reduce any long term impacts of the precommercial thinning activities. Stump height would need to be kept to a minimum, while line and color would be softened as grass and shrub layers become established.

Commercial thinning would occur on 25 to 28 acres along the Highway 207 viewshed. The increase in texture would create a more structurally diverse and desirable middle ground, as well as increase visual depth. As with the precommercial thinning, stump heights should be kept to a minimum and burn piles kept small.

Commercial thinning occurring in the A3 viewshed would reduce dense and or unhealthy characteristics of several areas. Southeast of Bull Prairie Reservoir the dense vegetation has changed the scenic character of the area. By thinning we can direct the form back toward the historically, more open and desirable landscape.

The Bull Prairie Recreation Area has a large amount of disease within the dense stands. The Forest Plan assigns Visual Quality Objectives of retention and partial retention for this recreation site. In order to obtain the desired condition, this area needs rehabilitation toward the characteristic landscape of open-large ponderosa pine stands, thinning can direct and maintain this visually desirable feature. Due to the high population of diseased trees within the Bull Prairie campground, some openings that would be created may temporarily lead towards the definition of modification, but the duration of this impact should only be for a year or so, until the line and color is softened by grasses and shrubs. The harvest activity would occur using draft animals while there is snow on the ground, thus reducing visual impacts created through soil disturbance and damage to remaining trees. To reduce the visual impact of the thinning, slashing of damaged saplings would be incorporated in the hand piling and burning of debris created from the harvest.

All other management areas within Rimrock allow for a complete range of visual quality objectives with various resources being the driving force behind the management strategy (See Table 3.6). Disturbances caused by the construction of temporary roads and the associated harvest of trees would have the largest impact on visual quality. This impact would be caused by contrasts

created between the current landscape and the managed landscape. This contrast involves changes in form, line, color, and texture of soil and vegetation.

Timber harvesting and associated road changes could modify the existing landscape to varying degrees, which would be more or less apparent at different distances. The significance of these actions would be dependent on the viewing distance. The longest lasting visual disturbance is typically caused by exposing soil from road construction. Harvested treatment units over time would recover to a less noticeable visual condition, while low standard roads can remain noticeable for years.

Any temporary road construction within the Rimrock Project area would be rehabilitated after thinning is completed, but visual impacts from change in form and line will remain visible for many years to follow. Under all action alternatives four miles of road would be decommissioned and 10 miles would be obliterated. This work would reduce, the form, line, and color contrasts that are currently present, and drive forward the recovery process of revegetating road surface and recontouring the land surface, resulting in overall greater scenic integrity.

The selective nature of the proposed thinning would minimize the impact to visuals, leaving a fully stocked forest of live trees as well as snags and large debris on the forest floor. In alternative 5, where salvage logging would remove a larger number of trees in a localized area, post-harvest reforestation would accelerate the vegetative recovery process. The duration of recovery is directly related to the extent of disturbance. In a year or so, herbaceous vegetation should cover most disturbed sites.

Opportunities to minimize visual effects are greater on ground with slopes less than 30 percent. This is because the size and shape of a harvest unit can be manipulated on the gentler slopes more effectively to screen disturbance. The use of helicopter based removal systems on slopes over 35 percent would reduce the visibility that harvest activities might have when readily viewed. In alternatives 3 and 5 all ground based harvest activities would occur using a forwarder rather than a tractor, thus reduced soil disturbance results in a more desirable contrast of color, line, form and texture between soil and vegetation.

Cumulative Effects: Past forest management practices have left much of the Rimrock Project area with less desirable visuals of dense stands, resulting in the lack of texture and line. All action alternatives would distribute vegetation manipulation over an extended period resulting in various visual contrast and scenic character. Periodic prescribed fire in the future would create temporary changes within all areas of scenic integrity. All proposed Rimrock activities comply with the Umatilla Forest Plan (4-51) standards and guides for Visual Resource Management.

Contrasts created from roads are viewed as undesirable. Past roading has left a long-term effect upon visuals. The action alternatives would temporarily add to the visual effects of unnaturally appearing line, texture, form, etc. already caused by management in the area. Thirty-three miles (alternative 3 and 5), or 37 miles (alternative 2 and 4) of road would be reopened in the project area and 11.3 miles (alternative 2 and 4), or 13.5 miles (alternative 3 and 5) of temporary road would be constructed. After thinning activities are completed and these roads are once again closed, transportation ways could blend with the surrounding landscape. All action alternatives also include the obliterating and decommissioning 14 miles of existing road. This would reduce the visual contrast created by past management practices. No other road changes are planned within the reasonably foreseeable future.

Fish and Aquatic Habitat

General Habitat

Alternative 1

Direct and Indirect Effects: This alternative would have no impact on individual **steelhead** or **redband trout** and presently occupied habitat. However, because long-term benefits from in-

channel fish structure improvements, fish passage improvements, and road stabilization would not be realized, sediment from these sources would continue to enter streams. As a result, deterioration of aquatic habitat would continue, supporting fewer numbers of fish over time.

Cumulative Effects: Sediment predictions based upon data relative to the Douglas-fir tussock moth defoliation reflect an incremental increase in base-line sediment input for Watershed 24 and specifically an increase in sub-watershed 24G, Where most of the defoliation has occurred.

Alternative 2

In order to facilitate the analysis, similar proposed projects, or projects that would be expected to produce similar effects to aquatic habitat, are grouped and discussed together.

Direct and Indirect Effects: The proposed thinning and underburning activities in the Rimrock project would take place outside PACFISH RHCA's, so these projects would not directly affect fish or aquatic habitat. This alternative would treat 5,489 acres (4,615 commercial thin acres and 874 precommercial thin acres). Logging systems utilized would be helicopter (932 acres), tractor (1,424 acres), forwarder (2,230 acres), and animal (29 acres). To reduce the natural fuels, underburning would treat 30,000 acres and an estimated 4,615 acres of slash would be treated (by either piling or underburning) with this alternative. The indirect effects would be based on effects to the soil (see Rimrock Hydrology report), such as increased erosion and delivery of additional fine sediment to the stream channels. This would depend on harvest systems, hill-slope, and the amount of ground covering vegetation and debris, both within harvest units and between harvest units and stream channels. In general, wildfire and logging accelerate sediment production at similar rates (Rieman and Clayton 1997).

The primary risk to fish or aquatic habitat comes from roads or landings that are used to conduct harvest activities, especially where these enter RHCA's or cross-stream channels. The project would reopen 37 miles of closed roads that have revegetated and construct 11.3 miles of temporary road. Seventeen miles of road would be reconstructed and 27 miles of open road would be resurfaced with 4 inches of gravel, which would reduce the amount of sediment coming from the transportation system. Rieman and Clayton (1997) state that road construction causes the most severe disturbance to soils, which overshadows fire and logging as the cause of accelerated erosion. Because sediment levels are high (>20% fines at surface or depth in spawning habitat), additional sediment could reduce the degree of successful salmonid reproduction within the stream systems by reducing egg and fry survival. Salmonids would not be capable of cleaning redd gravels adequately during spawning, which would reduce egg and fry survival. The 300-foot RHCA on Class I and 2 streams, the 150-foot RHCA on the Class 3 streams and the 100-foot RHCA on Class 4 streams provide surface roughness and vegetation to trap sediment produced by road reconstruction, logging, and burning thus, sediment reaching the streams would be minimal.

The road repair, reconstruction and resurfacing work would reduce the amount of sediment coming from the transportation system. The project would decommission 4 miles of road and obliterate 10 miles of road. Road obliteration and decommissioning would disturb soils and may result in short term delivery of some fine sediment to stream channels, particularly where this activity would occur near streams. Generally, this sediment production should subside to background levels in three years following the project. In the long term, road obliteration and decommissioning would reduce stream sedimentation, which would benefit fish by improving spawning conditions (through reduced substrate embeddedness). This project would also partially restore natural ground water movement in the areas adjacent to the obliterated roads. Road obliteration would allow surface water collected by roadside ditches to infiltrate the soil, and subsurface water intercepted by cut banks to remain subsurface. The resulting ground water contribution to the adjacent streams will help maintain lower stream temperatures.

The in-channel fish structure maintenance and installation of the low water fords would increase suspended sediment concentration during implementation. The released sediment would be derived from sediment previously deposited on the channel bed. Included in the risks to fish is the possibility/probability of mortality from the use of heavy equipment necessary to complete the

work. The direct effects on fish habitat would be short-term because of the short duration of the project. These projects are the reason for the determination of may effect-likely to adversely affect finding for the mid Columbia Steelhead (Rimrock Biological Evaluation for Aquatic Species). Confining work to the period of low stream flows and the use of silt fences or temporary diversion of flow around the construction site would reduce the amount of sediment introduced to the stream. The long-term effects of these projects would be beneficial.

The ground disturbance associated with the aspen and precommercial thinning projects would not result in delivery of fine sediment to the stream channels. These projects would have no direct or indirect effects on fish or aquatic habitat.

Cumulative Effects: The subwatersheds in Rimrock face some risk of a small amount of degradation of aquatic habitat quality from sedimentation. Sediment modeling, which is intended for comparison of alternatives rather than an absolute prediction of expected sediment yield, shows that Alternative 2 would produce the highest sediment yield increase of all alternatives. Repairs, reconstruction and resurfacing of existing roads, road obliteration and decommissioning of unused roads would reduce sediment in the long-term.

Several proposed projects (fish structure maintenance, low-water ford installation) would increase suspended sediment concentration during implementation. The released sediment would be derived from sediment previously deposited on the channel bed. However, these projects will result in a long-term reduction of sediment to the streams.

Three livestock grazing allotments are located in the analysis area. Monitoring has shown that livestock distribution has not been uniform. Cattle tend to congregate in the lower gradient riparian areas and as a result, these areas have been persistently overgrazed. However, fences that exclude cattle from the fish bearing reaches of Wall, Wilson, Colvin, Porter, and Indian creeks have been installed during the last decade to allow recovery of riparian vegetation. Full recovery of riparian vegetation and stream bank stability may require several decades. Numerous perennial non-fish bearing and ephemeral streams remain accessible to livestock.

Alternative 3

Direct and Indirect Effects: The amount of total area harvested is 45 acres less than alternative 2. Forwarders would be utilized for all ground-based logging, and an additional 87 acres converted from ground based harvest method to a helicopter logging system. These changes in harvest methods would reduce soil disturbance, soil compaction, thus potential sediment delivery to streams and fish habitat. There would be a reduction of 3 miles of road reconstruction, a reduction of 4 miles of roads reopened for haul, and an increase of 2.2 miles of temporary roads constructed with this alternative. This would also reduce any sediment delivered to streams.

Figure 4.6 on page 125 shows a comparison of percent increase in available sediment yield by year. This graph shows that alternatives 3 and 5 would result in the least amount of sediment increase over the first 5 years after project implementation. After year 5, the sediment yield would go below that of the current sediment availability.

Mitigation measures required before, during, and after management activities occur on the Rimrock project area, would reduce sediment movement and therefore very little difference would show in sediment movement between action alternatives. (See Biological Opinion, located in the Project Record, for an outline of Reasonable and Prudent Measures and Terms and Conditions).

Cumulative Effects: Would be similar to Alternative 2 with a variation in the sediment differences as discussed in direct/indirect effects from this alternative.

Alternative 4

Direct and Indirect Effects: In comparison to Alternative 2, alternative 4 would have 474 acres less helicopter logging, 28 acres less of logging with a forwarder, 500 acres less of slash treatment, and one mile more of road reconstruction. The increase in tractor logging would result in two more acres of soil disturbance thus, possible increase in sediment available to reach

stream buffers. Even with the differences between this alternative and the proposed action, there is very little change in fish habitat. Therefore, the effects for this alternative will be similar to the proposed action.

Cumulative Effects: Would be similar to Alternative 2 with a variation in the sediment differences as discussed in direct/indirect effects from this alternative.

Alternative 5

Alternative 5 is similar to Alternative 3, with a change in the prescription of the harvest in those units within Subwatershed 24G from a commercial thin to a shelterwood regeneration harvest. These units account for 122 acres defoliated by Douglas-fir tussock moth.

Direct and Indirect Effects: Difference in sediment yield can be seen in Figure 4.6, the model shows alternative 5 to be the same as Alternative 3. Sediment predictions based upon updated data relative to the Douglas-fir tussock moth defoliation reflect an incremental increase in base-line sediment input for Watershed 24 and specifically an increase in sub-watershed 24G, where most of the defoliation has occurred. The 122 acres of shelterwood harvest would be restocked after harvest. This would accelerate forest regeneration and reduce future soil erosion.

Cumulative Effects: Would be similar to Alternative 2 with a variation in the sediment differences as discussed in direct/indirect effects from this alternative.

Management Indicator Species (MIS)

Alternative 1

Direct and Indirect Effects: Steelhead (*Oncorhynchus mykiss*) and **Redband (rainbow) trout** (*Oncorhynchus mykiss gibbsi*) and the habitat would remain unchanged. This alternative has no direct risk to fish, aquatic habitat, or additional sedimentation from timber harvest, road construction, and stream crossing improvements. Although, this alternative will be lacking from the long-term benefits of in-channel fish structure improvements, fish passage improvements, and road stabilization. This alternative would probably show the continued deterioration of the aquatic habitat.

Cumulative Effects: Current stream crossings do provide direct risks to fish that are in the area. This risk will continue as vehicles enter into the streambed moving sediment that has settled and disturbing fish. As the trend of recreation use increases these crossings may experience more traffic.

Alternative 2, 3, 4, and 5

Direct and Indirect Effects: The proposed thinning and underburning operations would be conducted outside RHCA's, so they should not directly affect fish or aquatic habitat. The indirect effects would be based on what happens to the soil (see Rimrock Hydrology report), such as increased erosion and delivery of additional fine sediment to the stream channels. With the streams within the planning area presently holding high sediment levels, additional sediment could reduce the streams capacity to support successful salmonid reproduction, such as salmonids not being capable of cleaning redd gravels adequately during spawning and thus egg and fry survival is reduced. In this project, timber harvest would not be conducted within RHCA's. On Class 1 and Class 2 streams, a 300 foot wide RHCA should provide enough surface roughness and vegetation to trap sediment produced by reconstructed roads, logging, and burning activities. The Class 3 and 4 streams, a 150 and 100 foot wide RHCA, respectively, should be adequate for trapping sediment.

The ground disturbance needed to complete the road system projects could likely result in some fine sediment to reach stream channels, especially for those road obliteration projects that are near streams. However, it is not clear that the amounts of sediment delivered as a result of these

activities would exceed the quantities delivered by these same roads if they were left in their present condition (see Rimrock Hydrology report). Long-term effects for road decommissioning and obliteration could reduce sediment delivery to stream channels, and partially restore natural conditions of ground water movement by eliminating road surfaces and ditches which would otherwise continue to function as both eroding surfaces and extensions of the stream channels (by converting ground water to surface flow). By keeping subsurface flow subsurface, stream water temperatures remain lower, so that these projects produce a dual benefit to aquatic habitat.

The in-channel fish structure maintenance (181 structures) and installation of the four low water fords would result in direct effects to fish habitat. The in-channel structure maintenance and the four low water ford improvements would have beneficial long-term effects for fish habitat. The negative-direct effects on the fish habitat, including possible fish mortality caused by the equipment working within the streams, would be short-term. The long-term benefit for the fords would be less sediment addition to the streams from vehicle crossings, and this would end the chance of direct effects upon spawning grounds or fish at the crossings.

The natural enhancement projects (aspen stands: removal of encroaching conifers, ungulate-proof fences, mechanical root stimulation) are intended to improve riparian vegetation. The ground disturbance needed to complete these projects would not likely result in fine sediment to reach the stream channels. Therefore, the natural enhancement projects should not have negative direct or indirect effects on fish or aquatic habitat.

Cumulative Effects: Recreation activities within the Rimrock project area include camping, hunting, fishing, and off-highway vehicle (OHV) trail use. Effects from recreational activities can include increased erosion, delivery of fine sediment to streams, and harassment of listed fish species. Overall recreation activities are expected to increase in the future as the Morrow County OHV Park begins operation. Grazing will continue to occur within the Rimrock area, although the additional fencing will reduce effects on sediment yield from current levels. Several private land in-holdings occur within the Wall watershed. The Forest Service is not aware of any proposed projects on these properties that would affect the fish or their habitat. The proposed Bologna Basin Timber Salvage would not have an effect on the fish or their habitat because it does not occur within the habitat area. (See Appendix G for a complete list of past, present and reasonably foreseeable activities.)

Threatened, Endangered, Proposed and Sensitive Species

A biological evaluation has been completed for all threatened, endangered, proposed, or sensitive species known or expected to inhabit the planning area. Endangered Species Act determinations for each species were identical for all alternatives. The determinations from the biological evaluation are summarized in the following table. The Biological Evaluation is available in section three of the Rimrock Project File.

