Chapter 3

Affected Environment and Environmental Consequences

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. The effects may be direct, indirect, and / or cumulative. The chapter is divided between Key Issues, Environmental Consequences, and Other Required Disclosures.

Specialists' reports provide the basis for the conclusions discussed in this chapter; therefore, all specialists' reports are incorporated by reference (40 CFR 1502.21). The information in this chapter summarizes the affected environment, direct and indirect effects of the alternatives and conclusions. Further information on the specifics of the affected resources such as historical conditions, assumptions, methodologies, analyses, specific localized information, references, and technical documentation can be found in the individual specialists' reports in the project file.

Key Issues

Key Issue 1: Effects to Wildlife Habitat

Issue Statement: Vegetative treatments, including prescribed fire, may impact habitat effectiveness for a variety of wildlife habitat within the West Maurys project area. Those habitats are associated with goshawk, pileated woodpecker, elk, and late and old structured habitat dependent species.

Issue 1A. Late and Old Structure - There is a concern that all types of treatments within currently mapped late and old structured (LOS) stands would result in a change in structure and amounts of LOS across the landscape.

Current Conditions

The project area is currently below the historic range of variability (HRV) for LOS stands in both single-strata and multi-strata stands. The Eastside Screens stipulate that timber harvest may not occur within LOS stands if conditions are below HRV. Other treatments, such as noncommercial thinning and fuels reduction treatments, are not covered under the Eastside Screens and may proceed. Many stands are overly dense with shade-tolerant, smaller-diameter, and relatively young trees resulting from years of fire suppression. These trees are not normally found in fire-dominated ecosystems and present potential fuel hazards threatening the long-term existence of the LOS stands. Proposed treatments to reduce stand densities, increase resiliency and vigor of remaining stands, and promote long-term LOS conditions may alter conditions such that the LOS no longer functions. Table 1.1 (in Chapter 1) displays the current levels of LOS by plant association group compared with the HRV. All plant association groups are below HRV for all LOS categories except for juniper steppe multi-strata which has a minimal range of 0 percent.

Measuring Factor:

The measuring factor would be the number of LOS acres treated and the resulting structural conditions after treatment.

Affected Environment

All plant association groups within the West Maury project area have less late and old structure (LOS) than the historic range of variability as described in the Viable Ecosystems Management Guide (VEM) except for juniper woodland multi-strata. Within Viable Ecosystems and this analysis, LOS includes E5, M5 and L5 seral/structural stages. Table 3.1 shows the distribution of late and old structure by PAG from pixel data.

LOS acreage figures are based on accumulated pixel data from satellite imagery as interpreted within the VEM model and do not represent stands of LOS because pixels only represent 25 meters squared. Pixels indicating large structure (trees greater than 21 inches DBH) are scattered through out the watershed. In the satellite imagery, areas that are dominated by dense understory canopies would not be identified as late and old (E5, M5, L5) even though there may be sufficient large trees to meet the LOS definition. To correct this situation, on-the-ground sampling of areas identified in the imagery with seral/structural stages containing large trees was done to augment the pixel data. With this conversion to large trees per acre, similar imagery was grouped to show stands of LOS that meet minimum acreage criteria.

Table 3.1 Historic Range of Variability by Plant Association Group and Seral / Structural Stage

Plant Association Group	Seral Structural Stage	Historic Range of Variability (Acres)	Existing Acres	Multi Strata	Single Strata	Number of Stands
Dry Grand fir	E5	714 – 1,152	233	95	138	18
	M5	595 – 1,486	0	0	0	
	L5	119 -- 892	0	0	0	
Douglas-fir	E5	3,125 – 4,509	364	122	242	15
	M5	451 – 1,353	2	0	2	
	L5	361 – 721	1	0	1	
Moist Pine	E5	0 – 715	0	0	0	2
	M5	0 – 858	2	0	2	
	L5	3,574 – 5,004	126	40	86	
Dry Pine	E5	0 -- 67	0	0	0	3
	M5	334 -- 902	2	0	2	
	L5	1,002 – 2,671	103	31	72	
Juniper Woodland	L5	369 -- 886	46	19	27	28
Juniper Steppe	L5	30 -- 72	1	0	1	0
Total Acres		10,674 – 21,288	880	307	573	

Table 3.2 displays the codes utilized to characterize the vegetative conditions in the project area.

Table 3.2 Seral and Structure Definitions (Seral / Structural Stages)

Structure Class	Species Composition		
	Early	Mid	Late
Grass, forb, shrub (trees may be present but not dominant)	E1	M1	L1
Seedling, sapling (less than 4.9 inches DBH)	E2	M2	L2
Pole (between 5 and 8.9 inches DBH), high density	E3a	M3a	L3a
Pole, low density	E3b	M3b	L3b
Small (between 9 and 20.9 inches DBH), high density	E4a	M4a	L4a
Small, low density	E4b	M4b	L4b
Medium/large (21 inches DBH and larger), high density (LOS)	E5a	M5a	L5a
Medium/large, low density (LOS)	E5b	M5b	L5b

Codes E5, M5 and L5 constitute late and old structured stands. Multi-strata stands, stands with greater than 55 percent canopy closure, are coded as "a" while single-strata stands, stands with less than 55 percent canopy closure, are coded as "b".