Table 4.4 Biological Evaluation Categories for TEPS (aquatic)

Species	Status	Determination
Steelhead (Middle Columbia River) (*Oncorhynchus mykiss*)	Threatened	**May Affect, and are Likely To Adversely Affect** Mid Columbia steelhead, but will Not Likely result in adverse modification or degradation of designated critical habitat.
Bull trout (Columbia River pop) (*Salvelinus confluentus*)	Threatened	**No effect** on the species or its habitat
Snake River Chinook Salmon *(Oncorhynchus tshawytscha*)	Threatened (Critical habitat)	**No effect** on the species or its habitat
Redband trout (*Oncorhynchus mykiss gibbsi*)	Sensitive	**May impact** individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species

Water Resources

The water resource indicators selected for analysis are annual water yield, soil erosion and introduction of sediment into the stream system, and stream temperature. These were chosen because they are more likely to be affected by the Tussock Moth outbreak or the forest management activities such as those proposed in this document. The analysis compares the magnitude, extent, and duration of the different alternatives on the three water quality parameters. Data includes field measurements, reports from stream surveys, an Equivalent Clear-cut Acres (ECA) model, and a soil erosion and sediment yield model. The ECA model was chosen to aid in the analysis of the effects of harvest, roads, and defoliation on water yield and peak flows. These activities and disturbances are more likely to affect the forest canopy over a large area, which in turn would affect hydrology at the analysis area scale. The erosion and sediment yield model was chosen to aid in the analysis of the effects of harvest, roads, and burning. These activities are most likely to affect sedimentation at the scale of the analysis area.

Alternative 1

Alternative 1 is the no action alternative. There would be no activities under this alternative other than scheduled maintenance and operations covered by separate management plans, such as grazing and road maintenance. The disturbance processes of insects, wildfire, poorly constructed and located roads, and in-stream structures would continue according to current trends.

Direct/Indirect Effects: Thousands of acres within the Wall Watershed have been affected by recent defoliation, and the results of this defoliation are the largest change in the existing condition. No direct or indirect effects to the stream system or to beneficial uses would result from implementation of this alternative.

Cumulative Effects Cumulative effects from past harvesting, road and fire management, grazing, and fish habitat improvements would continue. Over the long term, the riparian area would be more threatened as dead trees fall and the risk of wildfire increases. Roads in poor condition, poorly located roads, and in-stream structures would continue to supply sediment to the stream system.

One effect of past harvest, road construction, and grazing, is that there is a change in the composition and distribution of trees and shrubs that shade the ground and water. It is unlikely that water yield is affected, because of the wide range of natural variation in climate and the relatively small area that is effectively clearcut (p. **Error! Bookmark not defined.**). It is likely that stream temperature is affected, because shade is an important component of maximum temperatures in small, montane streams (Isaak and Huber, 2001). No actions are proposed under this alternative that will either increase or decrease the amount of shade, so there will be a gradual increase in shade as lost foliage and dead trees are replaced. In addition, 1990s era changes in grazing management and fences will continue to allow recovery of riparian vegetation.

Another effect of past harvest, road construction, fire, in-stream structures, and grazing is an increase above background in sediment in streams and in the flood plains. Because there have been no large wildfires since 1990, and there has been no timber harvest since 1997, it is unlikely that fire or past harvest are contributing to measurable sedimentation in these streams. Slightly more than 1 percent of the area is occupied by roads, and it is likely that the road system is contributing some sediment to streams. Virtually all of the analysis area is grazed, and it is possible that grazing is contributing a low level of sedimentation in the project area. No actions are proposed under this alternative that will either increase or decrease the amount of sediment in the streams or floodplains.

The Equivalent Clear cut Acres (ECA) model was used to analyze cumulative effects of roads, past harvest, and defoliation on annual water yield (see p. **Error! Bookmark not defined.** for a description of ECA). ECA was calculated for the entire watershed for past harvest, roads, and defoliation.

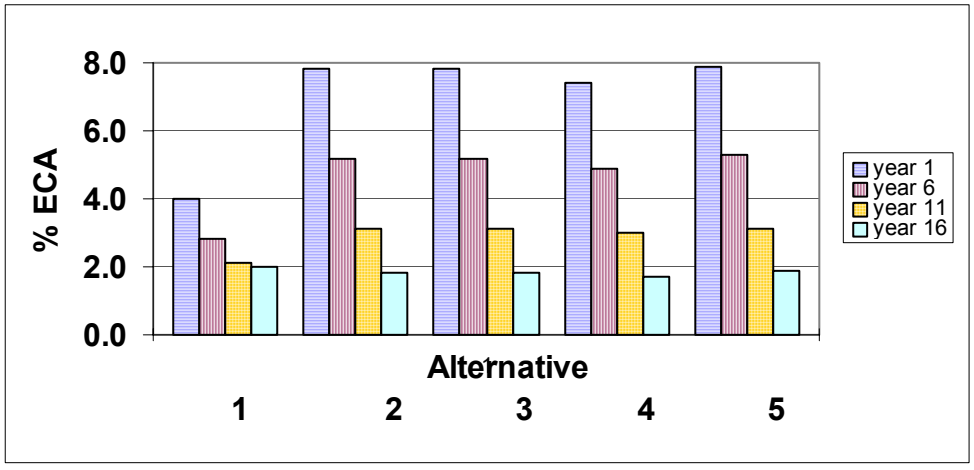


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Figure 4.6 Percent ECA in Wall Creek watershed for selected years after harvest by alternative.

In 2004, the ECA for the Wall Creek watershed would be 4 percent, considerably less than the lowest level at which effects were found in the three studies that were examined (Helvey and Fowler, 1995; Helvey and Tiedemann, 1978; and Cheng, 1989, (Figure 4.6).

The sediment yield model accounts for the effects of past logging, existing roads, and fires, if any. The model indicates that erosion of the road surface, cut banks, fill slopes and ditch lines of the existing transportation system contributes an estimated 40 percent increase in sedimentation above the presumed unmanaged background condition. This 40 percent increase in sediment

above the background, which results from past activities, is the baseline level. Sedimentation from past timber harvest is negligible (Table 4.5).

Table 4.5 Existing condition sediment model estimates, showing increases above unmanaged baseline.

Source	Tons from all SWS	Tons/sq. mile	% of increase
Open roads	304	4.7	26%
Closed roads	171	2.6	15%
Past harvest	19	0.3	2%
Total	494	7.6	42%

Densely stocked timber stands and stands defoliated by insects would continue to pose an increased risk of high intensity wildfire. Under this worst case scenario, such a wildfire would severely reduce stream shade and increase the possibility of soil erosion over a large area.

Impacts to unfenced stream banks by cattle, elk, and deer would continue under this alternative. Ungulate grazing is the on-going activity that is most likely to influence stream temperature by reducing shade. To facilitate the recovery of riparian vegetation, 13 miles of the fish bearing reaches of Wall, Wilson, Colvin, Porter and Indian creeks have been fenced to exclude cattle during the last decade (see table 1.1 and Appendix G).

Effects Common to All Action Alternatives

All four of the action alternatives contain several common activities. These include maintenance and repair of 155 in-stream fish habitat structures and a road restoration package consisting of 9 miles of road obliteration, 4 miles of road decommissioning, 3 miles of open roads to close, 22 road closures to be improved, 4 low water fords to be improved, and 2 culverts to be replaced. There are also 2 vegetation management projects, 874 acres of non-commercial thinning (including juniper treatments) and 24 acres of aspen treatments. Disturbed soil would be revegetated by spreading seed or by planting bare root or containerized nursery stock as part of these projects.

Direct and Indirect Effects of Activities Common to All Action Alternatives

Over the short term, there would be disturbance to sediment in the streams because of activity caused by the maintenance of in-stream structures and the road restorations. These effects would be localized within treated reaches. Unusual weather or other unanticipated events could increase the sediment that reaches streams. Over the long term, less sediment would reach the streams because of the reduced erosion and sedimentation from poorly located roads and culverts, fords, and in-stream structures.

These very small, local, short term sediment increases would be partially mitigated by doing in-stream work during seasonal low flows, by designing the projects to avoid sedimentation, by installing silt fences where needed, and by diverting flow around the disturbed areas.

In addition to accounting for the effects of past logging and existing roads, the sediment model also accounts for the effects of proposed road restoration and construction, logging, and burning. It estimates that the effect of 9 miles of road obliteration in a one year timeframe would increase sediment approximately 7 percent above the baseline during the first year after implementation (Table 4.6). This gain would decrease to zero after 3 years, and would result in an immediate reduction of background sediment from existing roads.

Table 4.6, Sediment model estimate for road obliteration.

Source	Tons from all SWS	Tons/sq.mi	% of increase
road obliteration	88	1.4	7%

The actual amount of sediment reaching streams would be less than the model's estimates, because of mitigations such as silt fencing and project design. In addition, all disturbed soil would be revegetated in time for the next growing season. Work on the in-stream structures would

dislodge sediment that is already in the stream channel and flood plain. During low flows, this sediment could carry for a few hundred feet downstream before it was redeposited. In-stream structure maintenance and road restoration would not be likely to affect shade.

The object of non-commercial thinning is to concentrate the growth of a stand onto a smaller number of stems. Sub-dominant trees and less desirable species are cut to allow the remaining trees to grow faster. Within a few years, the canopy closes again, but at a higher elevation. Since there is no thinning proposed in the riparian areas, there would be no effect to stream shade from the non-commercial thinning. The aspen treatments would favor aspens over conifers. Cutting the conifers allows aspen to dominate the site. In the short term, shade on small streams would be reduced, which may cause unmeasurable increases in stream temperature. Over the longer term, shade would return to the pre-treatment condition when aspen foliage equals the conifer foliage that was removed. Because of the very small areas to be treated, and the large range of variation in climate and stream flow, it is unlikely that the non-commercial thinning or aspen treatments would have any effect on water yield or peak flows. Because there is little possibility of soil disturbance, the non-commercial thinning and the aspen treatment are unlikely to have any effects on sediment.

Cumulative Effects

Water Yield and Peak Flows

The ECA model includes the effects of all past harvest, defoliation, and roads. It estimates that ECA would be increased from approximately 4 percent to approximately 8 percent in the first year after one of the action alternatives is implemented. Because of the road restoration package and recovery from harvest and defoliation, ECA for the action alternatives would decrease over time. However, because of the road restoration package, which reduces the total miles of road in the area, ECA would decrease below the level of the no-action alternative after 15 to 16 years. At no time would the area equivalent to clear cut approach the percentage of clear cut watershed at which Helvey and Fowler, 1995; Helvey and Tiedemann, 1978; or Cheng, 1989; found effects to water yield or peak flows. Instream structures, non-commercial thinning, and aspen treatments are unlikely to increase or decrease cumulative effects to water yield.

Stream Temperatures

Existing roads have decreased shade in the analysis area. The road restoration projects would allow trees and shrubs to grow on obliterated, decommissioned, and closed roads. There would be no further reduction in stream shade. In concert with previous changes in grazing management and riparian fencing, there would be a gradual increase in stream shade as trees and shrubs grew on restored roads. As shade increased, less solar radiation would reach the streams and their temperatures would increase more slowly, which would ultimately result in lower stream temperatures.

Non-commercial thinning would not affect stream shade because there would be no thinning in the riparian areas. Instream structure maintenance would also not affect shade.

Aspen treatments are proposed for 24 acres of the area, and they would cause a minute, short-term, localized reduction in stream shade with a corresponding increase in temperature. In 5 to 10 years, shade would fully recover to pre-treatment levels. Thriving aspen stands would eventually result in minute increases in shade above the present levels.

Sediment

Using the measured sediment yield from the High Ridge area, a modified version of the R1-R4 sediment model (Potyondy, et. al., 1991) was prepared. This model considers soil erosion by type of activity (such as harvester/forwarder logging, road construction, low intensity fire) and the distance sediment would have to be transported to enter a stream. It is calibrated to the baseline sediment yield from the High Ridge Analysis Area. Because of the wide natural range of variation

in sedimentation, small changes over large areas are difficult to detect. Since actual changes from the Rimrock projects are expected to be small, the model is designed to exaggerate sediment yields, so that clear comparisons can be made of the relative effects between alternatives. The model is not meant to predict actual future sediment yields from the Rimrock projects, and does not account for slope, soil type, PACFISH buffers, or Tussock moth defoliation (see Appendix A). Sediment yields were expressed as a percent increase over annual baseline levels for comparison between alternatives.

The model assumes that past harvest effects would persist for six years after the activity and that existing road effects would remain constant over time. Several of the past timber harvesting projects in the analysis area (Upper Wall and Tamarack Thin and Indian) continued to impact water quality when the modeling was performed in 1999. Modeled results show past timber harvesting contributing a less than 1 percent increase in annual sediment yield above the baseline. Modeled results also show that roads in the analysis area contributed an approximately 40 percent increase in annual sediment yield above the baseline (Figure 4.5).

The increased sedimentation from maintenance of the instream structures and the road restoration would combine with the sediment from past activities. However, by performing these activities, the background sediment yield would be decreased. The increases from the activities would last 1 to 3 years, but the resulting decreases in sediment would be permanent.

The High Ridge study (Helvey and Fowler, 1995) detected a sediment yield of approximately 18 tons per square mile from the untreated watershed. This is assumed to be the background yield for the Rimrock analysis area. The model estimates that the existing 212 miles (table 3.12) of roads contribute 7 more tons per square mile in the analysis area. This is an increase over background of approximately 39 percent (7 tons/18 tons). Past harvest is modeled to increase sediment by approximately 2 percent (0.3 tons/18 tons) (Table. 4.5). The action alternatives propose several road restoration activities including obliteration of 9 miles of existing roads. The model estimates that the road obliteration would add an additional 1.4 tons per square mile of sediment. This would be an additional increase of approximately 7 percent over the baseline (Table 4.6). However, by obliterating 9 miles of existing roads, it is estimated that baseline sediment would decrease by approximately 4 percent (9 miles/212 miles). The model assumes that the increase in baseline sediment would last no more than 3 years. However, the decrease in background sediment would be permanent. Non-commercial thinning and aspen treatments are not likely to affect sediment.

Alternative 2

This alternative proposes commercial thinning of 4,615 acres using rubber tired skidders (tractors), harvester/forwarders, draft animals, and helicopters . Associated with the logging would be 13 miles of road reconstruction, 27 miles of road resurfacing, 42 miles of closed roads reopened for hauling, and 11 miles of temporary road construction. Also 34,615 acres are proposed for prescribed burning. The instream structures, road restoration package, non-commercial thinning, and aspen treatments are included in this alternative. Revegetation by spreading seed or by planting bare root or containerized nursery stock is part of all these projects. All of these activities, including burning, would be scheduled to take place over a period of several years, so their impacts would be spread out in time. They are mitigated to reduce their undesired environmental effects. Water quality Best Management Practices (BMP's) for harvest, burning, roads, watershed, and vegetation are included in plans for Rimrock projects, and would serve to maintain and improve water quality.

Direct and Indirect Effects

Sediment

This alternative proposes the largest volume of harvest of the alternatives. Over the short term, there would be a slight increase in sediment delivered to the streams because of soil disturbance

from harvest landings or road construction that is close to streams. Beneficial uses are not likely to be affected. Mitigations are proposed to reduce these increases.

All of the logging in this alternative is commercial thinning. Commercial thinning removes up to 30 percent of the basal area of a stand, and leaves the largest, well-formed trees to grow with less competition. The forest canopy remains intact. Of the total harvest acres, approximately 6 percent of the harvester/forwarder ground and 12 percent[2] of the skidder ground would be exposed to potential soil effects (such as surface disturbance or compaction). These would decrease to zero percent as the soil freezes. Harvester/forwarder systems process the logs at the stump, suspend the logs above the soil during transport, and use the debris as a cushion to insulate the equipment from compacting and disturbing the soil. Skidders mostly operate on the ground dragging bundles of logs behind, and logs are processed at the landings where large piles of debris accumulate. Landings are often larger with skidder systems than with harvester/forwarder systems. Where harvester/forwarders are used, the chance of soil compaction and disturbance would be reduced, especially in wet weather. Large debris piles at landings pose a risk of sterilizing the soil when they are burned, due to the intensity of heat given off by the fuel accumulation.

Roads can act as conduits of sediment from the road surface and ditches into streams. Roads receive sediment from overland flow, soil creep, landslides, and debris flows. In addition, unpaved road surfaces contain a blend of fine and coarse sediment (gravel). Well designed and engineered roads have drainage systems which can collect water and dissipate it on the landscape. Well designed roads also have the ability to store sediment, usually more than an average year's build up. This sediment is stored in drainage ditches and is removed during annual maintenance. Roads used to haul logs under this alternative would have maintenance performed before and after use. Reconstruction and resurfacing would make existing roads less erodable. These actions would reduce the amount of sediment available for transport to the streams. Temporary road construction and re-opening of closed roads would cause small, local increases in sediment. These actions are included in the calculations of the sediment model.

There is some risk of increases in sediment in individual subwatersheds from burning. This might occur if the wind unexpectedly changed speed or direction during a burn, or if there was unusually heavy rainfall after burning and before resprouting of vegetation. The risks of unusual weather occurring are low. For example, there is a one percent probability of a 100-year storm occurring in any given year and a 99 percent probability that it will not occur (Van Haveren, 1988). The effects of such a storm would be greatest in the year immediately following an activity, and decline thereafter. The effects of a 100-year storm might include mobilization and transport of sediment stored in the flood plain, and uprooting of stream bank trees.

Stream Temperature, Water Yield, and Peak Flows

The activity most likely to decrease stream shade is the proposed burning, because there would be no harvest and little roadwork in the riparian areas. However, it is unlikely that a prescribed fire would get out of control and burn at more than a low intensity, because ignition is only prescribed under suitable weather and fuel conditions. The burning prescription would call for no lighting in the riparian areas, although fire would be allowed to back into them. Since the weather and fuel conditions for burning are restricted, it is unlikely that backing fires would carry far enough into riparian areas to affect shade, or that shade-casting trees or shrubs would be killed. Thus, it is unlikely that burning would have any effect on stream temperatures or on water yield or peak flows.

Road reconstruction, resurfacing, and reopening are not likely to have an effect on shade, because there are few substantial trees growing on them. The temporary road construction may cause a small amount of shade reduction, but these roads would be sub-soiled after use, and

[2] These percentages were approximated using the estimated width and length of skid/forwarder trails times their estimated frequency of occurrence.

allowed to revegetated. It is unlikely that any of the road construction would have an effect on water yield.

Non-commercial thinning is applied to clumps and stands of trees that are approximately 1 to 8 inches in diameter at breast height (DBH). Larger, hardy trees are selected to remain, and smaller trees are cut and left. After a few years, all the potential volume of wood in the stand is concentrated on the leave trees. This results in fewer total trees, but the remaining trees are larger. The canopy of the larger trees is higher in elevation than it would be without thinning, and a larger area is shaded.

Because there is little possibility of soil disturbance, the non-commercial thinning is unlikely to have any effects on sediment. Stream temperatures would also not be directly affected, because no thinning, harvest, or burning would take place in Riparian Habitat Conservation Areas. Non-commercial thinning would change the forest canopy. In the first approximately 10 years after thinning, the canopy would be reduced and there would be less shade than before thinning. After that period, shade would increase, as the leave trees expanded into the available space. These changes in canopy are within the natural range of variation and are not expected to affect water yield.

Mitigation would reduce some of the effects of harvest on soil and water quality. No harvest or thinning would occur in riparian areas, which would protect vegetation near streams. Where crossing an ephemeral draw with equipment is unavoidable, slash would be placed into the crossing to minimize soil disturbance. Equipment would be confined to designated crossings in ephemeral draws to avoid soil exposure in areas that collect snow melt. Units located on steep slopes, dry sites, or sensitive soils would be harvested using a forwarder system and trees would be fully suspended to reduce soil disturbance and compaction (see Appendix E for a list of units where soil type limits yarding method). Slopes that are predominantly greater than 35 percent would also be avoided by machinery to reduce potential erosion and instability. Skid trails would be spaced as wide as operationally possible and trees would be felled at an angle to the skid trail to minimize compaction and disturbance, and their location would be controlled in order to meet best management practices. Water used to settle dust on haul routes would come from a designated source to protect water resources during low flows. When activities are complete, skid trails, landings, and exposed mineral soil would be seeded, water barred, etc. as needed to reduce soil erosion. Sub soiling would occur in heavily compacted areas (such as landings), where appropriate, to reduce compaction. The Timber Sale Officer (TSO) will continuously monitor roads, landings, and trails for detrimental soil effects. The TSO is authorized to halt any operation that is causing damage because of wet conditions. *For a more detailed list of: mitigations see Chapter 2, page* ***Error! Bookmark not defined.****; BMP's, Appendix B; and Biological Opinion located in the Project File.*

Cumulative Effects: Effects from past harvesting on public and private land, road and fire management, grazing, and insect defoliation would continue, and combine with the harvest, road construction, and burning effects from this alternative. Over the long term, the riparian areas would continue to be threatened by the risk of wildfire. However, because this alternative reduces fuel loads by harvest and prescribed burning throughout the analysis area, any wild fires would be less intense and thus have more moderate effects to water quality. Roads in poor condition and poorly located roads would continue to supply sediment to the stream system, but the road reconstruction and increased road maintenance would reduce that sediment from the current levels.

Figure 4.5 shows the 16-year period during which ECA is elevated because of this alternative. During this time, harvest and road effects would combine with background effects in any storm events. After this time, it is unlikely that project effects would contribute to a storm event, because disturbance caused by this alternative would have recovered. The chance of a 100-year storm occurring during this 16-year period is approximately 16 percent, so the hydrologic risk of these activities contributing to the effects of a 100-year storm is 16 percent (Van Haveren, 1988).

The current background ECA is 4 percent. This includes the accumulated effects of past harvest, existing roads, and tussock moth defoliation. ECA would increase to a high of approximately 8 percent in the first year after harvest. It would decline to less than 2 percent after 16 years, because of road obliteration and recovery from the logging (Figure 4.6). The ECA for this alternative would be lower than the ECA for the no action alternative after approximately 15 years, because roads would be obliterated in this alternative, and not in alternative 1. Because no more than 8 percent of the watershed would have cumulative effects from past harvest, harvest from this alternative, and roads, compared to the 30 to 100 percent level for detectable effects, it is unlikely that there would be any detectable change in water yield (Helvey and Fowler, 1995; Helvey and Tiedemann, 1978; and Cheng, 1989).

The sediment yield model assumes that all proposed activities would take place in one year, while in reality they would take several years. This provides exaggerated results that are useful for comparing alternatives. The model estimates that this alternative would result in a further increase in sediment of approximately 65 percent above the 40 percent from past activities. Most of this increase is from prescribed burning, the effects of which would have recovered by the third year. In the seventh year after harvest, the model estimates that the effects of this alternative would be less than the effects of the no action alternative (See Figure 4.7).

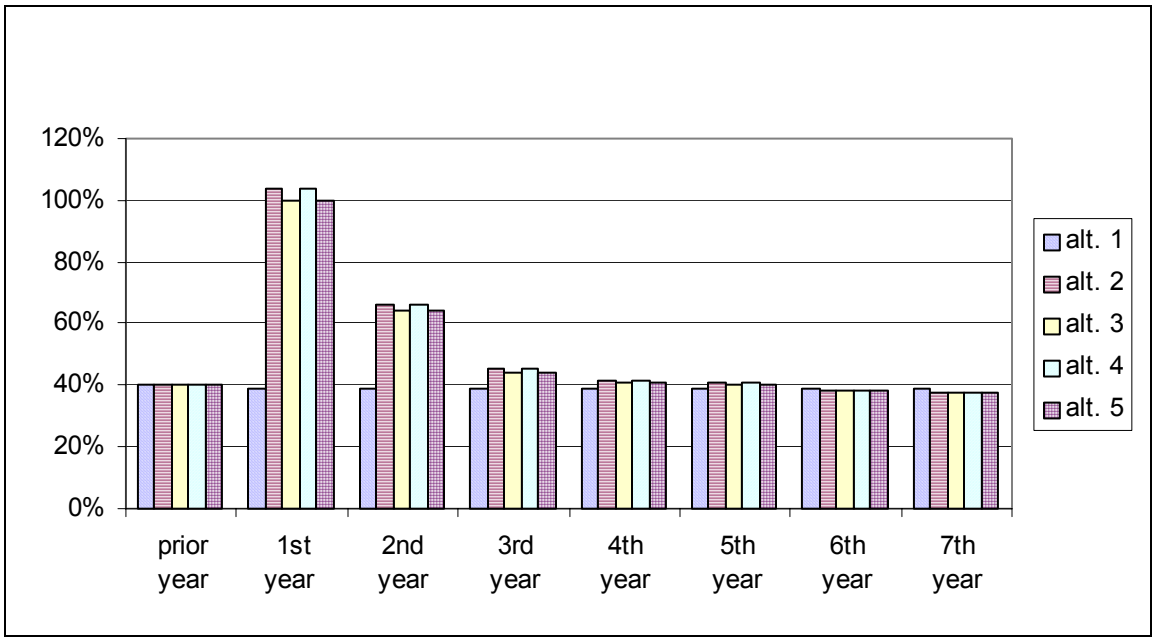

Figure 4.7 Modeled percent increase in annual sediment yield by year from the 5 proposed alternatives over the entire analysis area.

Any actual sedimentation effects from the logging, roads, and burning in this alternative would be greatly reduced by prescriptions and mitigations. These include no harvest or burning in the riparian areas, and the use of helicopters and harvester/forwarders. However, it is possible that there would be some low magnitude, short duration sediment increases from landings or road projects that are close to streams. These increases would be partially offset by re-seeding, riparian planting in disturbed areas, and silt fences.

Past harvest and grazing have reduced shade in analysis area streams. The activities specific to this alternative are unlikely to cause further reduction in shade, and the road restorations common to all alternatives would increase shade in the riparian areas.

Alternative 3

This alternative consists of commercial thinning 4,570 acres. The mix of logging systems is designed to minimize soil disturbance. Associated with the logging is reconstruction of 14 miles

of road, resurfacing of 27 miles, reopening 33 miles of closed roads, and construction of 13 miles of temporary roads. In addition, 34,570 acres are proposed for prescribed burning. The in-stream structures, road restoration package, non-commercial thinning, and aspen treatments are included in this alternative. Revegetation by spreading seed or by planting bare root or containerized nursery stock is part of all these projects. All of these activities, including burning, would be scheduled to take place over a period of several years, so their impacts would be spread out in time. They are mitigated to reduce their undesired environmental effects. Water quality Best Management Practices (BMP's) for harvest, burning, roads, watershed, and vegetation are included in plans for Rimrock projects, and would serve to maintain and improve water quality. See Figure 4.7 for comparison of sediment yield.

Direct/Indirect Effects: All ground based logging would be with harvester/forwarders or animals and there would be no rubber tired skidders (tractors). Harvester/forwarder systems process the logs at the stump, and use the debris as a cushion to insulate the equipment from the soil. In comparison to Alternative 2, using only harvester/forwarders means that the chance of soil compaction is reduced, especially in wet weather. In addition, this alternative slightly increases the amount of helicopter logging, which also reduces the risk of soil compaction.

Cumulative Effects: Same as under Alternative 2

Alternative 4

The objective of alternative 4 is to accomplish the Purpose and Need in the most economical way. Thus, the very costly helicopter logging is reduced to a minimum, and the less costly skidder is reintroduced to the mix. This alternative proposes to commercial thin 4,115 acres using rubber tired skidders (tractors), harvester/forwarders, draft animals, and helicopters. Associated with the logging are 18 miles of road reconstruction, 27 miles of road resurfacing, reopening of 37 miles of closed roads, and 11 miles of temporary road construction. In addition, 34,115 acres are proposed for prescribed burning. The in-stream structures, road restoration package, non-commercial thinning, and aspen treatments are included in this alternative. Revegetation by spreading seed or by planting bare root or containerized nursery stock is part of all these projects. All of these activities, including burning, would be scheduled to take place over a period of several years, so their impacts would be spread out in time. They are mitigated to reduce their undesired environmental effects. Water quality Best Management Practices (BMP's) for harvest, burning, roads, watershed, and vegetation are included in plans for Rimrock projects, and would serve to maintain and improve water quality.

Direct and Indirect Effects: The difference between this alternative and the others is that approximately 500 acres that were prescribed for helicopter logging would not be logged. In addition, this alternative has slightly more skidder logging than Alternative 2. Because of skidder logging, a larger portion of logged area would be exposed to soil disturbance. However, since fewer acres would be logged, the overall effects of soil compaction and displacement are similar to Alternative 2. See Figure 4.7 for comparison of sediment yield.

Cumulative Effects: Same as under Alternative 2

Alternative 5

Alternative 5 was created as a response to the tussock moth outbreak of 2001, which is described in Chapter 3. Alternative 5 proposes to commercial thin 4,448 acres and salvage log 122 acres. Associated with the logging is reconstruction of 14 miles of road, resurfacing of 27 miles, reopening 33 miles of closed roads, and construction of 13 miles of temporary roads. In addition, 34,570 acres are proposed for prescribed burning. The in-stream structures, road restoration package, non-commercial thinning, and aspen treatments are included in this alternative. Revegetation by spreading seed or by planting bare root or containerized nursery stock is part of all these projects. All of these activities, including burning, would be scheduled to take place over a period of several years, so their impacts would be spread out in time. They are

mitigated to reduce their undesired environmental effects. Water quality Best Management Practices (BMP's) for harvest, burning, roads, watershed, and vegetation are included in plans for Rimrock projects, and would serve to maintain and improve water quality.

Direct and Indirect Effects: The distinction of this alternative is that it does the most to reduce the potential for high intensity wildfire. There is the same amount of prescribed burning in this alternative as the other alternatives. However, this alternative removes much of the standing dead timber that was defoliated by the tussock moth. That dead timber would increase the intensity of any future wildfires, thus resulting in an increase of exposed soil. See Figure 4.7 for comparison of sediment yield.

This alternative is similar to alternative 3, except that 122 acres that were to be commercially thinned have been defoliated by tussock moths since the draft EIS, and are now proposed for salvage logging. Shade is expected to increase faster after harvest and planting than if the defoliated trees were left in place with volunteer seedlings and young trees competing with the downed trees for space and resources.

Cumulative Effects: Same as under Alternative 2

Fuels

Alternative 1

Direct, Indirect and Cumulative Effects: Under Alternative 1, the Rimrock analysis area would continue to be managed under its current trend. No harvest or prescribed fire activities would occur under the direction of this environmental assessment.

Forest stands that are overstocked, diseased and insect infested would not be treated. Fuel loading within these stands would continue to build over time, increasing the chance of a high intensity, large-scale fires. Grand fir and Douglas-fir would continue to invade previously open forest stands and would contribute to fuel loading and the ladder fuels necessary to support large scale, stand replacing fires.

Areas of mixed conifer forest in the analysis area that have been affected by the Douglas-fir tussock moth defoliation will also contribute to the increasing fire hazard. Trees killed by the defoliation will fall, contributing to the ground fuels. This increase in ground fuel loading will have a significant impact to soils in the form of baking and exposure should a high intensity ground fire occur.

Current grazing management would continue to affect understory fuels, with grasses and some forbs and shrubs reduced below their natural levels. This would reduce the frequency at which underburning can be conducted and could lead to redevelopment of ladder fuels and thick understories of grand fir if not carefully managed.

Alternatives 2, 3, 4, and 5

Direct and Indirect Effects: Under alternatives 2, 3, 4 and 5, large areas in the Rimrock analysis area would be prescribed burned and mechanically treated to reduce hazardous fuel loads.

Approximately 30,000 acres would be treated with a series of large scale, landscape prescribed burns over the course of 4 to 5 years. These landscape burns will serve to reintroduce fire in the analysis area. The reintroduction of fire will be in the form of a low intensity fire to consume natural fuels and reduce fuel loading. Application of landscape burning will be in a mosaic pattern across the analysis area. These prescribed burns would be a combination of both spring and fall burns. Of the 30,000 acres targeted for burning, 6800 acres are targeted for spring-only burning, 4300 acres are targeted for fall-only burning and 18,800 may be burned in either the spring or fall.

In addition to large-scale, landscape burning, there are selected areas to be mechanically treated and residual slash prescribed burned to lower ground fuel loadings to conditions that would exist

under a natural fire regime. These treatments would serve to reduce density understory fuel loading necessary to support large-scale wildfire and result in a more fire safe forest. The use of mechanical thinning treatments and prescribed fire to remove slash reduces the intensity and the effects of wildfires, by opening the crowns densities and reducing ladder fuels.

Mechanical Treatment / Prescribed Fire

The mechanical thinning or harvesting of smaller diameter suppressed trees would break up crown densities and remove understory ladder fuels. The breakup of this fuel continuity through harvesting activities would serve to reduce the chance of large fire scale occurring and reduce the damage these fires can cause. The direct effect is fire hazard[3] is reduced. Fire hazard can be further reduced with the use of prescribed fire to further reduce fuel loadings of residual slash.

A direct effect from post-harvest treatments is an increased fire hazard in harvested units from increased fuel loading from residual ground slash left by the mechanical treatment. While harvesting methods open crowns densities, reduce ladder fuels, and allow more sunlight on the forest floor. These activities increase the ground fuel loading with smaller diameter fuels, increase the drying rate of fuels by opening the vegetative canopy and increase the rate at which fire spreads. Harvest operations increase the risk of wildfire by concentrating machine and human activity (Clark, 1993). This hazard is removed once the harvested unit can be treated with prescribed fire to remove unwanted residual ground slash. Treating residual slash includes piling and burning of slash and prescribed burning to remove the smaller, fine residual fuel.

Units that are helicopter logged or in which a forwarder is used would have more slash left in the units than those that are tractor logged. It is estimated that all helicopter units would require slash treatment and three-quarters of all other units will require slash treatment. Treatment of slash may occur on up to 4,615 acres under Alternative 2; 4,570 acres under alternatives 3 and 5; and 4,115 acres under Alternative 4.

Landscape Burning

Burning during either spring or fall is expected to reduce the understory of shade tolerant trees, have a slight impact on the overstory trees, and would reduce the fine fuel and shrub layers. More openings in the canopy and forest floor would allow grasses, forbs and low shrubs to increase. Controlled burns would be implemented when fuel and weather conditions combine to result in a low intensity ground fires. Aerial ignition by helicopter would be the primary method of ignition. Sensitive or difficult areas may require hand ignition using drip torches.

The season in which burning takes place would have some influence on the fire's effect to soils and plants. Spring burning would generally have less of an impact as soil and duff are moister and fewer fuels are available to burn. These fires are generally low intensity. Large down woody materials usually have too high of a moisture content in the spring for complete combustion. It is expected that less than 75% of the fuels would be consumed with a spring burn. Areas selected to burn during the spring season were based on the ability to use ridgelines and or spring riparian areas as holding lines.