In the West Maury Project Area most LOS is located in upper Florida Creek, the Hammer Creek drainage and the east side of Pine Creek. Currently, more of the project area is covered by dense stands of small trees than was present historically. Stands dominated by large trees are much fewer than were present historically. The amount of area dominated by large trees is estimated to have ranged historically from 10,500 acres to 19,600 acres (acreages do not include western juniper plant associations). At present, there are approximately 880 acres dominated by large structure, although more acres still contain a component of large diameter trees. Species composition of forest stands has shifted from early seral (fire resistant Ponderosa pine) towards late seral.

LOS within the project area occurs in small patches of 5 to 40 acres. There are approximately 737 acres of LOS in these size patches. These patches often occur close together in larger stands that can be identified as a complex of LOS. The patchiness of the LOS often is due to different site conditions such as changes in aspect, inclusions of non-forest areas or rock outcrops. Previous fire disturbance and management activities have created gaps between LOS patches. LOS complexes may include early, mid, or late seral large trees and may have a single canopy or multiple canopies in adjacent patches although most of the LOS is multi-strata and densely stocked.

From 1960 to about 1995, management direction of major timber sales within these drainages concentrated on harvest of large trees. However, most stands still have a component of large trees that can be maintained and augmented over time. Some areas nearly meet the large tree criteria for LOS and present opportunities for expanding the size of existing LOS patches and developing new LOS by reducing the amount of smaller diameter trees and encouraging growth.

Most large trees within LOS in the watershed are at risk due to high understory stocking levels and the resulting competition stress. These trees are often highly susceptible to insect and disease problems. On the other hand, monitoring in stands where similar treatments have been implemented has shown increased diameter growth rates of large residual trees.

Conditions on an additional 13,000 acres are such that development and improvement of late and old structure can be accelerated by thinning now. Approximately 16,000 acres have pine overstory at risk due to overstocked conditions. Approximately 5,000 acres currently have stocking levels conducive to growth and maintenance of large trees.

Information from stand exams indicate that the number of large diameter trees (over 21 inches in d.b.h.) in existing LOS ranges up to 21 trees per acre. Mortality of large diameter trees has accelerated to such an extent that some currently mapped LOS stands soon may no longer qualify as LOS. Most existing LOS is multi-strata with early to mid-seral species mixtures in the overstory. The understory tends to be a mix of mid- to late-seral species.

Growth measurements in stands on better sites with basal area less than 80 square feet showed typical diameter growth on dominant trees of 2.5 inches per 10 years. At this growth rate, trees that are 12 inches in diameter may become 21 inches in diameter trees within 40 years. In dense stands (basal area greater than 80 SQ.FT.), growth is typically less than 1.2 inches diameter per 10 years. Twelve-inch trees would require at least 75 years to become larger than 21 inches in diameter. With constant growth, basal area increases which causes reduced growth rates on individual trees and increases competition stress leading to higher bark beetle susceptibility.

Direct, Indirect and Cumulative Effects of No Action

No treatments would occur within LOS stands. LOS stands would remain dense with high risk of competition-related mortality, especially of the large tree component. Mortality of large diameter trees has accelerated to such an extent that some currently mapped LOS stands soon may no longer qualify as LOS. Review of the annual aerial surveys for insect and disease occurrence showed several LOS stands with current bark beetle activity. LOS stands would remain at high risk or severe wildfire due to high canopy closure, ladder and ground fuels. Multiple canopy layers would continue to develop and the amount of multi-strata forest conditions would increase unless set back by disturbance agents such as insects, disease or fire. Concurrently, the amount of single-strata conditions would decrease over time. In dense stands (basal area greater than 80 SQ.FT.), growth is typically less than 1.2 inches diameter per 10 years. Twelve-inch trees would require at least 75 years to become larger than 21 inches in diameter. With constant growth, basal area increases causes reduced growth rates on individual trees and increases competition stress leading to higher bark beetle susceptibility. Projections indicate that at twenty years multi-strata LOS would remain below HRV in Douglas-fir PAG and become below HRV in the moist and dry ponderosa pine PAG. At twenty years single-strata LOS would remain below HRV in all of these PAGs. Only in the grand fir PAG, would multi-strata LOS develop enough to reach the low end of HRV.

There are no other planned activities that would affect LOS stands within the project area. Past harvest actions and their resultant effects haven been taken into consideration in the description of the affected environment and current condition. Estimations of future levels of LOS are based on current vegetation characteristics, including stand age, density and growth...

In the event of a wildfire, those stands with high densities and ladder fuels would probably be consumed if wind and humidity conditions fueled the fire. Because there is such a small amount of LOS within the project area, and that it is distributed in several areas, it is unlikely that all LOS would be lost. However, the rate of future development of LOS would be severely reduced in those stands that are approaching LOS conditions.

Action Alternative Descriptions

Since the emphasis of treatment in West Maury project area is the development and maintenance of late and old structure, the proposed action is designed to treat LOS with harvest, precommercial thinning and prescribed fire. Alternatives 3 and 4 do not commercially harvest in LOS but include other treatments. Live trees greater than 21 inches in diameter would not be cut in any alternative. No snags would be cut except those necessary for safety and road constructed reasons. Tables 3.3, 3.4, and 3.5 display the amount of existing LOS treated by alternative, by plant association group and management area allocation in the Ochoco Land and Resource Management Plan (LRMP).

Table 3.3 Treatment Acres of LOS by Alternative and Treatment Type

Alternative	Harvest and Associated Treatment Acres	Noncommercial Thinning and Associated Fuels Treatments	Prescribed Burning acres	Total Acres Treated
Alternative 2	157	86	74	**317**
Alternative 3	0	89	49	**138**
Alternative 4	0	230	28	**258**

Table 3.4 Treatment of LOS by Plant Association Group and Alternative

Plant Association Group	Number of stands	Existing Acres	Treated Acres			Percent of LOS Acreage Treated		
		Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 2	Alt. 3	Alt. 4
Dry Grand Fir	18	202	117	20	88	58%	10%	44%
Douglas-fir	15	174	41	30	11	24%	17%	6%
Moist Ponderosa Pine	2	23	22	5	22	100%	22%	100%
Dry Ponderosa Pine	3	30	30	16	30	100%	53%	100%
Juniper Woodland	28	308	107	67	107	35%	22%	35%
Totals	**66**	**737**	**317**	**138**	**258**	**43%**	**19%**	**35%**

Table 3.5 Acres of Commercial Harvest of LOS by Management Area Allocation

Alternative	General Forest	General Forest Winter Range	Hammer Creek Wildlife and Recreation Area	Visual Quality Corridor	Totals
Alternative 2	145	8	2	1	**157**
Alternative 3	0	0	0	0	**0**
Alternative 4	0	0	0	0	**0**

Direct and Indirect Effects of Alternative 2

This alternative would treat approximately 157 acres of current LOS with commercial harvest, noncommercial thinning and fuel treatment. As displayed in Table 3.5, the majority of acres commercially treated would be within the General Forest Management Area and is reflective of the desired conditions identified for this management area in the Ochoco National Forest Land and Resource Management Plan. Desired conditions include managing forested stands to improve vigor and health of the residual trees and

to improve growth rates. This alternative would treat an additional 86 acres of LOS with precommercial or juniper thinning outside of commercial harvest units. Prescribed burning would be employed on 74 acres of LOS where no cutting would be proposed.

No trees more than 21 inches in diameter at breast height (d.b.h.) would be cut. All existing large diameter trees would remain. All snags would remain, except those posing a safety hazard or would need removal for road construction. Commercial treatments are designed to maintain large trees by changing LOS from multi-strata to single strata conditions although these stands would continue to have an uneven-aged (uneven-sized) structure. Harvest prescriptions retain the historic characteristics of LOS with groups of younger and older trees intermingled throughout the stands maintaining structural diversity. Treatments are designed to reduce understory canopy layers, thus reducing competition stress in the older, larger overstory. Many large trees, both inside and outside LOS complexes, exhibit low vigor from long-term competition stress. Large trees in treated LOS would persist longer than in untreated LOS. Due to the number of large trees, treated LOS would retain basal areas at the high end of recommended stocking which means that the effects of treatment would not last as long or produce as much growth as stands with lower densities.

Commercial harvest treatments would generally change multi-strata LOS to single-strata LOS as the thinning of the 9 to 20.9-inch d.b.h. trees would result in canopy closures less than 55 percent. While the canopy closure percents do change in the LOS stands, there would be no change in the amounts of LOS after treatment. In areas of LOS where there are high densities of trees over 21 inches in diameter, fewer understory trees (9-20.9 inches d.b.h.) would be left and these areas would appear single-storied. In areas of lower densities of large diameter trees, more understory trees would be left and these stands' appearance would remain multi-storied. Noncommercial thinning and prescribed burning in commercially treated units would have additional smaller diameter (9 inches in diameter and smaller) seedlings, saplings and pole-sized removed or burned, with an average resultant spacing of approximately 18 feet to 30 feet depending on the density of large diameter trees. More variability of spacing would result with prescribed burning.

LOS Stand After Select Tree Harvest

All stands would remain LOS after commercial harvest.

Noncommercial thinning and prescribed burning outside of commercial harvest units would not remove any trees over nine inches in diameter in the LOS stands and would result in an average spacing in the smaller diameter trees of approximately 18 feet to 30 feet depending on the density of large diameter trees. More variability of spacing would result with prescribed burning. There would be little change from the current condition in numbers and spacing of trees larger than 9 inches in diameter.

All stands would remain LOS after noncommercial thinning and prescribed burning.

Wildlife species dependent on stand conditions with higher canopy closures, such as pileated woodpeckers, would have reductions in suitable habitat in this alternative. Species dependent on more open canopy conditions, such as white-headed woodpeckers, would have increases in habitat. This alternative would alter the current condition and trends within LOS stands. The longevity of existing large diameter trees would be expected to improve on sites that cannot sustain high conifer tree density and the recruitment of large ponderosa pine trees in treated stands would be

expected to accelerate. The relative abundance of large fir trees would be reduced in treated stands as ponderosa pine in these stands would be preferentially left.

By 20 years, 40 percent more LOS would develop as a result of Alternative 2 compared to Alternative 1 (No action).

LRMP Amendment
The implementation of Alternative 2 would require a site specific Ochoco LRMP amendment. The Eastside Screens include standards that when LOS is currently below the historic range of variability, then commercial harvest is not permitted. Because commercial harvest treatment is proposed in LOS in both multi-strata and single-strata structural conditions when below the historical range of variability, a LRMP amendment is needed to implement these actions in Alternative 2. The amendment was described in Chapter 2. The Eastside Screens were intended to maintain options for future management of LOS and only apply to timber sales. No regeneration harvest is proposed in Alternative 2. The proposed thinning treatments are designed to reduce tree density and thereby improve growth of the residual trees, enhance forest health, or recover potential mortality resulting from inter-tree competition. Thinning would more quickly restore historic seral/structural stage conditions and improve growing conditions for larger trees than either no action or prescribed fire alone. Thinning contributes to the primary purposes of fuel treatment: decreasing the probability of crown fires, decreasing the severity of the impacts, enhancing effectiveness and safety, and reducing costs. While there may be short-term decreases in stand densities and wildlife species dependent on those higher density stands would have reduced habitat, the longer-term maintenance of LOS into the future is desirable. After treatment, all 157 acres of LOS would remain LOS, but would have reduced canopy closures and stand densities. No trees over 21 inches in diameter would be removed except in instances for safety or road construction.