Alternative 5

Alternative 5 is the same as Alternative 3, modified to address the stands most heavily defoliated by the Douglas-fir tussock moth outbreak. In the six units (122 acres) prescribed for shelterwood harvest, fuel loadings will be less than under all other alternatives. Trees affected will be removed by mechanical treatment or will be consumed through the process of prescribed activity and landscape burning. After treatment is completed, these areas will be less susceptible to large fire damage for approximately 10-20 years.

Cumulative Effects Common to All Actions

[3] Fire hazard refers to the potential intensity or severity of a fire given a particular fire or fuel source.

The long-term goal of these fires would be restoration of a semi-natural fire regime and reduction of the hazardous fuel loading. Ancillary benefits would enhance the forest by improving wildlife habitat, forage production and increasing vegetation growth and vigor.

Treatment with harvest and prescribed fire results in changes in the quality and quantity of fuels available for wildland fire for a limited period of time. These changes are in both the vertical and horizontal continuity of the fuels and in the amount of fine fuels available to carry a fire. The horizontal continuity returns more rapidly than does the vertical continuity, as needles and branches fall and grasses and shrubs return to a site. The changes resulting from landscape level prescribed fires occur on both a local and watershed scale, with patches of high fuel loading separated by areas of low fuel loading (Martin et al. 1989). In order to maintain the effectiveness of prescribed fire, managers' ability to use it, and achieve the desired future condition being managed towards, it must be re-applied on a regular basis. The areas being treated with prescribed fire would need to be retreated every 3 to 15 years. Those stands dominated by grass and brush would have the shortest return interval for fire treatment, while those dominated by trees would have the longest. The intervals would overlap, as the treatment areas are larger than individual stands. Prescribed fire has been used frequently in recent decades to mimic historical frequent, low intensity fires. It is reasonable to expect prescribed fires to be used again in the future. The effect of future prescribed fires, when added to the timber harvest and prescribed burning proposed in this EIS, would be to maintain fuels at a level where wildfires would be expected to be at a scale and intensity similar to historical conditions, e.g., fires would more likely be relatively low intensity surface fires through most of the Rimrock area.

Current grazing management would continue to affect understory fuels, with grasses and some forbs and shrubs reduced below their natural levels. This would reduce the frequency at which underburning can be conducted and could lead to redevelopment of ladder fuels and thick understories of grand fir if not actively managed.

Air Quality

Alternative 1

Smoke impacts under Alternative 1 would be infrequent but are potentially severe (see Table 4.7). Prescribed fire has been used frequently in recent decades to mimic historical frequent, low intensity fires. It is reasonable to expect prescribed fires to be used again in the future, even if not implemented through the Rimrock Ecosystem Restoration Projects. Smoke would generally be limited to minor amounts from small wildfires and prescribed fires. Most of the prescribed burning would be in the lightest fuel types, which generate the least smoke. On occasions when large-scale wildfires occur, smoke impact would be severe. The town of Monument, which is located down valley from the analysis area, would experience significant levels of smoke for extended periods should a large-scale fire occur.

Alternative 2, 3, 4, and 5

A comparison of expected emissions from the planned prescribed fires and a possible uncontrolled crown fire shows a doubling of small particulate matter and CO emissions per acre for a summer crown fire compared to spring and fall surface fires (First Order Fire Effects Model (FOFEM), Reinhardt et al. 1997). This assumes that there would eventually be a large summertime crown fire under the no action alternative, similar to the fire that occurred in 1996 at Wheeler Point, just to the west (Table 4.7)[4].

4 FOFEM output on file at Heppner Ranger District.

Table 4.7: Smoke Emissions by Fire Type (lbs/acre) [5] -[6]

Fire Type	PM-10	PM-2.5	CO
Spring, surface burn, moderate conditions	658	558	6,331
Fall, surface burn, moderate conditions	728	617	6,997
Summer, crown involved, dry conditions	1,337	1,334	12,971

The district has procedures in place to notify the public prior to burns of the burning and expected smoke impacts. The notification is a two-step process. Media announcements are made prior to the start of the burning season, generally in March or April and again in September. Communities and interested persons are notified of individual burns through individual contacts.

The Forest Service works with the State of Oregon to manage smoke emissions from national forest lands. All prescribed burning takes place within the guidelines of the Oregon Smoke Management Program. The three national forests of Northeast Oregon have established personnel responsible for smoke management and smoke coordination between districts and forests. There is an emissions cap in place for prescribed burning in Northeast Oregon. Smoke management forecasts by the State of Oregon are requested and the direction within them is followed for each burn.

All burns are registered with the state and the expected consumption and tonnage of material consumed are included with the registration. The actual consumption and acres burned is reported to the state on a daily basis. Data reported includes estimates of PM10 and PM2.5 within the smoke. The Forest Service uses a computer program called FASTRACS (Fuel Analysis, Smoke Tracking and Report Access Computer System) to plan, calculate, track and report fuels management related activities. This information is used by the State of Oregon to monitor and manage the amount of smoke emissions scheduled to be emitted. Burns are not conducted on days when it is expected that smoke would impact population centers. If smoke does impact a community unexpectedly the ignition is terminated and the prescribed fire is allowed to burn itself out. The Heppner Ranger District is not adjacent to any listed sensitive sites or non-attainment areas.

Due to the variety of conditions that burning takes place under it is impossible to give a precise number of acres per day, daily emissions. Estimates of maximum amounts are provided in the following tables.

Table 4.8 Estimated Potential PM2.5, lbs/acre

	Natural Fuels, Average Load	Natural Fuels, Heavy Load	Slash, Average Load	Slash, Heavy Load
Spring, Moderate Conditions	321	333	462	596
Fall, Moderate Conditions	424	469	511	665
Fall, Dry Conditions	410		488	

Table 4.9 Estimated Potential PM10, lbs/acre

	Natural Fuels, Average Load	Natural Fuels, Heavy Load	Slash, Average Load	Slash, Heavy Load
Spring, Moderate Conditions	379	392	544	702
Fall, Moderate Conditions	501	554	603	785
Fall, Dry Conditions	483		575	

5 Fuel loading based on MC 02 photo series in Ottmar et al. 1998.

6 PM-10 and PM-2.5 are measurements of particulate matter 10 micrometers or less and 2.5 micrometers or less, respectively.

Table 4.10 Estimated Maximum Unit Size and Burning Duration

	Harvest Units / Slash	Landscape Scale RX Fire
Estimated Maximum Acres Burned per Day	300	5,000
Estimated Maximum Acres Per Burn Unit	120	8,000
Maximum Duration of Ignition per Unit (days)	3	6
Maximum Duration of Smoldering (days)	15	15

Table 4.11 Estimated Max. Total Potential Emissions (tons) for Rimrock Analysis Area

	Total Acres	PM2.5	PM10	CO
Slash Burns	4,350	1450	1710	15600
Spring Natural Fuels[1]	25,400	4230	4980	45380
Fall Natural Fuels[2]	23,100	5420	6400	59250

1Includes Spring only and Spring or Fall acres

2Includes Fall only and Spring or Fall acres

Cumulative Effects

Smoke would generally be limited to minor amounts from small wildfires and prescribed fires. Most of the prescribed burning would be in the lightest fuel types, which generate the least smoke. On occasions when large-scale wildfires occur, smoke impact would be severe. The town of Monument, which is located down valley from the analysis area, would experience significant levels of smoke for extended periods should a large-scale fire occur.

Transportation

Alternative 1

Direct and Indirect Effects: Roads would remain in their current condition. The proposed projects would not happen and sediment would remain at the current levels.

Alternative 2, 3, 4, & 5

Direct and Indirect Effects: Twenty-seven miles of roads would be resurfaced, which would decrease the potential for sediment production. Effects on forest users should be short-term, only during the maintenance period. Thirteen miles of closed roads would be decommissioned, which would result in a reduction of sediment contribution. Road obliteration would occur on 10 miles of road. Obliterated roads are removed form the transportation system (FSH 7709.54).

Road 2402030 is a closed road that will be opened for timber haul. This road crosses two intermittent streams were culverts would be installed. The culverts will be sized for 100 year flows. This is a low level road and a drivable drainage structure is preferred for long term maintenance need but the crossings occur in corners with large fills so installing a dip would require allot of soil movement making this not desirable or economical.

Temporary roads constructed to access harvest units would be obliterated after harvest is complete, open road densities would not change as a result of constructing temporary roads. Two currently open roads (2.58 miles) would be closed. These roads are not currently being used by the public so no effect would be noticed in regards to transportation routes on the forest. The twenty-two road closure improvements would not change the transportation system. These roads are currently closed and the improvements should reduce unauthorized access. (See Appendix F and Map 8 for more detailed road information.)

Cumulative Effects: Within the planning area, open road density would change from the current 1.7 miles of road per square mile to 1.6 miles of road per square mile. Past and future changes to the road system on the forest are noted within the Access and Travel Management Plan.

Non-Forest Vegetation – Noxious Weeds

Alternative 1

Direct and Indirect Effects: Where undisturbed vegetation currently exists on the project site some limited natural control exists. Through the utilization of resources including; nutrients, water, and space, existing vegetation would be expected to deter (although not entirely exclude) invasion by noxious weed species.

Cumulative Effects: Introduction of noxious weeds into the proposed analysis area through harvest-related activities would not occur. However, noxious weeds would likely increase within the analysis area due to natural mechanisms (wind, water, wildlife), ongoing projects, public woodcutting, active grazing allotments, and public and administrative use of roads.

Alternative 2, 3, 4, and 5

Direct and Indirect Effects: In addition to the weed spreading mechanisms identified under the no action alternative, noxious weeds could be spread by logging machinery and other vehicles associated with harvest operating along roadways, especially where soil is disturbed further. The timber harvest and temporary road construction proposed in alternatives 2-5 would increase the likelihood of spreading noxious weeds along roadways and establishing new populations in proposed harvest units. Table 4.12 shows a comparison, by alternative, of disturbed soil created by the harvest operations. These areas provide possible sites for noxious weed establishment. Alternative 3 and 5 would have the least amount of disturbed soil, and alternative 4 would have the greatest amount of disturbed soil.

Table 4.12: Acres of disturbed soil by alternative

Logging System	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Forwarder	117	201	117	201
Helicopter	15	15	15	15
Tractor	187	0	189	0
Horse	5	5	5	5
Temporary Road	20	17	20	17
Total	343 acres	237 acres	346 acres	237 acres

Mitigation measures described under Prevention Strategies in Appendix E of the Umatilla National Forest Management of Noxious Weeds EA and in the Noxious Weed Plan for Rimrock would reduce the possibility of noxious weed establishment and spread under alternatives 2, 3, 4, and 5. Post-project surveys would be used to determine if existing infestations spread because of project activities or if new infestations become established. If problem areas are found they would be analyzed and treated using the procedures outlined in the above-mentioned EA.

Other proposed activities would also require noxious weed post-project surveys. The closed roads, obliterated roads and decommissioned roads could hide present or future noxious weed communities. Bare soil would be available for several years following activities and some

dispersal agents of noxious weeds are not stopped by mechanical closures. Post project surveys would determine if new infestations have occurred.

Most noxious weeds of concern within the Rimrock planning area have little to no information on fire relationships and propagation of the species. Prescribed burns would reduce litter cover on the soil surface, thus increasing possibilities for further establishment of various kinds of vegetation, including noxious weeds. The Rimrock Noxious Weed Report, located in the Project Record, contains management direction for noxious weeds in relation to prescribed burn projects.

Many actions can both encourage natural controls or help avoid conditions that favor the invasion and establishment of noxious weeds. The actions and measures, which have been determined to be feasible, are defined in the Mitigation Measures section of this FEIS (see page **Error! Bookmark not defined.**).

Cumulative: Past mining, road construction, grazing, timber harvesting and other soil disturbing activities have provided; environments for noxious weed species establishment, vectors for noxious weed dispersal, and infestations to provide propagule source material. Any future ground disturbing activity could be conducive to noxious weed invasion and spread. Recreation, livestock, and small forest-product collection are likely to introduce and spread noxious weeds in the area.

Wildlife Habitat

Although the action alternatives differ, the differences are small enough in regards to wildlife habitat that the effects for each alternative are similar. Therefore, the discussion of effects for each action alternative is grouped in one section.

General Habitat

Alternative 1

Direct and Indirect Effects: Forest and riparian habitat would continue to develop at the current rate in the analysis area. Species dependent on mature and or late seral habitat structural conditions would continue to occupy the area. Riparian vegetation could be dominated by conifers instead of shrub and hardwoods making riparian habitat unsuitable for species associated with riparian hardwoods and shrubs.

Areas with a high density of standing and or down wood would still provide habitat for species dependent on that type of habitat. Species associated with older and larger trees would continue to use the area at its current potential.

Aspen restoration and protective measures would not occur resulting in the continued decline and risk of extirpation of these stands. Conifers would continue to encroach and canopy cover would continue to decrease. This would result in sites that are less desirable and unsuitable for species that prefer this habitat.

Prescribed underburning would not occur allowing continued fuel build up in areas that would normally be dominated by grasses. This would result in reduced vigor for grasses and shrubs and a decline in species dependent on this habitat. Habitat (forage and cover) for small mammal and ground nesting birds would remain plentiful.

Cumulative Effects: Past (<20 years) and present (on-going) actions have changed habitat conditions in the analysis area. Past harvest activities which removed large ponderosa pine and Douglas-fir, and the suppression of fires have resulted in mixed conifer stands that are dominated by grand fir. With no management activity occurring, much of the area would continue to move into a mid/late seral stage that is dominated by mixed conifers. This would provide wildlife species a large diversity of habitat in the area. The risk of losing this habitat to a large high intensity fire would continue to increase as fuels accumulate.

Alternative 2, 3, 4, and 5

Direct, Indirect and Cumulative Effects: Overall, proposed commercial and pre-commercial thinning activities would improve the forage component and allow forested areas to reach maturity sooner. Harvest activities would disturb the herbage within the unit. However, this is a short-term effect, because disturbed sites (skid trails, landings, and temporary roads) would be seeded after harvesting is completed. These sites would be re-vegetated following one growing season. Harvesting activities would open the forest canopy, allowing more sunlight to reach the forest floor. Sunlight stimulates the germination of grass, forbs and shrub seed in the soil, leading to sprouting and growing of the herbage. The increase in herbage would provide forage and cover for many species of wildlife in the area. Commercial thinning in the area would maintain the structural integrity of the stands and allow trees to increase in size and shape. With the proposed thinning activity, the stands would reach the late structural class sooner and would be in a healthier condition to resist insects and disease. This activity would increase suitable habitat for species associated with older and larger trees.

Proposed fencing projects (aspen/riparian) would help maintain and protect grasses and shrubs in riparian area, wet meadows, and wetlands from excessive utilization. This would allow wetland vegetation to develop and provide wetland species with quality habitat. Restoration activities would restore and maintain wetland habitats in the analysis area.

The maintenance and restoration of in-channel fish structures would help restore and maintain aquatic habitat. The 155 structures needing repair are not functioning at full capability. When repairs are completed, the structures would continue to provide wetland habitat for aquatic insects, amphibians and a watering source for wildlife.

Proposed prescribed burns would enhance forage for herbivores, reduce ladder fuels, and improve or enhance shrub habitat.

No new permanent roads would be constructed for this proposal. Temporary roads would be constructed to facilitate timber removal in harvest units then obliterated and re-vegetated after harvest activities are completed. Obliterated roads would add area for herbage and allow trees and shrubs to regeneration on the site and would reduce big game vulnerability. With the increased herbage and tree regeneration, foraging and cover habitat would develop in these areas. Road repair activities would have little or no effect on cover or forage habitat at the designated sites because minimal amount of grasses and shrubs would be disturbed and activities would remain within the current road prism. Disturbed sites would be re-vegetated and grasses and shrubs would reoccur at the site after the first growing season.

Past timber harvest and associated activities as well as fire suppression have changed habitat conditions in the analysis area. By maintaining the PACFISH buffers, implementation of the proposed activities would retain habitat diversity and connectivity in the area.

Management Indicator Species (MIS)

Alternative 1

Direct and Indirect Effects: Summer and winter foraging habitat for **Rocky Mountain elk** would be abundant throughout the analysis area. Summer forage quality would remain good with grasses being the dominant forage. Winter forage would be abundant in the winter range with grasses being the dominant forage.

Cover (hiding, thermal, calving) for Rocky Mountain elk would be maintained or increased in the short term. Cover developing in the area would occur in large patches and would be less fragmented. All satisfactory and marginal cover values would be maintained in the analysis area. Trees would remain as screening to obscure the view of elk and provide corridor habitat. Road densities would remain at the current level.

Snag habitat for the **northern three-toed woodpecker** and **primary cavity excavators,** including **pileated woodpeckers** would occur at levels described in the existing condition (Chapter 3). Primary cavity excavators would continue to occupy the analysis area at their current rate.

Cumulative Effects: The composition of MIS species has changed as a result of past and present actions and activities in the analysis area. This was primarily due to the changes in habitat from insect, disease, selective harvest and lack of natural fires. The number of elk has increased. The numbers of cavity nesters and woodpeckers are suspected to have increased because of changes in stand composition toward mixed conifer, which is favored by these species.