Factors to consider
Timing – The Ochoco Land and Resource Management Plan has been in effect since 1989 and is tentatively scheduled to begin the revision process in 2006. These amendments are proposed in the second decade of the plan period and therefore are less likely to be significant. The proposed treatments would take place with the implementation of this alternative within the next 1-5 years.
Location and Size – Approximately 157 acres would be treated out of the 737 acres of currently mapped LOS within the project area of 37,974 acres. All LOS treated, would remain LOS after treatment though the majority of acres treated would change from multi-strata to single-strata conditions and these stands would continue to have an uneven-aged (uneven-sized) structure. All treatments retain options for future management of LOS. No commercial treatments are proposed within the Ochoco LRMP Old Growth Management Area. Table 3.5 identifies the management areas where harvest would take place within LOS, mostly within the General Forest Management Area.
Goals, Objectives, and Outputs – There would be no change in the long-term relationships between the levels of goods and services projected by the LRMP and the impacts of implementing this Alternative because of the few acres being treated and the objectives of the treatments (to maintain LOS in the long-term).
Management Prescription – The amendment applies only to this project area and alternative and would not apply to future decisions within the project area. The amendment does not alter the desired future condition of the land or resources or the anticipated goods and services to be produced because of the small amount of acreage to be treated and that options for future management of LOS are being maintained.

Direct and Indirect Effects of Alternative 3
Stands identified as LOS would not be commercially treated in Alternative 3. This alternative would treat 89 acres of LOS with noncommercial thinning. Prescribed burning would be employed on 49 acres of LOS where no cutting is proposed (Table 3.3).

The effects of no commercial harvest would be similar to Alternative 1 and Alternative 4. The effects of stand density from noncommercial thinning alone would be similar to Alternative 1 because densities would not be reduced sufficiently to allow continued growth and vigor of the overstory large diameter trees. This would reduce the rate of development of potential LOS and limit the expansion of some LOS stands.

Noncommercial thinning would not remove any trees over 9 inches in diameter in the LOS stands and would result in an average spacing in the smaller diameter trees of approximately 18 feet to 30 feet depending on the density of larger diameter trees. There would be little change from the current condition in numbers and spacing of trees larger than 9 inches in diameter. More variability of spacing would result with prescribed burning.

All LOS before treatment would remain LOS after treatment, with more stands remaining multi-strata than in Alternative 2 but slightly less than Alternative 1.

Wildlife species dependent on stand conditions with higher canopy closures, such as pileated woodpeckers, would have less reduction in suitable habitat in this alternative than in Alternative 2. There would be no commercial harvest so those stands with canopy closures above 55 percent in trees over 9 inches in diameter would not be treated. Species dependent on more open canopy conditions, such as white-headed woodpeckers, would have less increase in habitat compared with Alternative 2 but more than in Alternative 4. This alternative would alter the current condition and trends within LOS stands to some degree. The longevity of existing large diameter trees would be expected to be improved on sites that cannot sustain high conifer tree density. The recruitment of large diameter trees would be expected to be accelerated but not as quickly as Alternative 2.

By 20 years, 16 percent more LOS would develop as a result of the Alternative 3 compared to Alternative 1 (No action).

Direct and Indirect Effects of Alternative 4

Stands identified as LOS would not be commercially treated in Alternative 4. This alternative would treat 230 acres of LOS with noncommercial thinning. Prescribed burning would be employed on 28 acres of LOS where no cutting is proposed (Table 3.3).

The effects of no commercial harvest would be similar to Alternative 1 and Alternative 3. The effects of stand density from noncommercial thinning alone would be similar to Alternative 1 because densities would not be reduced sufficiently to allow continued growth and vigor of the overstory large diameter trees. This would reduce the rate of development of potential LOS and limit the expansion of some LOS stands.

Noncommercial thinning would not remove any trees over 9 inches in diameter in the LOS stands and would result in an average spacing in the smaller diameter trees of approximately 18 feet to 30 depending on the density of the larger diameter trees. There would be little change from the current condition in numbers and spacing of trees larger than 9 inches in diameter. More variability of spacing would result with prescribed burning.

All LOS before treatment would remain LOS after treatment, with more stands remaining multi-strata than in Alternative 2 but slightly less than Alternative 1.

Wildlife species dependent on stand conditions with higher canopy closures, such as pileated woodpeckers, would have littler reduction in suitable habitat in this alternative. There would be no commercial harvest so those stands with canopy closures above 55 percent in trees over 9 inches in diameter would not change. Species dependent on more open canopy conditions, such as white-headed woodpeckers, would have less increase in quality habitat. This alternative would alter the current condition and trends within LOS stands slightly. The longevity of existing large trees would be expected to be improved slightly on sites that cannot sustain high conifer tree density, and the recruitment of large ponderosa pine trees in treated stands may be accelerated. The low intensity of treatments in this alternative would result in a lesser effectiveness in promoting stand development and open forest structural condition than would occur within commercially treated stands in Alternative 2.

By 20 years, 2 percent more LOS would develop as a result of the Alternative 4 compared to Alternative 1.

Table 3.6 displays the current levels of LOS for all PAGs and the projected levels for the dry grand fir, Douglas-fir, and moist ponderosa PAGs and compares them to the HRV for each LOS category by alternative. The dry ponderosa pine, juniper woodland and juniper steppe PAGs were not projected but would show increased LOS development with time although at a slower rate in Alternative 1 (No Action). They would also show similar results for Alternatives 2, 3, and 4. Alternative 1 LOS development in these PAGs would be slow.

Table 3.6 Comparison and Projection of Multi- and Single-Strata LOS by Alternative (from pixel data)

Plant Association Group	Time Period	LOS Type	Alt. 1	Alt. 2 Proposed Action	Alt. 3	Alt. 4	HRV
Dry Grand Fir	Current Level or Immed. Post Treatment	Multi-Strata	1.6%	1.1%	1.4%	1.6%	8-15%
		Single-Strata	2.3%	3.1%	2.8%	2.4%	18-38%
		Total	3.9%	4.2%	4.2%	4.0%	26-53%
	20 years Post Treatment	Multi-Strata	8.1%	8.5%	8.2%	8.3%	8-15%
		Single-Strata	4.4%	9.9%	7.4%	5.0%	18-38%
		Total	12.5%	18.4%	15.6%	13.2%	26-53%
	50 years Post Treatment	Multi-Strata	18.5%	20.1%	19.0%	19.1%	8-15%
		Single-Strata	6.5%	16.8%	11.9%	8.0%	18-38%
		Total	25.0%	36.8%	30.9%	27.1%	26-53%
Douglas-Fir	Current Level or Immed. Post Treatment	Multi-Strata	1.4%	1.0%	1.1%	1.3%	11-19%
		Single-Strata	2.7%	3.4%	3.3%	3.0%	33-54%
		Total	4.1%	4.4%	4.4%	4.3%	44-73%
	20 years Post Treatment	Multi-Strata	7.0%	7.7%	7.1%	7.1%	11-19%
		Single-Strata	5.1%	9.3%	5.9%	5.3%	33-54%
		Total	12.1%	17.0%	13.0%	12.4%	44-73%
	50 years Post Treatment	Multi-Strata	16.7%	19.1%	17.4%	16.9%	11-19%
		Single-Strata	7.5%	15.8%	8.4%	8.0%	33-54%
		Total	24.3%	34.9%	25.8%	24.9%	44-73%
Moist Pine	Current Level or Immed. Post Treatment	Multi-Strata	0.6%	0.4%	0.5%	.5%	0-9%
		Single-Strata	1.2%	1.7%	1.6%	1.5%	50-86%
		Total	1.8%	2.1%	2.1%	2.0%	50-95%
	20 years Post Treatment	Multi-Strata	3.5%	3.2%	3.1%	3.2%	0-9%
		Single-Strata	3.7%	5.7%	5.1%	4.3%	50-86%
		Total	7.2%	8.9%	8.2%	7.5%	50-95%
	50 years Post Treatment	Multi-Strata	9.6%	9.3%	8.9%	9.6%	0-9%
		Single-Strata	5.7%	10.5%	9.4%	6.0%	50-86%
		Total	15.3%	19.8%	18.3%	15.6%	50-95%
Dry Pine	Current Level or Immed. Post Treatment	Multi-Strata	0.5%	0.3%	0.3%	.5%	0-7%
		Single-Strata	1.1%	1.8%	1.8%	1.6%	25-59%
		Total	1.6%	2.1%	2.1%	2.1%	25-66%
Juniper woodland	Current Level or Immed. Post Treatment	Multi-Strata	0.3%	0.2%	0.2%	.2%	0%
		Single-Strata	0.4%	0.9%	0.8%	.8%	5-12%
		Total	0.7%	1.1%	1.0%	1.0%	5-12%
Juniper Steppe	Current Level or Immed. Post Treatment	Multi-Strata	0.0%	0.0%	0.0%	0%	0%
		Single-Strata	0.2%	0.3%	0.3%	.3%	5-12%
		Total	0.2%	0.3%	0.3%	.3%	5-12%

Cumulative Effects of the Action Alternatives

There are no other planned activities that would affect LOS stands within the project area. Past harvest actions and their resultant effects haven been taken into consideration in the description of the affected environment and current condition under Alternative 1. Estimations of future levels of LOS are based on current vegetation characteristics, including stand age and density. The projections displayed in Table 3.6 assume that no significant wildfire event occurs. In the event of a wildfire, stand replacement would likely

occur in those stands with high canopy closures, ladder fuels and high surface fuel loadings in the area of the fire. Replacement of LOS in those stands would likely take more than 200 years to develop. Livestock grazing would have no additional cumulative effect on LOS characteristics since the activity would not impact the abundance of large diameter trees, the amounts of snags, or coarse woody debris.

Issue 1B. Connective Corridors - There is a concern that the commercial harvest treatments within the connectivity corridors between the Old Growth Management Areas (MA) as prescribed by the Eastside Screens would result in reduced canopy closure in dense stands within the corridors. This may not promote habitat conditions that would facilitate species movement between areas and would make species vulnerable to predation and or exposure or block movement of species with limited mobility because of reduced densities of stands.

Current Condition

Connectivity corridors are defined as stands in which medium or larger diameter trees are common, and canopy closures are within the top one-third of site potential, approximately 50 percent canopy closure. Stands with more than three trees per acre over 21 inches in diameter also provide needed structure for species dependent on these corridors. Corridor widths should be at least 400 feet wide at their narrowest point. The only exception to stand width is when it is impossible to meet 400 feet with current vegetation structure, and these "narrower stands" are the only connections available. There is currently poor connectivity between Old Growth MAs and is a function of deficient LOS, extensive overstory removal and physical restrictions such as ridges, meadows and other environmental conditions that result in major plant association changes. Harvesting within connectivity corridors under Eastside Screens is permitted only if all of the above conditions can be met and some amount of understory is left in patches or scattered to assist in supporting stand density and cover. Some understory removal, stocking control, or salvage may be possible activities, depending on the site.