Alternative 2, 3, 4, and 5

Direct and Indirect Effects: Proposed activities would maintain or improve **Rocky Mountain elk** summer and winter foraging habitat. Proposed commercial and pre-commercial harvest, road obliteration activities and prescribed burning would improve or maintain the availability of grasses and shrubs in the analysis area. As a result, the forage component would increase in quality and quantity across the analysis area. With the abundance and wide distribution of grasses and shrubs, the utilization on riparian vegetation and conifer plantings would be localized and limited to seasonal use. The remaining activities (in-channel fish structures) would not have a direct or indirect effect on forage for elk because these activities will not greatly change the quantity or quality of forage in the analysis area.

There would be a reduction in satisfactory cover by 22% (2,472 acres) and marginal cover by 8% (1,888 acres). Proposed commercial and pre-commercial thinning harvest would reduce the quality of cover for elk in the analysis area. Trees removed for harvest would reduce the value of marginal and satisfactory cover. The commercial thinning proposed in the analysis area would maintain an overall canopy cover above 40% in harvest stands and maintain patches of understory seedlings and saplings to provide some cover components in the stand.

Proposed activities would not increase open road densities so there would be no additional vulnerability to elk in the analysis area. Temporary roads would be constructed to facilitate harvest activities but these roads would be closed and obliterated after harvest is completed. Some system roads would be obliterated in the analysis area thereby reducing the overall road density in the area. The remaining activities (in-channel fish structures and fencing) would not have a direct or indirect effect on road densities in the analysis.

Proposed activities would not impact the **northern three-toed woodpecker** or its potential habitat (USDA, FS 1990, DeGraaf 1991) in the analysis area. Currently, the only habitat in the analysis area includes Dedicated Old Growth (C1) and no activities are scheduled for these areas. No snags are being removed except in proposed units 110 and 130 and snag levels in these units would be retained to meet 100% population potential. Snag levels would be maintained by following tree marking guidelines for each timber sale. The implementation plan for each timber sale would ensure that all mitigation measures are carried forward through completion of each timber sale.

Proposed activities would not impact **primary cavity excavators** (hairy woodpecker, black-backed woodpecker, Lewis' woodpecker, common flicker, and downy woodpecker), **pileated woodpeckers**, or their potential habitats in the analysis area. Habitat for these species consists of dead standing trees (snags) for nesting and foraging. Snags would be retained at the 100%+ population potential for primary cavity excavators (Thomas 1979). Snag levels would be maintained by following tree marking guidelines for each timber sale. The implementation plan for each timber sale would ensure that all mitigation measures are carried forward through completion of each timber sale.

Cumulative Effects: In general, past and present actions and activities have changed the composition of MIS species in the analysis area. Proposed and future projects would improve or

maintain habitat conditions for MIS species. The populations of MIS species nor the species composition is expected to change as a result of implementing the proposed activities.

Neotropical Migratory Birds (NTMB)

Alternative 1

Dry Forest: With the No Action alternative, proposed thinning and underburning would not occur and so development of a "large tree, single-layered canopy with an open, park-like understory dominated by herbaceous cover, scattered shrub cover, and pine regeneration" would be delayed. Area NTMB species that are associated with this habitat will remain stable or decline until more of this type of habitat develops over time.

Mesic Mixed Conifer, Riparian Woodland, and Unique Habitats: No change in these habitats is expected under the No Action alternative, therefore NTMB species associated with these habitats, where they currently occur in the area, should not be affected.

Alternative 2, 3, 4, and 5

Dry Forest: Proposed thinning activities will promote the development of a large tree, single-layered canopy with an open, park-like understory dominated by herbaceous cover, scattered shrub cover, and pine regeneration. Species which favored open stands of old ponderosa pine have declined as these stands have grown in with more shade-tolerant species. Understory burning and thinning where appropriate is beneficial to this group, however the Conservation Strategy for Landbirds (Altman 2000) recommends retaining all ponderosa pine >18" dbh, which is not included in these alternatives.

Based on the forest vegetation analysis, the proposed activities would accelerate development of historic species composition, structure, and stand densities on 4,583 acres. Under alternative 5, the proposed regeneration activities within the six stands of approximately 122 acres would accelerate fragmentation which can have negative effects on landbirds such as insufficient patch size for area-dependent species and increase in edges and adjacent hostile habitats, which can result in reduced productivity through increased nest predation, nest parasitism, and reduced pairing success of males. Additionally, fragmentation can alter the dispersal and immigration of some populations that use this type of habitat.

Prescribed burning and harvest activities in the spring could temporarily displace ground-nesting birds. Recent studies indicate that a percentage of nests are burned in spring fires, but it is possible that those birds will re-nest in the same season.

Mesic Mixed Conifer, Riparian Woodland and Shrub, and Unique Habitats. Little to no change in these types of habitat is anticipated since minimum management activities are proposed. Riparian areas have been avoided in the development of the proposed actions, and therefore riparian habitat quality will not be affected. Aspen habitat will be improved by the proposed actions. Special habitats such as meadows, scab habitats, and rock/talus slopes would be directly avoided.

Cumulative Effects: Past, ongoing, and proposed activities could cumulatively impact potential bird populations in the area due to the extended duration and intensity of activities, and the large percentage of area affected.

Threatened Proposed and Endangered Species

Alternative 1

Direct and Indirect Effects: No direct or indirect effects to wintering or breeding **northern bald eagles** or their potential habitat (USDI 1986) occur because no activities take place to effect the bird or alter their habitat.

Past and present activities have not impacted potential northern bald eagle populations or their habitat in the North Fork John Day (NFJD) River system. Bald eagle populations (residents and migrants) have been increasing in the NFJD River system for the past 15 years (Isaacs and Anthony, 1998). Currently, resident eagle nests are along the lower portion of the NFJD River. Nesting sites could expand throughout the NFJD River system as long as reproductive success continues in the resident population. Wintering eagle populations have expanded throughout the river system more rapidly than resident populations and should remain stable or increase over the next few years.

Cumulative Effects: Past (<20 years)and present activities have not impacted bald eagle habitat in the NFJD River system. Habitat along and adjacent to the NFJD river corridor and Bull Prairie Reservoir continues to improve and recover from past (<30 years) activities. Numerous large trees (>30" dbh) for roosting and nesting occur within the analysis area and the NFJD River system. Habitat connectivity is adequate on National Forest lands but tends to fragment on private lands down stream from the analysis area. Habitat should maintain or improve its "potential" for nesting sites along the river corridor (Issacs etal. 1993).

Effects from past and present activities within and adjacent to the analysis area have led to increased access and the resultant increase in human disturbance throughout the area. Periods of high disturbance occur during the fall hunting seasons as well as during spring and summer mushroom picking and woodcutting. This periodic disturbance from humans will continue, but should be of short duration and not expected to affect bald eagle activity in the long term.

The Lynx Conservation Strategy (January 2000) describes Lynx Analysis Units (LAUs) which include geographic extent, lynx population distribution, habitat, and risk factors specific to home range. Analysis done during the winter of 2000 shows no LAUs in the Rimrock analysis area.

Alternative 2, 3, 4, and 5

A biological evaluation has been completed for all threatened, endangered, proposed, or sensitive species known or expected to inhabit the planning area. Endangered Species Act determinations for each species were identical for all action alternatives. The determinations from the biological evaluation are summarized in the following table. The biological evaluation is available in Section 3 of the Project File.

Table 4.13 Biological Evaluation Categories for TEPS

Species	Status	Determination
Northern Bald eagle (*Haliaeetus leucocephalus*)	Threatened	**No effect** on the species or its habitat
Canada lynx (*Lynx canadensis*)	Threatened	**No effect** on the species or its habitat
Gray wolf *(Canis lupus)*	Threatened	**No effect** on the species or its habitat
Columbia spotted frog (*Rana luteiventris*)	Candidate	**May impact** individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the populations or species
California wolverine (*Gulo gulo luteus*)	Sensitive	**No impact** on the species or its habitat
Gray flycatcher *(Empidonax wrightii)*	Sensitive	**No impact** on the species or its habitat

Direct and Indirect Effects: The majority of proposed activities in the analysis area would take place from April to October. Conflicts between **northern bald eagles** and the proposed actions are not expected, because eagles have not been observed in the majority of the analysis area during the breeding season (March-July). Some proposed harvest units in the south portion of the analysis area are within 1.5 miles of the Dry Creek Bald Eagle Consideration Area (BECA) (VanWinkle 1999b). Proposed thinning would not alter potential nesting habitat or potential nest trees, because trees greater than 21" dbh would be retained in harvest units. The canopy cover would remain intact within harvested stands. No activities would occur within the Bald Eagle Management Area (BEMA).

The proposed actions would not affect perching or roosting habitat (USDI, FWS 1986) for wintering eagles. This is because proposed harvest is outside the BEMA and harvest is limited to trees that are less than 21'' dbh. Snags would be retained as described previously across the analysis area and in harvest units to provide potential perching sites. Currently, the majority of eagle use (perching) is within one mile of the NFJD River and on the ridgeline north of the river. Wintering bald eagles would not be affected if harvest activities occur from December to March.

Cumulative Effects: Past and present activities have not impacted potential **northern bald eagle** populations or their habitat in the North Fork John Day River system. Over the last 15 years, bald eagle populations (residents and migrants) have been increasing in the NFJD River system (Isaacs and Anthony 1998). Currently, resident eagle nests are along the lower portion of the NFJD River. Nesting sites could expand throughout the NFJD River system as long as reproductive success continues in the resident population. Wintering eagle populations have expanded throughout the river system more rapidly than resident populations and should remain stable or increase over the next few years.

Effects from past and present activities within and adjacent to the analysis area have lead to increased access and the resultant increase in human disturbance throughout the area. Periods of high disturbance occur during the fall hunting seasons and the spring/summer mushroom

picking season. Proposed and future activities have focused on reducing road densities in the area through closures and obliteration, which helps reduce disturbance. Periodic disturbance from humans is expected, but should be of short duration and not expected to affect bald eagle activity in the long term.

The cumulative effects of the proposed activities would not impact the bald eagle habitat in the NFJD River system. Habitat along and adjacent to the river corridor continues to improve and recover. Numerous large trees (greater than 30" dbh) for roosting and nesting occur within analysis area and the NFJD River system. Habitat connectivity is adequate on National Forest lands but tends to fragment on private lands down stream from the analysis area.

No Lynx Analysis Units (LAUs) exist in the analysis area so there is no effect on lynx or its habitat.

Sensitive Species

Alternative 1

Direct, Indirect, and Cumulative Effects: Columbia spotted frog, gray flycatcher, and **California wolverine**, all listed as "Sensitive" by the Regional Forester, would not be negatively impacted under this alternative.

Past and present activities have not affected "potential" sensitive species populations or habitat in the area. A variety of habitats occur in the watershed and adjacent to the analysis area. However, because of the narrow habitat parameters for some sensitive species, habitats may be restricted by "natural" conditions in the watershed.

The **spotted frog** could be directly and indirectly affected. Without protection of aspen/riparian vegetation, habitat for the frog could deteriorate through excessive ungulate utilization of aspen/riparian vegetation. Habitat quality would be low and would not regenerate without continually being retarded. With ungulate use in aspen/riparian habitat the potential occurs for trampling frogs and riparian vegetation.

Alternative 2, 3, 4, and 5

Direct and Indirect Effects: Proposed activities would maintain or improve potential **Columbia spotted frog** habitat in the analysis area. Habitat for spotted frog would be protected with RHCA's buffers when activities occur near or adjacent to riparian or wetlands. Riparian vegetation would be allowed to regenerate and develop naturally without mechanical disturbance. Fencing aspen stands would enhance wetland habitat for potential spotted frog use. Fenced habitat would be protected from excessive utilization of riparian vegetation by ungulates. Limiting ungulate use in these types of habitat would maintain the quality of riparian habitat and provide potential habitat for the spotted frog.

The remaining activities (in-channel fish structures, prescribed burn, road work, etc.) would have an effect on the **Columbia spotted frog** and its habitat. This is because proposed activities would change the quality of habitat (forage and cover) and displace individuals.

The proposed actions would have no impact on the **California wolverine** or its habitat. Natal denning habitat for this species does not occur within the analysis area. Potential foraging habitat would be maintained in the lower portion of the analysis area. In addition, presence of this species has not been confirmed within the analysis area or on the district.

The majority of activities would occur in habitat unsuitable for denning because most of the open nature of the analysis area. The proposed commercial thinning in the analysis area would reduce tree densities but canopy cover and forest structure would be maintained, providing marginal habitat for foraging. The potential for wolverine to forage through the area during harvest operations is unlikely because of their sensitivity to human presence in the area. Proposed

activities and the restoration of vegetation in the analysis area could lead to higher densities of ungulates that could provide a food source for possible wolverine in the area.

Gray flycatcher would not be negatively impacted under this alternative. The flycatcher has not been documented in the analysis area or on the Heppner Ranger District. Nesting habitat for this species is not abundant in the analysis area. There are no known sightings of flycatchers within the planning area or on the Heppner Ranger District. Surveys have not been conducted specifically for the gray flycatcher. This species was added to the Region 6 Sensitive Species list in November 2000. Most sites have juniper encroachment and are of the low sagebrush variety. Sagebrush habitats within the planning area are not very tall or dense. It is likely that these habitats are marginal at best for flycatchers. More suitable habitat exists outside the planning area.

Cumulative Effects: The cumulative effects of the proposed activities combined with past, ongoing, and foreseeable future activities would not affect potential **California wolverine** populations or their habitat. Proposed activities would maintain or develop "potential" foraging habitat and initiate the recovery of future habitat for wolverine. There is very limited potential for natal denning habitat to occur within the analysis area. Past activities within the analysis area have changed the habitat for the **spotted frogs**. This was primarily because past management practices changed most habitats in the analysis area. This habitat condition changed the composition and number of species that could occur in the analysis area. Proposed activities should improve habitat for the spotted frog and no reasonable foreseeable future activates are known that would effect the spotted frog.

Species of Concern

Alternative 1

Direct, Indirect, and Cumulative Effects: No direct or indirect effects to the **northern goshawk** or the **white-headed woodpecker** or their habitat would occur because no activities would take place to alter potential habitat.

The removal of large ponderosa pine and the subsequent invasion of grand fir have changed habitat conditions for the white-headed woodpecker and the northern goshawk. This change in habitat condition has changed the composition and number of species that could occur in the analysis area.

This alternative would not affect the pale western big-eared bat, spotted bat, small-footed myotis bat, long-eared myotis bat, long-legged myotis bat, Yuma myotis bat, olive-sided flycatcher, or the northern sagebrush lizard.

Alternative 2, 3, 4, and 5

Direct and Indirect Effects: Proposed activities would maintain or improve potential **northern goshawk** habitat in the analysis area. During unit surveys a goshawk nest was located in proposed unit #184. The unit was dropped from consideration and would be protected from proposed activities that would occur in the vicinity of the nest site. The nest stand (30 acres around historical nest) would not be harvested. Harvest activities would occur inside the "post fledging" territory. Seasonal restrictions on activities near the nest site would be required for activity types that may disturb or harass the pair while bonding or nesting. Proposed commercial thinning would retain all trees greater than 21" dbh and move stands toward a late and old structural condition.

Proposed aspen/riparian projects would indirectly improve or maintain potential goshawk habitat in the analysis area. Maintaining or increasing hardwoods would improve habitats (forage and cover) for small birds and mammals. This would in turn provide a forage base (prey species) for any potential goshawk occupying the area.

The remaining activities (in-channel fish structures, road work, etc.) would not have a direct or indirect effect on goshawk or their habitat because proposed activities would not change the quantity or quality of habitat (forage and cover).

Proposed activities would maintain or improve potential **white-headed woodpecker** habitat in the analysis area. Proposed commercial thinning would retain all trees greater than 21" dbh and move stands toward a late and old structural condition. Proposed aspen/riparian projects would improve or maintain potential forage and nesting habitat in the analysis area.

The remaining activities (in-channel fish structures, road work, etc.) would not have a direct or indirect effect on white-headed woodpecker or their habitat. This is because proposed activities would not change the quantity or quality of habitat (forage and cover).

The proposed actions would have no impact on the **Pacific western big-eared bat** or its habitat. The bat is not documented in the analysis area and suitable roosting habitat (hibernacula or colonial roost) does not occur in the analysis area. Direct and indirect effects to the bat from proposed restoration activities are not expected to have an adverse effect on potential populations in the area. This is because of their limited distribution within the Forest and the State. No activities occur around mines or caves, if hibernacula or roosts are found they would be protected with buffers to maintain the integrity of the site. Snag habitat in the analysis area could provide temporary roosting habitat for foraging bats.

The proposed action would not affect potential foraging habitat for the species. Proposed restoration activities would occur during daylight hours, resulting in no direct effect on the foraging behavior of potential big-eared bats in the analysis area. Habitat for foraging bats would be unchanged in the analysis area because none of the restoration projects would affect moth populations. Proposed commercial thinning would maintain canopy cover across the treated stands at greater than 40%. Trees retained after harvest would continue to grow increasing the size of the crown and potential foraging habitat for many bats.

The proposed actions would have no impact on the foraging habitat for the **pale western big-eared bat, spotted bat, small-footed myotis bat, long-eared myotis bat, long-legged myotis bat**, or **Yuma myotis bat**. Proposed restoration activities would occur during daylight hours, resulting in no impact on the foraging behavior of potential bats in the area. Habitat for foraging bats would be unchanged in the area because none of the projects would change the prey population, while snags and standing trees will provide suitable roosting habitat.