Measuring Factor

The measuring factor would be the total amount of commercial harvest treated acres within the connectivity corridors and the resultant condition after treatment.

Affected Environment

Connective habitat has been mapped outside of designated old growth to meet the requirements of the Eastside Screens in providing connections between large blocks of old forest to facilitate movement between such habitat blocks. There are at least two, and where possible, three connective corridors between all allocated old-growth stands and old-growth/LOS stands larger than 100 acres. This habitat has been designed to connect to the adjacent East Maury project area. The Maury Mountains are a small, isolated forest 21 miles long by 5 miles wide, surrounded by dissimilar vegetation types. The landform is dominated by a ridge through the middle running east to west. Stream courses and the corresponding denser vegetation generally run north and south. Most dry grand fir plant associations are found on the north slope in a band approximately 3 miles wide. Drier plant associations dominated by ponderosa pine and western juniper are on the south slopes and near the National Forest boundary. Consequently, connectivity is geographically limited. Fourteen connectivity corridors have been located between existing LOS complexes. Several of the connectivity corridors do not currently meet all the criteria in the Eastside Screens because of the factors described above. The Forest Vegetation Analysis Report contains a more detailed description of vegetative conditions in each connective corridor.

While most sites within the watershed are capable of producing greater than 50 percent canopy closure, sustainability of this high density is not probable over the long term. At 50 percent canopy closure, most stands in the project area are susceptible to a number of insect and disease problems capable of causing severe mortality and consequent loss of crown closure. Riparian corridors generally have the highest productivity potential (and are expected to provide the best connective habitat) were more severely damaged by defoliation during the 1992 western spruce budworm epidemic than adjacent stands.

Direct, Indirect, and Cumulative Effects of No Action
No treatments would occur within connective corridors in this alternative. Connective corridors would remain densely stocked but would be slow to develop large trees. Those stands not meeting LOS or high canopy closure, would continue to grow and eventually approach characteristics in the future. No reduction in ladder or surface fuels would increase the potential for high-intensity wildfire. Some stands would remain at high risk of severe wildfire due to high canopy closure, ladder, and surface fuels. Multiple canopy layers would continue to develop and the amount of multi-strata forest conditions would increase unless set back by disturbance agents such as insects, disease, or fire. Concurrently, the amount of single-strata conditions would decrease over time.

The structural complexity and canopy closure within mapped connective corridors would be retained, at least in the short term. On wetter sites, the abundance of snags and down logs and the development of multiple canopy layers would continue on the current trend. Dense stands would increase the cover component within connective habitat on these sites. On drier sites, large structure ponderosa pine and larch would decline in vigor due to competition from the developing understory, resulting in a gradual loss of large live tree habitat and an increase in large snag habitat in the short term. This could also negatively affect connective habitat, in the long term, through loss of cover on sites with heavy infestations.

There are no other reasonably foreseeable future activities that would affect connective corridor habitat within the project area. The effects of previous management activities, such as timber harvest, have been incorporated into the development of the connective corridor strategy and LOS habitat. In the event of a high intensity wildfire, some stands, because of their high densities and multi-strata conditions, would likely incur substantial mortality and no longer be able to function as corridor habitat. Livestock grazing would not affect the attributes of connective habitat such as canopy cover and abundance of large diameter trees.

Action Alternatives Descriptions
Table 3.7 displays the acres and types of treatment within connective corridors by alternative.

Table 3.7 Acres Treated within Connective Corridors

	Total Acres Within Corridors	Harvest and Associated Treatment Acres	Precommercial Thinning and Juniper Thinning Acres	Prescribed Burning acres	Total Acres Treated
Alternative 2	800	232	111	70	413
Alternative 3	800	0	20	39	59
Alternative 4	800	0	322	87	409

Direct and Indirect Effects Alternatives 2, 3, and 4 (Prescribed burning only)
Natural fuels burning would be prescribed within connective corridors under all action alternatives. It is not anticipated that prescribed natural fire would result in substantial changes in seral/structural condition. However, trees up to 1" d.b.h. and fine fuels in the understory would be reduced, which could also affect visual cover and climatic moderation within the corridors. The primary objective of fuels management would be to reduce or maintain surface fuels at less than 5 tons/acre in the less than the 3" diameter class. Some loss of large woody debris and snags, along with a limited amount of mortality to trees greater than the 1" diameter class may occur where there are accumulations of fuel. It is anticipated that the level of retention post treatment would still provide adequate cover and structure to facilitate travel by most species that would use these corridors.

Direct and Indirect Effects of Alternative 2
No trees over 21 inches would be harvested. Treatments would focus in stands with canopy closures greater than 50 percent and more than three trees over 21 inches in diameter. Treatments would maintain existing large trees and promote development of additional large trees through reduced density and competition. Treated portions of corridors would continue to be dominated by medium to large trees but have fewer trees less than 21 inches in diameter. Canopy closure in treated portions of corridors would be reduced to less than 50 percent to allow growth. Noncommercial treatments in stands dominated with smaller diameter trees (less than 9 inches in

diameter) would benefit from density management with resultant increased growth rates. This would promote development of larger diameter trees in shorter time frames.

Within these areas of treatment, the vertical complexity and canopy closure within mapped connective corridors would be reduced in the short term. It is anticipated that the level of retention post treatment should still provide adequate cover and structure to facilitate travel by most species that would use these corridors. Some species that select for open forest conditions may find the habitat more favorable after treatment. Conversely, those species which favor more dense habitats and multi-storied conditions may not find the habitat as conducive for dispersal. Additionally, treated habitat within the corridors may be less desirable for species that have limited mobility, that are vulnerable to predation, or that are sensitive to climatic conditions. For these species this alternative would compound the effects of the fragmentation that has occurred in the past, particularly the fragmentation between blocks of old-growth habitat. Where these treatments occur within young stands, thinning designed to promote development of large trees would likely improve habitat conditions within the corridors in the long term, and may benefit the health of residual overstory trees where they are present. Most LOS stands have potential to expand in size in a relatively small timeframe. Silvicultural treatments including harvest and precommercial thinning can accelerate growth and development of large trees within existing LOS stands and in the connecting corridors.

LRMP Amendment
The implementation of Alternative 2 would require an LRMP amendment. The Eastside Screens include standards that when all the criteria for connective corridor habitat cannot be met then timber harvest should be deferred in connective corridors. Not all stands in connective corridors meet the canopy closure requirements and not all corridors meet the minimum width of 400 feet. Corridors do represent the best connections given the exiting conditions resulting from physical restrictions such as ridges, meadows and previous harvest practices. Timber harvest treatments in Alternative 2 in stands with canopy closures greater than 50 percent are designed to maintain existing large trees and promote development of additional large trees. Stand densities in the understory layers would be reduced to increase the health and vigor of remaining trees. Noncommercial activities are allowed in connective corridors under Eastside Screens.

Approximately 232 acres of commercial harvest would occur within connectivity corridor habitat in Alternative 2.

Factors to consider
Timing – The LRMP has been in effect since 1989 and is tentatively scheduled to begin the revision process in 2006. These amendments are proposed in the second decade of the plan period and therefore are less likely to be significant. The proposed treatments would take place with the implementation of this alternative within the next 1-5 years.
Location and Size – Approximately 232 acres would be treated out of the 800 acres within the connective corridor habitat acres. All treatments retain options for future management of connective corridors. Treatments would maintain existing large trees and would promote the development of additional large trees.
Goals, Objectives, and Outputs – There would be no change in the long-term relationships between the levels of goods and services projected by the LRMP and the impacts of implementing this alternative because of the few acres being treated and the objectives of the treatments (to maintain LOS in the long term).
Management Prescription – The amendment applies only to this alternative in this project area and would not apply to future decisions. The amendment does not alter the desired future condition of the land or resources or the anticipated goods and services to be produced because of the small amount of acreage to be treated and that options for future management are being maintained.

Direct and Indirect Effects of Alternatives 3 and 4
These alternatives would not commercially harvest stands within corridors. Current conditions of canopy closure and large diameter trees would remain. Noncommercial thinning and associated fuels treatments would focus in the understory in the smaller diameter trees. Prescribed fire would reduce surface fuels and smaller diameter trees. In areas of current high densities of trees, prescribed fire without pre-thinning could result in more residual damage to larger diameter trees because of the presence of ladder fuels and the increased intensity during burning operations. Alternative 3 would treat 20 acres with noncommercial thinning and 39 acres with prescribed fire. Alternative 4 would treat 322 acres with noncommercial thinning

and 87 acres with prescribed fire. Competition in trees over 9 inches d.b.h. would continue at existing levels, with possible mortality continuing to occur in the larger diameter trees due to continued competition. Negligible gains would be made in growth and development of large trees and treatments. Vertical complexity and canopy closure would favor those species that select for multi-structure stand conditions. Alternative 4 treats more acres than Alternative 3 with noncommercial thinning and prescribed fire treatments, but like Alternative 3, the negligible increases in growth rates would not decrease the risk of mortality to large diameter trees and sustaining connective corridors over the long-term.

It is anticipated that the level of retention post treatment would still provide adequate cover and structure to facilitate travel by most species that would use these corridors. Those species which favor more dense habitats and multi-storied conditions would likely find the habitat conducive for dispersal. Additionally, habitat within the corridors may be more desirable for species that have limited mobility, that are vulnerable to predation, or that are sensitive to climatic conditions, at least in the short term. Where these treatments occur within young stands, thinning designed to promote development of large trees would likely improve habitat conditions within the corridors in the long term. Both alternatives would protect the existing connective habitat values of down-wood and canopy closure where large trees are present.

Cumulative Effects of Alternatives 2, 3, and 4
There are no other reasonably foreseeable future activities that would affect connective corridor habitat within the project area. The effects of previous management activities, such as timber harvest, have been incorporated into the development of the connective corridor strategy and LOS habitat. In the event of a high-intensity wildfire in the project area, the stands currently functioning as connective habitat, because of their high densities and multi-strata conditions, would likely incur substantial mortality and would not likely function as corridor habitat after a wildfire. Livestock grazing would not affect the attributes of connective habitat such as canopy cover and abundance of large diameter trees.

LOS habitat is limited on private lands in the project area because of past timber harvest. Connective habitat between old-growth blocks have been mapped around private lands.