The **northern sagebrush lizard** occurs in open forests of juniper, ponderosa pine, and lodge pole pine that have open brushy understories. The proposed actions would not impact the species or its habitat.

The **olive-sided flycatcher** is found in the analysis area. No impact to its foraging or nesting habitat would occur. Habitat would be improved indirectly by some of the proposed restoration projects. Foraging habitat would be improved with proposed aspen/riparian enhancement and riparian fencing.

Cumulative Effects: Past, ongoing, and proposed activities would not cumulatively impact potential **Pacific western big-eared bat** populations in the analysis area. The vegetative composition in the analysis area has been maintained. Proposed activities would maintain any potential foraging habitat and would initiate the development of future foraging habitat. Proposed activities encourage vegetative development, that ultimately provides habitat for insect populations. Snags occur at various densities and size classes in the analysis area. Snags densities would be retained in the analysis area at prescribed levels and would persist across the analysis area.

Past activities within the analysis area have changed the habitats for goshawk, white-headed woodpecker and spotted frogs in the analysis area. This was primarily because past management practices changed most habitats in the analysis area. This habitat condition changed the composition and number of species that could occur in the analysis area.

Economics/Social

The social and economic effects of the various proposed management alternatives were assessed in terms of viability of harvestable timber, employment supported by the alternatives, and the economic efficiency for relative comparison between alternatives.

Viability of Timber Harvest

The area proposed for commercial thinning within the Rimrock Project area was analyzed to determine the economic viability of harvesting timber by determining the tentative advertised bid rates per hundred cubic feet ($/ccf). This estimate was based on estimates of volume, species, amount of sawtimber and nonsaw material, logging systems costs, haul costs, road maintenance costs, contractual costs, erosion control and other developmental costs, temporary road costs, and specified road construction costs, and the value of timber proposed for removal. The preliminary value of the timber was based on the prices for the same species and material of all sales actually sold within Appraisal Zone 3 (primarily Blue Mountain forests) within the last 12 months.

The tentative advertised bid rates estimated for the Rimrock Project reflect the most current volume, price and cost estimates for this analysis. An initial bid rate was determined by subtracting the costs associated with logging from the base period prices adjusted for the quality of the material and current market conditions. This rate was further reduced per current appraisal methods (Transaction Evidence Appraisal) to allow for competition between bidders to determine the tentative advertised bid rate. The computer software program, TEA_ECON was used for this analysis.

All alternatives that harvest timber would produce positive bid rates indicating that the project would provide a viable harvest proposal. Based on this analysis, alternative 4 provides the highest tentative advertised bid rate at $30.78/ccf and therefore, the highest potential revenue from the sale of timber. Alternative 2 bid rate is slightly lower at $25.52/ccf due to a greater amount of helicopter logging systems. Alternative 5 bid rate is $22.25/ccf followed by Alternative 3 with the lowest bid rate ($22.02/ccf). Alternative 3 would provide the least amount of revenue from alternatives that harvest timber due to harvesting almost twice as much of the volume with helicopter logging systems which is more expensive than ground-based systems. However, all horse logging units except under alternative 4 would result in negative bid rates and would not be economically viable harvest proposals on their own. Alternative 1 would not harvest any timber and therefore, would not produce any revenue or benefits to wood products industries. Refer to Figure 4.8 for an illustration of tentative advertised bid rates by alternative.

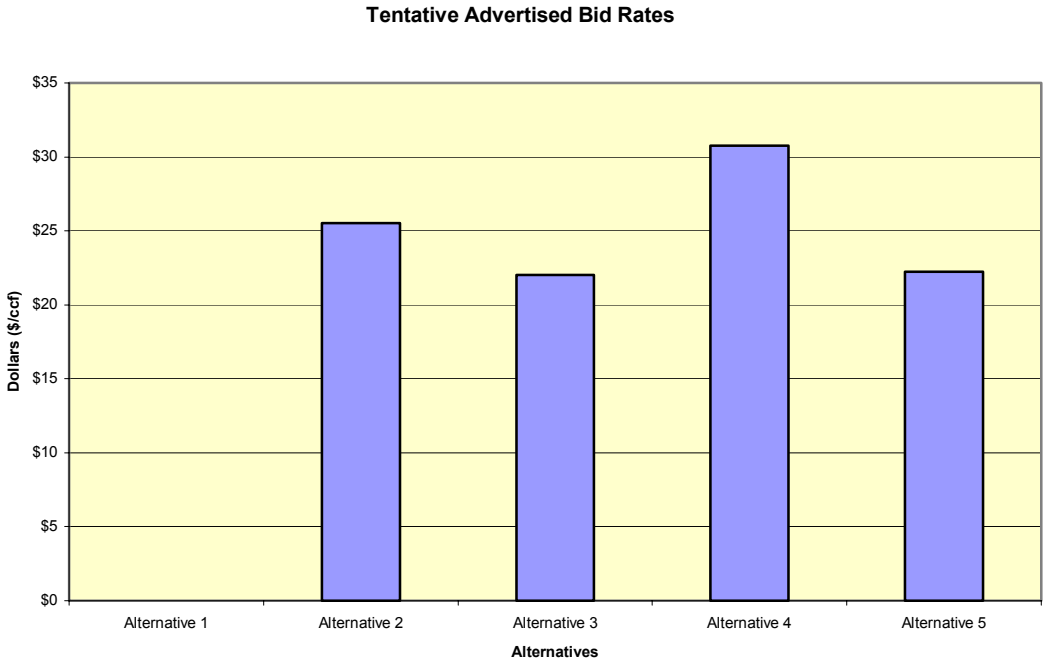

Figure 4.8 Tentative Advertised Bid Rate by Alternative

Cumulative Effects: Estimates for tentative advertised bid rates for alternatives 2, 3, 4 and 5 are within the range of rates experienced by the three Blue Mountain forests (Malheur, Umatilla, and Wallowa-Whitman) within the last two years (Hancock 1998). Advertised bid rates have fluctuated over the last few years reflecting the volatility of the market for timber. Changes to prices would likely occur in the future at the time of the appraisal depending on actual market conditions at that time.

Employment

The primary effect on timber-harvest related employment would occur from commercial harvesting associated with the alternatives over the next three years. Financially viable sales would be necessary to provide opportunities for timber-harvest related employment. Levels of harvest volume by alternative would affect employment and income in several ways:

- *directly* - (effects attributable to employment associated with harvesting, logging, mills and processing plants for sawtimber, pulp, chips, veneer and plywood)
- *indirectly* - (effects attributable to industries that supply materials, equipment, and services to these businesses)
- *induced* - (effects attributable to personal spending by the business owners, employees, and related industries).

Employment and income effects were derived from response coefficients from the input-output model, IMPLAN (Impact Analysis for Planning), for the Umatilla National Forest impact zone and from the forest-level Timber Sale Program Information Reporting System (TSPIRS) analysis in fiscal years 1996 to 1998 (USDA 1998, USDA 2000). Job estimates include temporary and permanent full-time, part-time employment. The estimates do not include unpaid family workers or sole-proprietors.

This analysis assumes that all harvesting would occur over the next two years. Employment effects from recreation and domestic-livestock grazing activities were not analyzed because the level of use was not expected to change by alternative. The estimates provide a relative comparison of jobs supported by the alternatives to communities and counties in the regional impact zone and not necessarily to any one county.

No harvest related activities would occur under Alternative 1 (No-action) and therefore, no contribution to direct, indirect, or induced employment and income associated with timber harvesting would result from the project. Declining trends in timber harvesting from National Forest System lands would continue in the future and contribute to declines in wood products employment over the next two decades. Changes in the economic base and wood products infrastructure for the impact area would also continue to be influenced by fluctuations in market prices, international market conditions, changes in technology and industry restructuring.

Alternative 5 would support the highest level of employment (185 jobs) over the two-year period. Alternatives 3 and Alternative 2 are slightly lower with 177 and 174 jobs, respectively, followed by the lowest potential employment supported in Alternative 4 with 145 total jobs. The overall employment and income effect from the action alternatives would continue to support the wood products manufacturing component of the economic base of the impact area. The magnitude of the economic effects would be limited to two years associated with the harvesting activities. Any individual county or community in the impact area could experience greater benefits in the short-term (2-3 years) particularly the communities very highly specialized in wood products manufacturing.

However, several factors would influence the ability of any one county or community to experience the largest extent of the harvest-related employment and income effects. The financial viability of the timber sale proposals would influence whether potential purchasers closest to the project area could be competitive with other purchasers to acquire the majority of the supply of wood. New road construction and reconstruction proposed under the alternatives would increase access and increase the quality of access to sale units and increase financial viability of harvesting units with ground-based logging systems. Employment projections would depend on other factors such as market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

The distribution of economic impacts would depend on the location of the timber purchaser awarded the contracts at the time of the sale, the availability of equipment and skills in the impact area, and the location and availability of the wood processing facilities and related infrastructure. Given the size of the potential volume compared to offerings in the last year from NFS lands across the Blue Mountains, several mills located in other counties in Northeast Oregon would be potentially interested in the supply of wood offered. Processors outside of Northeast Oregon would potentially bid on the sales and distribute the jobs and income effect to other counties in the Blue Mountains or outside of the area entirely. Refer to the following table for an illustration of employment effects from timber harvesting by alternative.

Table 4.14 – Timber-harvest Related Employment and Income by Alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Employment					
Total direct, indirect and induced	0	174	177	145	185
% change	0%	0%	2%	-16%	6%
Income					
Total direct, indirect and induced	$0	$4.9 million	$4.9 million	$4.1 million	$5.2 million
% change	0%	0%	2%	-16%	6%

Cumulative Effects: Annual timber related employment supported by timber harvested from the Umatilla National Forest for the years 1995-97 averaged 394 jobs. Employment supported by commercial thinning in all action alternatives would support approximately 20-22 percent toward this level of annual employment. Alternative 1 would not provide harvest opportunities and would not support employment in the impact zone from timber harvesting.

Other employment would continue to occur as a result of other timber sales in progress, domestic-livestock grazing, and recreation activities, and other special use receipts across the Forest. Commercial collection of nontimber forest products such as mushrooms could continue to occur although the quantity of harvest is unknown. In addition, other employment opportunities would also be provided by restoration and enhancement activities outlined for the Rimrock Project and would depend on the level of funded projects.

Economic Efficiency

Forest Service Handbook 2409.18 provides direction to analyze financial efficiency and, if needed, economic efficiency to identify the most efficient alternative that achieves the desired objectives of the project. Consideration of the proposal that maximizes net public benefits is an important consideration of the decision-making process.

An economic efficiency analysis was completed that focused on identifiable and quantifiable ecosystem benefits and costs for each alternative in terms of the present net value (benefits minus costs) to assess which alternative comes nearest to maximizing net public benefits (36 CFR 219.3).

Ecosystem functions provide a broad set of ecosystem services such as clean water or native forest stands that are valuable to both human and nonhuman components of the ecosystem. These ecosystem values may be assessed in economic and noneconomic terms. Economic valuation provides a partial measure of the full range of ecosystem values in commensurate terms for assessing economic tradeoffs. Noneconomic values are necessarily assessed in terms relevant to other disciplines such as ecology or ethics. Changes in ecosystem services must be measurable and quantifiable in like terms, preferably monetary measures, in order to assess a relevant change in economic value (Bergstrom and Loomis 1999).

This analysis is based on identifiable and quantifiable economic benefits and costs and is more typically a financial comparison between revenues and costs. The objective of the economic efficiency analysis is to show a relative measure of difference between alternatives based on direct costs and values used. All dollar values have been discounted in terms of the present net value (2002 dollars). Discounting is a process whereby the dollar values of costs and benefits that occur at different time periods are adjusted to a common time period so that they can be compared. The real (exclusive of inflation) discount rate of four percent was used in the analysis over the planning period.

Present net value is defined as the present (discounted) net value of project benefits minus the present (discounted) net value of project costs. A benefit-cost ratio is the ratio of present net benefits to present net costs. Present net value is a more appropriate measure for comparison between alternatives when land and productive activities are limiting such as in an environmental analysis of alternatives. A benefit-cost ratio comparison is more appropriate when investment capital is limited, for example when considering budget allocation among a number of different activities. Refer also to the Umatilla National Forest, FEIS, Appendix B, for a comprehensive quantification of the net public benefits for the Forest Plan (USDA 1990).

Direct and Indirect Effects: Measurable and quantifiable economic market benefits identified in the Rimrock Project include discounted revenue from timber volume proposed for harvest. Revenue is derived from the tentative advertised bid rate for the timber multiplied by the total cubic-feet proposed for harvest and discounted to the present. Refer to the section above on Viability of Timber Harvest. Other nonmarket benefits that may occur as a result of the proposed activities include changes in recreational fishing through reductions in sediment and

improvements to fisheries habitat, improvements in the quality of the recreation experience, and increases in forage to wildlife species.

In addition to use values, existence values otherwise referred to as passive, nonuse or preservation values may capture important economic value to the public (Swanson and Loomis 1996). Although these benefits are important components of the ecosystem services provided to humans, the production relationship between ecosystem functions and ecosystem services (such as changes in recreation visitor days, fishing days, animal units months, or fish population) is not well defined or measurable at the project level in terms that provide meaningful comparisons of commensurate dollar values.

Measurable and quantifiable costs at the project level include direct costs to the Forest Service for preparing and administering the commercial timber and implementing other restoration activities including precommercial thinning, road closure improvements, decommissioning, obliteration, slash treatment, natural fuels treatments, fish structures, and aspen treatments. Refer to Chapter 2 – Rimrock Alternative Comparison, for a complete list of activities.

All action alternatives illustrate a negative present net value based on discounted revenue received from the project compared to the discounted total dollar-quantified costs for the project. The no-action Alternative (Alternative 1) would not harvest timber and would not produce quantified benefits due to the data limitations described for quantifying economic benefits and costs beyond those identified at the project level. Alternative 1 would have no costs associated with harvesting although ongoing costs associated with management of the area would continue. Planning costs associated with the project are treated as “sunk costs” which have already been incurred regardless of the alternative and are not graph.

Because present net values are negative, the comparison of alternatives is an illustration of the figures bearing in mind that the lowest figure for present net value demonstrates the greatest contribution to present net value. Alternative 4 would produce the greatest present net value (-$1,222,662), followed by Alternative 2 (-$1,423,843), Alternative 3 (-$1,543,125) and Alternative 5 (-$1,552,043). The following figure illustrates the present net value by alternative.

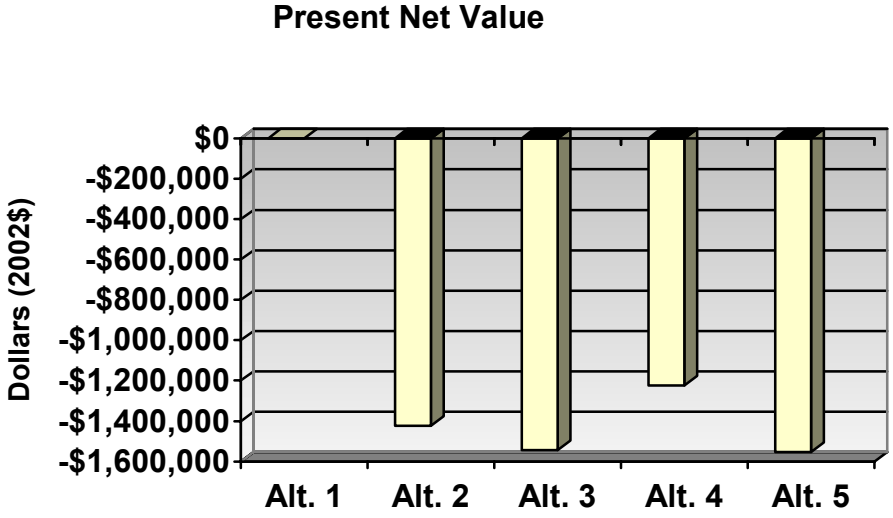

Figure 4.9 Present Net Value of Projects

The dollar-quantified present net benefit from the project compared to the dollar-quantified present net costs is show in the table below.

Table 4.15 Present Net Benefits by Alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Present Net Benefits					
Timber Value	$0	$839,471	$736,022	$845,629	$779,406
Present Net Costs					
Sale preparation and administration	$0	(1,075,080)	(1,092,514)	(897,837)	(1,144,815)
Restoration and mitigation projects	$0	(1,188,234)	(1,186,634)	(1,170,454)	(1,186,634)
Present Net Value					
Present Net Value	$0	-$1,423,843	-$1,543,125	-$1,222,662	-$1,552,043
Percent Change	0%	0%	-8%	23%	-23%

Alternative 4 would have the greatest present net value of the action alternatives due primarily to the highest timber value resulting from lower associated logging system costs. Alternative 2 present net value would be similar to Alternative 3 but would have slightly higher costs associated with logging systems. Alternatives 5 and 3 would have lower timber values (8-12% less) compared to Alternative 2 due to higher logging costs associated with helicopter logging. Costs for sale preparation and administration vary by alternative based on the amount of timber harvested. Costs for restoration and mitigation projects associated with the alternatives would be similar under all alternatives (approximately $1.2 million). Alternative 1 would have no project-associated costs for comparison to the action alternatives.

Potential benefits that were not quantified in economic terms due to the limitations of measuring the production relationship between ecosystem functions and ecosystem services at the project level include improvements to soil productivity, reduced erosion, water quality improvements in temperature, terrestrial and aquatic habitat improvement. Potential improvements in fish habitat would subsequently increase smolt survival rates, overall fish population levels and increase commercial and recreational fishing opportunities. Two measures of potential economic effects would be changes in the value of commercial and sport fishing harvests.

Sport values quantified for fish range from an average net value per fish (the economic trade-offs an angler would make for access to a given fishing experience) of $57 for salmon and $161 (2002$) for steelhead in the Columbia River Basin depending on the location and size of the catch (Olsen et al 1991). Depending on the level of change from the restoration activities in the project area, the net economic value of fish for example, would or would not be affected. Changes in sport fishing would also have an effect on recreation expenditures and potential

economic impacts. Refer to the Aquatics section of this EIS for further discussion of effects to fish habitat.

Other potential qualitative economic benefits or costs from the alternatives include changes to the diversity, quality and quantity of wildlife habitat for both game and nongame terrestrial species. With respect to big-game populations, the economic value of hunting would depend on how changes in population levels and spatial distribution of game animals affect either the quality or intensity of the hunting experience. Consequently, the overall level of hunting would change with corresponding economic impacts from hunting-related expenditures. Changes in nongame population levels and diversity would affect wildlife viewing, photography and other nonconsumptive uses of the area. Refer to the Recreation and Terrestrial sections of this EIS for further discussion of effects to these resources.

Other opportunity or externalized costs that would potentially occur include damage to soils from harvest operations resulting in long-term losses in soil productivity and potential timber harvest, losses in wildlife habitat as a result of reduced large snags or increases in wildfire risk, or increases in sedimentation to downstream fish habitat and public drinking water from erosion in the fire area. These costs are not well defined or measurable at the project level in terms that provide comparison of commensurate dollar values. Refer to the other environmental consequences sections in this EIS for a discussion of effects to ecological and human use for a relative comparison between alternatives.

Range

This section discusses potential effects to Range by evaluating the no action/action alternatives and the elements that make each alternative unique to the restoration project.

Goal: To manage the forage resources for an upward trend in the quality and quantity of desired vegetation for livestock and wildlife on National Forest System Lands.

Alternative 1

Direct and Indirect Effects: Present and future livestock grazing activities will continue within the analysis area. Under the no-action alternative, current management of the Little Wall, Hardman and Tamarack/Monument Cattle allotments will continue. Grazing livestock on National Forest System Lands is tiered to the terms and conditions within the Term Grazing Permit and the Annual Operating Instructions (AOI).

Cumulative Effect: Over the last two decades the number of permittee on the three allotments within the analysis area has change from 12 permittees in 1983 to 7 permittees in 2003. The total number of Animal Unit Months (AUM's) has decreased over the last 20 years due to resource conditions and the desired management goals and objectives. AUM's have decreased from 7,618 AUM's to the current 5,895 AUM's. It is expected that the number of permittees and the number of AUM's will stabilize according to the economics of grazing livestock on National Forest System Lands, and the policies directing multiple use.

Alternative 2, 3, 4 and 5

Direct and Indirect Effects: Forage that is desirable to livestock is abundant within the analysis area. Treatments that reduce tree canopy cover, dead down woody materials and timber litter will increase desired plant species used by livestock.

Thinning and removal of conifers could initially add large volumes of down wood material (slash) to the forest floor. Material that is left behind as a result of the treatment could create problems for livestock movement and management. During logging operations, gates should remain closed to

keep cattle from leaving their designated grazing areas. Good communications between the Range Specialist, Timber Sale Officer and Purchaser Representatives should occur before work is initiated to eliminate potential problems or damage to structural improvements (fences, ponds and spring developments).

Prescribe burning will stimulate available forage preferred by livestock. By burning and removing old thatch material that has accumulated over time; grass plants will contain more green leaf area and provide better quality forage for livestock and wildlife. Range structural improvements should be identified in all burn plans and be protected during the burning operations.

Roads that are closed or obliterated as a result of the restoration project are often used by the permittee to manage their allotments; roads are used as livestock driveways, and for access by the permittees to manage their cattle on the allotments. Closing and obliterating roads will increase the amount of time and effectiveness of the permittees to manage their allotments.

The proposed aspen exclosures would have minimal effect on grazing. A reduction in available forage would be approximately 24 acres throughout the entire analysis area. As the fence structures deteriorate, cattle may find their way into the interior of the aspen exclosures. Once inside the fenced area, livestock may become temporarily confined, resulting in grazing of the area that is being protected.

Cumulative Effects: Past treatments on the Heppner Ranger District where timber was removed and forest litter was reduced have increased the quantity and quality of desired vegetation for livestock and wildlife. The management of desirable forage species for livestock and wildlife in the uplands has decreased impacts to sensitive riparian areas. Future restoration projects that restore grassland areas to a more natural state will benefit the management of livestock and wildlife on National Forest System Lands.

Compliance with Other Laws, Regulations, and Policies

National Historic Preservation Act

As identified in Chapter 3, 83 heritage properties exist within the analysis area. Prior to project implementation, State Historic Preservation Office consultation has been completed under *Programmatic Agreement among the United States Department of Agriculture, Forest Service, Pacific Northwest Region (Region 6), The Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer regarding Cultural Resource Management on National Forests in the State of Oregon,* dated March 10, 1995, pursuant to stipulated Forest Archaeologist review dated November 15, 1996. Prohibiting any disturbance within 50 feet of the site's perimeter will protect sites that have been identified.

Endangered Species Act and Regional Forester's Sensitive Species

The Endangered Species Act requires protection of all species listed as "threatened" or "endangered" by federal regulating agencies (Fish and Wildlife Service and National Marine Fisheries Service). The Forest Service furthermore maintains through the Federal Register a list of species which are proposed for classification and official listing under the Endangered Species Act, species which appear on an official State list, or that are recognized by the Regional Forester as needing special management to prevent their being placed on Federal or State lists. This section identifies the actions taken to comply with the Endangered Species Act. Details regarding the actual species found within the Rimrock area and potential effects of proposed activities on those species and their habitat are contained under Non-Forest Vegetation, Wildlife Habitat, and Fish and Aquatic Habitat sections.

Plants

A Biological Evaluation for endangered, threatened, proposed, and sensitive plant species has been completed. This area was surveyed between 1988 and 1995. *Allium madidum,* which was delistd in 1992, and *Mimulus washingtonensis*, which was delisted in 1999, were both found in the project area. *Silene spaldingii* is proposed for federal listing and there are no populations in the vicinity of the Rimrock project area. The Regional Forester's Sensitive Plant Species List was updated in May 1999, and includes two species that are or may be present. The newly added plants are *Carex crawfordii* and *Carex interior*, both sedges that grow in moist or wet areas. The potential habitat for these two sedges was surveyed in August 1999. Neither species was found in the project area. A finding of "no impact" is appropriate for these species. *Silene spaldingii* is proposed for federal listing and known to occur on the Umatilla National Forest. *Silene spaldingii* occurs primarily in open grasslands with deep Palousian soils. There are no populations in the vicinity of the Rimrock project area.

There are three plant species listed as species of concern by the Fish and Wildlife Service. *Mimulus washingtonensis* var. *washingtonensis* is present in the project area, but it is considered common enough that is was dropped from both the Oregon Natural Heritage Program and the Regional Forester's Lists. *Myosurus minimus* spp. *apus* is not on the Regional Forester's List because it has not been found on Forest Service holdings. It grows in the same habitat as *Mimulus washingtonensisi*, which has been surveyed for extensively and thoroughly, so if it was present it should have been found in the *Mimulus* surveys. *Thelypodium eucosum* is present approximately 3 miles south of the proposed project area, but has not been found in the proposed project area with extensive searching. A finding of "no impact" is appropriate for these species.

Terrestrial Wildlife

The Biological Evaluation for endangered, threatened, proposed, and sensitive terrestrial wildlife species determined that this project would not adversely affect, contribute to loss of viability, nor contribute to a trend toward Federal listing of any wildlife species currently listed as sensitive on the Regional Forester's Sensitive Species List dated May 1999. A Biological Assessment is not necessary for **bald eagle** or **Canada lynx** since a determination has been made that the proposed activities will have no effect. See the Wildlife section for detailed discussion of the predicted effects on endangered, threatened, proposed, and sensitive species.

Aquatic Wildlife

A Biological Evaluation for endangered, threatened, proposed, and sensitive aquatic species was completed. Consultation with USDI Fish and Wildlife Service and USDC National Marine Fisheries Service has been completed. A Biological Assessment has been prepared. The Biological Opinion for the proposed project is on file in the Project Record.

Bull Trout have not been documented within the Rimrock planning area or the Heppner Ranger District. Bull trout have been observed in the North Fork of the John Day River near the mouth of Wall Creek. A finding of no effect was determined for the proposed projects.

Steelhead Trout occur throughout the Rimrock planning area, wherever adult fish have access to spawning areas. They are known to spawn within Big Wall, Indian, Porter, and Wilson creeks. The Biological Evaluation determined that the proposed projects may affect-likely to adversely affect this species. The Biological Assessment for the Steelhead Trout is on file in the Project Record.

Class 1 and Class 2 streams within the Rimrock planning area support populations of **redband trout**. The Biological Evaluation determined that the proposed project may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species

The **Spring Chinook salmon** have not been documented within the Rimrock area or the Heppner Ranger District. A finding of no effect was determined for the proposed projects.

The Confederated Tribes of the Umatilla Indian Reservation surveyed the John Day River and its Forks **Pacific lamprey** larvae in 1999. Larvae were found to River Mile 87, near Granite Creek, on the North Fork of the John Day River, and spawning adults were noted above River Mile 87 in Granite Creek. Spawning habitat for Pacific lamprey is available in Wall Creek at river mile 23 of the John Day River. The Biological Evaluation determined that the proposed projects may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Clean Air Act

Analysis of potential impacts on air quality related to proposed activities indicates that none of the alternatives would violate Federal Clean Air Act PM-10 (PM-10 is a measurement of particulate matter (smoke) which is 10 micrometers or less in size) Emission standards due to the quantity of expected emissions and the proximity of the nearest “special protection zone” (LaGrande, Oregon which is over 60 air miles from the Rimrock area). All burning would comply with the State of Oregon’s memorandum of understanding between the State of Oregon, USDI Bureau of Land Management, and the USDA Forest Service. See Air Quality in Chapter 4 for further discussion.

Clean Water Act

The Clean Water Act of 1977 focuses on the restoration and maintenance of the chemical, physical and biological integrity of the Nation’s waters. This was amended in 1987 to protect waters against pollution from both point and non-point sources. As part of the implementation of this act, the State of Oregon maintains an inventory of water quality limited streams, based on standards developed by the Oregon Department of Environmental Quality.

Land disturbing activities such as roads and timber harvest can result in non-point source pollution. Strategies to prevent non-point source pollution include Best Management Practices (BMP’s), watershed and riparian area restoration and enhancement, and improved monitoring for detection and validation of water quality concerns. The BMP’s, located in Appendix B of this FEIS, would at a minimum maintain existing water quality in analysis area streams.

Project activities were designed to avoid any increases in temperature and sediment or degradation of aquatic habitat. Road obliteration, in-stream structure maintenance, and construction of low water fords would cause localized increases in sediment for short periods of time. In the long term, these projects would cause a net decrease in sediment. For these reasons, the Rimrock projects would be consistent with the water quality requirements of the Clean Water Act.

A Water Quality Restoration Plan (WQRP) was developed with this project to address the water temperature and habitat modification parameters that failed to meet State standards within Big Wall, Indian, Porter, and Wilson creeks. Upon completion of the Total Maximum Daily Load, the State will review the WQRP for compliance with the Clean Water Act.

Executive Orders 11988 and 11990: Flood Plains And Wetlands

In 1977 the National Environmental Policy Act of 1969 (NEPA) was amended (42 U.S.C. 4321 et seq.) in order to avoid short and long term adverse impacts associated with the destruction or modification of flood plains and wetlands. Two Executive Orders were issued as a result of this amendment. Both of these orders were applicable to riparian areas found in the analysis area.

Executive Order 11988 provides flood plain management direction to federal agencies. It states that the Forest Service shall take action to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities for conducting Federal activities and programs affecting land use, including water and related land resource planning and licensing activities. The term "flood plain" was defined as the lowland and relatively flat areas adjoining inland waters including at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

The Protection of Wetlands Executive Order (11990) states that the Forest Service shall take action to minimize the destruction, loss or degradation of wetlands, to preserve and enhance the natural and beneficial values of wetlands in carrying out its responsibilities for conducting Federal activities and programs affecting land use, including water and related land resource planning and licensing activities. In carrying out these activities the Forest Service shall consider factors relevant to a proposal's effect on the survival and quality of the wetlands. These factors include: water supply, quality, and discharge; pollution; sediment and erosion; maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources. The term "wetland" was defined as those areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Executive Order 12898: Environmental Justice

Executive Order 12898 requires that federal agencies adopt strategies to address environmental justice concerns within the context of agency operations. With implementation of any of these alternatives, there would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations. The actions would occur in a remote area and nearby communities would mainly be affected by economic impacts as related to timber harvest or contractors implementing rehabilitation activities. Racial and cultural minority groups could also be prevalent in the work forces that implement thinning activities.

National Forest Management Act Compliance

Because this analysis involves vegetative management treatments NFMA compliance items covered under 36 CFR 219.27.(b)Vegetative Manipulation, 36 CFR 219.27.(c)Silvicultural Practices, 36 CFR 219.27.(d)Even-aged Management and 36 CFR 219.27.(e)Riparian Areas is summarized below:

Vegetation Manipulation

219.27 (b)(1): *Be best suited to the multiple use goals established for the area with potential environmental, biological, cultural resource, aesthetic, engineering and economic impacts, as stated in the regional guides and forest plans.*

> In Chapter 4, each resource is evaluated as to how each alternative addresses multiple use goals that are inherent in the Forest Plan Standards and Guides. As described in these effects discussions, all action alternatives comply with Forest Plan Standard and Guides.

219.27 (b)(2): *Assure that lands can be adequately restocked as provided in paragraph (c)(3) of this section, except where permanent openings are created for wildlife habitat improvement, vistas, recreation uses, and similar practices.*

> No permanent openings are being created by harvest activities under any alternative. There are no regeneration harvest treatments prescribed under any alternative. Any areas requiring regeneration (alternative 5 only) are a direct result of the Douglas-fir tussock moth activity and not directly caused by harvest activity.

219.27 (b)(3): *Not be chosen primarily because they will give the greatest dollar return of the greatest output of timber, although these factors will be considered.*

> While economics and outputs are considered, additional factors related to the protection of resources and reducing the impacts of past forest activities (insects, disease, fire frequency, or stand density) within the project area as described in Chapter 3 and Chapter 4 will also be used to determine the best action to implement. The reason for the decision will be fully described in the Record of Decision.

219.27 (b)(4): *Be chosen after considering the effects on residual trees and adjacent stands.*

Areas proposed for treatment under the action Alternatives were those most impacted by past forest activities (insects, disease, fire frequency, or stand density), or at the highest risk of future loss or degradation.

219.27 (b)(5): *Avoid permanent impairment of site productivity and ensure conservation of soil and water resources.*

Best Management Practices (BMP's) implemented in project design and contract initiation are designed to minimize impacts to site productivity and ensure conservation of soil and water resources. These are discussed in Chapter 4 and Appendix B. Contract provisions will be used that implement BMP's, such as directional felling, designated skid trails, landings, etc.

219.27 (b)(6): *Provide the desired effects on water quantity and quality, wildlife and fish habitat and other resource yields.*

Thinning and salvage harvest (alternative 5 only) would have no significant additive effects to water quality and fish habitat, due to the implementation of BMP's and mitigation measures outlined in Chapter 2.

219.27 (b)(7): *Be practical in terms of transportation and harvesting requirements, and total cost of preparation, logging and administration.*

The transportation and harvest methods described in this analysis use equipment and practices that are common in eastern Oregon and Washington. The economic analysis described in Chapter 4 shows that all alternatives have a positive expected bid rate, indicating that the alternatives are economically feasible. Timber sale preparation and administration costs would be typical for the local area.

Silvicultural Practices

219.27 (c)(1): *No timber harvesting shall occur in lands classified as not suited for timber production pursuant to 219.14 except for salvage sales. These lands shall continue to be treated for reforestation purposes if necessary to achieve the multiple-use objectives of the plan.*

This has been discussed in Chapter 3 and Chapter 4 under the section *Forest Vegetation.* Based on discussions in these sections, all harvest activities proposed are in full compliance with this management requirement.

219.27 (c)(2): *The selected sale schedule provides the allowable sale quantity for the first planning period. Within the planning period, the volume of timber to be sold in any one year may exceed the annual allowable sale quantity so long as the total amount does not exceed the allowable sale quantity. Nothing in this paragraph prohibits salvage or sanitation harvesting of timber stands which are substantially damaged by fire, windthrow, or other catastrophe, or which are in imminent danger of insect or disease attach and where such harvests are consistent with silvicultural and environmental standards. Such timber may either substitute for timber that would otherwise be sold under the plan or, if not feasible, be sold over and above the planned volume.*

Portions of the volume sold under the action alternatives would contribute to the allowable sale quantity as designated in the Forest Plan. Sale of any volume proposed under the action alternatives would not result in exceeding the allowable sale quantity for the planning period. Salvage harvesting under Alternative 5 may either substitute for timber that would otherwise be sold under the plan or, if not feasible, be sold over and above the planned volume.

219.27 (c)(3): *When trees are cut to achieve timber production objectives, the cuttings shall be made in such a way as to assure that the technology and knowledge exists to adequately restock the lands within 5 years after final harvest. Research and experience shall be the basis for determining whether the harvest and regeneration practices planned can be expected to result in adequate restocking.*

Under the proposed action, preferred, and other action alternatives, dead, dying Douglas-fir tussock moth infested trees are being cut. Only in areas where Douglas-fir tussock moth have killed substantial numbers of trees would an unstocked opening be created, and regeneration activity be necessary. Regeneration in these areas is not a result of silvicultural treatments aimed at achieving timber production objectives, but is a result of site rehabilitation on areas impacted by a major disturbance event (Douglas-fir tussock moth). Therefore, the NFMA 5 year requirement does not apply to regeneration activities proposed under the any action alternatives. However, regeneration success in adjacent stands has been excellent, and successful regeneration of unstocked stands in this project is expected within 5 years of harvest. Monitoring would be used to assess the success of regeneration efforts following project completion. Desired and forest plan standards would be specifically stated in the detailed silvicultural prescriptions written for each area.

219.27 (c)(4): *Cultural treatments such as thinning, weeding and other partial cutting may be included in the forest plan where they are intended to increase the rate of growth of remaining trees, favor commercially valuable tree species, favor species age classes which are most valuable for wildlife, or achieve other multiple-use objectives.*

The need for the Rimrock area is to thin trees toward the historically more open forest stands. Thinning of the dense stands would allow remaining trees more resources, thus increasing growth rate and insect and disease resistance. All treatments are within compliance with the mentioned objectives of 36 CFR 219.27 (c)(4) and Forest Plan Standards and Guidelines.

219.27 (c)(5): *Harvest levels based on intensified management practices shall be decreased no later than the end of each planning period if such practices cannot be completed substantially as planned.*

This applies to the Forest Plan Level decisions, not to the project level decision.

219.27 (c)(6): *Timber harvest cuts designed to regenerate an even-aged stand of timber shall be carried out in a manner consistent with the protection of soil, watershed, fish and wildlife, recreation, aesthetic resources and the regeneration of the timber resource.*

No treatments designed to regenerate even-aged stands are proposed under the proposed, preferred, or other action alternatives. However, as discussed in Chapters 3 and 4, and listed in Appendix B, BMP's are designed to protect soil, water, and in-stream resources. Mitigation measures, listed in Chapter 2, would further protect any sensitive resources.

219.27 (c)(7): *Timber harvest and other silvicultural treatments shall be used to prevent potential damaging population increases of forest pest organisms. Silvicultural treatments shall not be applied where such treatments would make stands susceptible to pest-caused damage levels inconsistent with management objectives.*

No stands would be treated to increase susceptibility to forest pest organisms. Many stands within the Rimrock area are currently at density levels that make them susceptible to insect infestations. The purpose and need of this project is to reduce this susceptibility. Damaging population levels of Douglas-fir tussock moth inhabited the eastern portion of the Rimrock project area in 2000 and 2001, resulting in high mortality

levels of Douglas–fir and grand fir and greatly weakening much of the ponderosa pine. These stands are now susceptible to further damages and infestations of other forest pest such as bark beetles.

Even-aged Management

219.27 (d)(1): *Openings shall be located to achieve the desired combination of multiple-use objectives. Regional Guides shall provide guidance on dispersion of openings. As a minimum, openings in forest stands are no longer considered openings once a new forest is established. Forest plans may set forth variations to this minimum based on site-specific requirements for achieving multiple-use objectives. Regional guides shall provide guidance for determining variations to this minimum in the Forest Plan.*

Refer to the discussion under 219.27(d)(2)

219.27 (d)(2): *Individual cut blocks, patches, or strips shall conform to the maximum size limits for areas to be cut in one harvest operation established by the Regional Guide. This limit may be less than, but will not exceed 40 acres for all other forest types except as provided in paragraphs (d)(2)(i) through (iii) of this section.*

(d)(2)(i) *Cut openings larger than those specified may be permitted where larger units will produce a more desirable combination of net public benefits*

(d)(2)(ii) *Size limits exceeding those established in paragraphs (d)(2) and (d)(2)(i) of this section are permitted on an individual timber sale basis after 60 days' notice and review by the Regional Forester.*

(d)(2)(iii) *The establishment limit shall not apply to the size of areas harvested as a result of natural catastrophic condition such as fire, insect and disease attach, or windstorm.*

36 CFR 219.3 states that: *Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.* Therefore, the shelterwood prescription under the Preferred Alternative 5 could constitute an even-aged management stand. Except, these areas of open stand conditions that are a direct result of the impacts created by the Douglas-fir tussock moth epidemic and subsequent mortality of the trees. Harvest operations proposed in these stands would not cause any increase in opening size and fall within 36 CFR 219.27(d)(2)(iii).

Riparian Areas

219.27 (e): *Special attention shall be given to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water. This area shall correspond to at least the recognizable area dominated by the riparian vegetation. No management practices causing detrimental changes in water temperature or chemical composition, blockages of water courses, or deposits of sediment shall be permitted within these areas which seriously and adversely affect water conditions or fish habitat. Topography, vegetation type, soil, climatic conditions, management objectives, and other factors shall be considered in determining what management practices may be performed within these areas or the constraints to be placed upon their performance.*

Using PACFISH buffers for all perennial streams, lakes, and other bodies of water will create vegetation buffers of at least 100 feet. Activities planned within the riparian areas include stream crossing construction and in-stream fish structure repair and maintenance. Direction for all activities that could have an impact on streams can be found in the Project Record, Section 3, Biological Opinion and Mitigations in Chapter 2 of this FEIS.

Soil and Water

219.27 (f): *Conservation of soil and water resources involves the analysis, protection, enhancement, treatment, and evaluation of soil and water resources and their responses under management and shall be guided by instructions in official technical handbooks. These handbooks must show specific ways to avoid or mitigate damage, and maintain or enhance productivity on specific sites. These handbooks may be regional in scope or, where feasible, specific to physiographic or climatic provinces.*

Following management direction as outlined in the Forest Plan and the Best Management Practices will maintain or enhance site productivity. Chapter 4 documents the analysis of soil and water resources affected by the proposed projects. Mitigation measures described in Chapter 2 and Terms and Conditions found in the Biological Opinion will attribute to the protection, enhancement, and treatment of the soil and water.

Diversity

219.27 (d): *Management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which would be expected in a natural forest and the diversity of tree species similar to that existing in the planning area. Reductions in diversity of plant and animal communities and tree species from that which would be expected in a natural forest, of from that similar to the existing diversity in the planning area, may be prescribed only where needed to meet overall multiple-use objectives. Planned type conversion shall be justified by analysis showing biological, economic, social, and environmental design consequences, and the relation of such conversions to the process of natural change.*

As discussed in chapters 3 and 4 of this EIS, the vegetation management prescriptions are designed to move stands in the planning area toward a condition more representative of the historical diversity of the biophysical environments present. No reductions in animal communities are expected in the planning area. No type conversions are proposed. Aspen stands would be restored in locations where they were historically more prevalent.

Forest Plan Consistency

The actions of this project are consistent with the Forest Plan objectives prescribed in Chapter 4 of that document. The actions are also consistent with management prescriptions and standards and guidelines for this area (36 CFR 219.21(b).

The required screening process (as found in Forest Plan Amendment #11) for timber sales was applied to this analysis. Under the riparian screen, PACFISH Riparian Habitat Conservation Areas are designated for class 1-4 streams, ponds, springs, and other riparian areas. Under the ecosystem screen, the subwatersheds within the analysis area are outside their Historic Range of Variability for structure. It is anticipated that thinning would initiate a movement within the subwatersheds towards the Historic Range of Variability.

Habitat Effectiveness Index (HEI) was analyzed for the Rimrock Project Area to measure the quality of elk habitat. There was little difference between the existing condition and the action alternatives. The monument winter range habitat capability is less than the Forest Standard and Guidelines due to site potential (generally open ponderosa pine stands). The HEI analysis is located in the Rimrock Project File, Section 4.

Other Jurisdictions

There are a number of other agencies responsible for management of resources within the Rimrock area. The Oregon Department of Fish and Wildlife is responsible for management of fish and wildlife populations, whereas the Forest Service manages the habitats for these animals. The Oregon Department of Fish and Wildlife has been contacted regarding this EIS and has provided information used in the development of alternatives and analysis. The USDI Fish and Wildlife Service and National Marine Fisheries Service are responsible for the recovery of species listed under the Endangered Species Act. Any Forest Service activities that have the potential to affect such species must be approved by the responsible agency. Consultation with those agencies regarding the proposed Rimrock projects is ongoing and would be completed before any activities related to this EIS could be implemented.

The Environmental Protection Agency is responsible for enforcement of environmental quality standards, such as those established for water resources, while the Oregon Department of Environmental Quality sets standards, identifies non-point sources of water pollution, and determines which waters do not meet the goals of the Clean Water Act. The Environmental Protection Agency has certified the Oregon Forest Practices Act as Best Management Practices. Oregon State compared Forest Service practices used to control or prevent non-point sources of water pollution with the Oregon Forest Practices Act and concluded that Forest Service practices meet or exceed State requirements (Forest Service 1988). These are periodically reviewed as practices change. The Forest Service and Oregon Department of Environmental Quality have signed a Memorandum of Understanding (2/12/79 and 12/7/82) outlining this. A water quality restoration plan has been developed concurrently with this EIS to satisfy State requirements for water quality streams. Permits for any instream work would be required from the Oregon Division of State Lands.

Oregon Department of Environmental Quality and the Oregon Department of Forestry are responsible for regulating all prescribed burning operations. The Forest Service Region 6 has a Memorandum of Understanding with Oregon Department of Environmental Quality, Oregon Department of Forestry, and the USDI Bureau of Land Management regarding limits on emissions, as well as reporting procedures. All burning will comply with the State of Oregon's Smoke Management Implementation Plan and the memorandum of understanding mentioned above.

Energy Requirements and Conservation Potential

Some form of energy would be necessary for proposed projects requiring use of mechanized equipment: road repair or obliteration; instream work; subsoiling; prescribed fire; and thinning. Precommercial thinning would involve small machines, while the in-stream work could require heavy machinery for a small amount of time. Both possibilities would result in minor energy requirements. High fuel requirements are associated with helicopter operations (prescribed burning and harvest), however, helicopters are more productive and do not need to be operated for as long as more conventional ground-based machines. Harvest using helicopters would also avoid the need to consume fuel for road construction.

Harvesting trees would create supplies of firewood as a by-product and would contribute to the local supply of energy for home space heating.

Urban Quality, Historic, and Cultural Resources

The Rimrock area contains no urban areas. The goal of the Forest Service's cultural resource management program is to preserve significant historic and cultural resources in their field setting and ensure they remain available in the future for research, social/cultural purposes, recreation, and education. The proposed activities could inadvertently expose prehistoric cultural resources through ground disturbance.

Prime Farmland, Rangeland, and Forestland

The alternatives presented are in compliance with Federal Regulations for prime lands. The project area does not contain any prime rangeland or farmlands. The definition of prime

forestland does not apply to lands within the National Forests. In all alternatives, Federal lands would be managed with the appropriate consideration to the effects on adjacent lands.

Consumers, Minority Groups, & Women

The effect on civil rights, including those of minorities and women, is expected to be minimal. Alternatives 2 through 5 would be governed by Forest Service contracts, which are awarded to qualified purchasers regardless of race, color, sex, religion, etc. Such contracts also contain nondiscrimination requirements. While the activities identified here would create jobs and the timber harvest would provide consumer goods, no quantitative output, lack of output, or timing of output associated with these projects would affect the civil rights, privileges, or status quo of consumers, minority groups, and women.

Unavoidable Adverse Effects

Implementation of any of the alternatives would inevitable result in some adverse environmental effects. The severity of the effects can be minimized by adhering to the direction in the management prescriptions and Standards and Guidelines in Chapter IV of the Forest Plan and additional mitigation proposed in Chapter 2 of this document. These adverse environmental effects are discussed at length under each resource section.

Short-Term Use and Long-Term Productivity

The relationship between short-term uses of man's environment and the maintenance and/or enhancement of long-term productivity is complex. Short-term uses are generally those that determine the present quality of life for the public. In the Pacific Northwest this typically includes: timber harvest, livestock grazing, recreation, transportation, utility corridors, and wildlife habitat. Long-term productivity refers to the land's capacity to support sound ecosystems producing a continuous supply of resources and values for future generations. Management activities associated with short-term uses (i.e. burning, use of machinery, or removal of wood fiber) could reduce the productivity of some portions of the National Forest. The magnitude that long-term productivity is reduced is not known because investigations of these effects have only recently begun. However, general comments can be made regarding potential effects caused by the proposed activities. For purposes of this analysis, the duration of this project would be at least five years. Under all alternatives, the long-term productivity of the Forest lands and resources would be protected from unacceptable degradation by the standards and guidelines in the Forest Plan, specific project design, and mitigation measures for the alternatives, described in Chapter 2 of this document.

Structural improvements contribute towards the opportunity to use the potential productivity of the analysis area. Roads provide necessary access, and roads are considered long-term improvements, which provide for continued use over time. While no new construction would occur, 41 miles of roads would be improved and four stream crossings would be repaired which would improve the accessibility of roads to the public. All alternatives would reduce public accessibility by closing Forest Roads 2309020 (2.08 miles) and 2300101 (.50 miles). Wildlife use the created openings resulting from the presence of roadways. Animals that use roads open to the public are at risk of hunting, harassment, or injury or death by vehicular collision during their life cycle. Proposed road improvements could modify future population levels, with a greater effect on non-game species, since game species have regulated population levels.

Preserving long-term soil productivity is essential for maintaining a healthy ecosystem and allowing the sustained yield of timber and other renewable resources from the Forest. Proposed subsoiling and road obliteration would reduce long-term soil compaction, which resulted from management activities.

No negative long-term effects to water or its beneficial uses are expected from the proposed management activities under any alternative. However, the physical characteristics of one or more streams could be temporarily or permanently altered because of short-term direct and

indirect effects of management (i.e., road crossings, erosion, deposition of sediments, instream restoration, etc.).

Effective fire prevention and suppression, while minimizing damage to existing timber stands and other resources, has resulted in long-term changes in vegetative composition including excessive fuel buildups. Removal of wood fiber and disposal of slash, if done through a proper prescription, would have little effect on long-term productivity. However, productivity could be adversely affected if large wood is not removed, or slash resulting from harvest is not treated or is inadequately treated. Burning at the wrong time or allowing for a high intensity, long duration fire (i.e., too hot for too long) would generate a loss of soil fertility. Most other effects of slash disposal would be short-term and have little effect on productivity.

Harvest, thinning, and prescribed fire can be utilized both effectively and efficiently to reduce fuel loadings and otherwise manipulate the various fuels complexes in the analysis area. This would greatly reduce the consequences of a wildfire in the manipulated fuels complexes and in adjacent complexes. It would also enhance the long-term productivity of wildlife habitat, increase stream flows, provide more visual diversity, and provide the disturbance necessary for the perpetuation of important plant species. The temporary impacts of smoke from prescribed fire under alternatives 2 through 5 would have minor effects on the short-term use of Forest resources such as recreation sites and visual resources. The use of prescribed fire to reduce the flammability of activity fuels would affect long-term forest productivity by reducing the risks and consequences of a major wildfire. The long-term benefits of prescribed fire in natural fuels more than outweigh the short-term impact to air quality.

Irreversible and Irretrievable Effects

An **"irreversible"** commitment of resources refers to a loss of future options with nonrenewable resources. An **"irretrievable"** commitment of resources refers to loss of opportunity due to a particular choice of resource uses.

No new construction of permanent roads is planned, however construction of temporary roads would pose an irretrievable loss of productivity and uninterrupted underground water flows. Decommissioning would restore much of the temporary road to productivity, particularly where compaction is reduced through subsoiling. However, only recontouring of the road to restore previous slope would begin to restore prior drainage patterns or underground flows. As a result, temporary road construction would result in some irretrievable losses in hydrologic function and site productivity. Roads and landings would produce irreversible changes in the natural appearance of the landscape. This would be greatly reduced where actual obliteration would occur. Rock used to surface roads or harden campsites or trails would be an irreversible commitment of mineral resources.

It is not presently possible to quantify irreversible or irretrievable commitments of fisheries resources associated with alternatives that predict decreases in fish habitat condition. In general, losses in habitat would be expected to increase as a function of increased, chronic sediment. However, some of the proposed restoration projects that would increase short-term sediment would actually decrease sediment over the long-term. This would provide for healthier fisheries in the future as long as they are able to survive the short-term sediment increases.

Species extinction is irreversible, so it is essential that habitat for sensitive species be maintained or enhanced. Mitigation in Chapter 2 was designed to minimize impacts on sensitive species.