Issue 1C. Goshawk Habitat Treatments - Treatment activities to reduce fuel loadings, decrease stand densities, and promote more open late and old structured stands may reduce goshawk post-fledging habitat. Goshawk core nest areas and post-fledging areas (PFAs) are approximately 30 and 400 acres in size respectively. There are 14 nest core and post-fledging areas within the West Maurys project area. Of these nesting territories, six had confirmed nesting records during the period 2001 to 2003, six were confirmed as active nests in 1998 or 1999, and two were last confirmed as active nests during, or prior to, 1990. Core nest areas provide security for incubating and raising nestlings. No harvest is proposed within core nest areas and will not be discussed further. Post fledging areas provide security for young birds to mature, learn hunting techniques from the adult and eventually disperse to other areas outside of the home range. Preferred stand structures include intermingled crowns in 12 inch diameter and larger trees with patchy clumps of more dense stands, less dense stands and small openings scattered throughout the stands. Commercial thinning treatments would reduce stand densities below optimal levels. The Eastside Screens stipulate that no timber harvest may occur within the 30-acre nest core areas. In post fledging areas, harvest activities may occur but treatments should focus on retaining LOS stands and enhancing young stands toward LOS conditions.

Current conditions:
There are currently 5,817 acres of post-fledging habitat within the West Maurys Project area.

Measuring Factor:
The measuring factor would be the number of acres of post-fledging habitat treated by treatment type and the resulting description of stand structure and composition.

Affected Environment
Goshawks use mixed coniferous forest stands with relatively high canopy closure. Patchy crown density and horizontal diversity of forest conditions are important components of habitat for goshawks. Stands

characterized by a sparse overstory of young to mature pine, with some Douglas-fir may not provide suitable nesting habitat. There may not be sufficient canopy closure for suitable nesting habitat. Where such stands are dominated by a dense understory of young to mid-level pine and Douglas-fir, these stands could be thinned to improve goshawk foraging habitat.

Currently, trees greater than 9 inches d.b.h. dominate approximately 95 percent of the all post fledging areas (PFAs). Sixty eight (68) percent of the area has 3 or more trees per acre larger than 21 inches d.b.h. Seventeen (17) percent of the PFAs have more than 10 trees per acre greater than 21 inches d.b.h. Currently 134 acres (2%) meet LOS conditions at this time. Crown closure varies. PFAs located on south aspects and drier sites tend to be more open with crown closure averaging around 40 percent. PFAs on north aspects have higher average crown closure (50-60%). Nonforest, steppe, and low density woodland sites are found within 2,355 feet (radius of 400 acre circle) of any nest stand in the project area. PFAs on 3,494 acres (58%) have basal area greater than 80 square feet per acre and more than 200 trees per acre indicating high risk to overstory and mid-canopy trees to bark beetle mortality and to high intensity fire events. Historically, less area within these PFAs was in forest cover and stands with forest cover were less dense. Stands dominated by groups of large trees were more common. The proportions of western juniper, Douglas-fir, and grand fir have increased.

Direct, Indirect, and Cumulative Effects of No Action
No treatments would be implemented. This action would maintain the existing acres of mixed conifers and canopy closure, at least in the short term. Lack of treatment of the mid-story trees in these stands would perpetuate development of the co-dominant canopy layer of fir with a positive effect on canopy closure and interlocking crown structure, at least in the short term. These features are important components of nesting habitat. On the other hand, existing canopy gaps and patches of open forest would become reduced as understory conifers fill in. The continuation of over-stocking in the understory of these stands may render them less suitable for goshawk foraging due to dense understory canopies. Shrub and herbaceous understory important to some prey species may be lost as the understory conifer density increases. These features are important components of foraging habitat. This alternative would maintain the suitability of all existing habitat for goshawks within the PFAs and would not result in displacement of goshawk from existing occupied territories.

No treatment in overstocked stands would likely result in slowing the advancement of some of these stands toward LOS. Stand density would increase resulting in increased competition stress, reduced growth and vigor, increasing mortality due to bark beetle, increased loss of large overstory trees and increasing risk of stand replacement due to high intensity fire.

There are no other current or reasonably foreseeable future activities that would affect goshawk habitat within the project area. The effects of previous management activities, such as timber harvest, have been incorporated into the existing condition description and evaluation of habitat. Livestock grazing would not impact the conifer component of the goshawk stands. Impacts currently occurring to the shrub and herbaceous understory would continue providing no change to the current condition for habitat for prey species. In the event of a high intensity wildfire, this current goshawk habitat, because of the high densities and multi-strata conditions, would likely incur substantial mortality and no longer be able to function as goshawk habitat. However, the effect of such disturbances on crown closure in the long term is dependent on the type, severity, and extent of the event(s).

Action Alternative Descriptions
Table 3.8 displays the acres and types of treatment within goshawk habitat and post fledging areas.

Table 3.8 Summary of Treatments within Goshawk Post-Fledging Areas, by Alternative

Post-Fledging Area		Alternative 2			Alternative 3			Alternative 4	
Site Number	Total Acres	Harvest	Noncom Thinning	Add. Fuel Treat	Harvest	Noncom Thinning	Add. Fuel Treat	Noncom Thinning	Add. Fuel Treat
0937 PFA	418	72	1	232	70	0	88	3	302
0938 PFA	402	81	63	174	76	50	35	121	198
0940 PFA	355	0	0	0	0	0	1	0	1
0941 PFA	398	0	166	94	0	76	94	165	94
0944 PFA	439	113	9	0	113	9	0	58	0
5028 PFA	480	124	27	104	124	27	56	123	132
5029 PFA	417	0	43	201	0	43	39	43	39
5030 PFA	418	272	81	5	188	36	3	325	3
5031 PFA	404	0	0	0	0	0	0	0	0
5032 PFA	408	1	6	0	1	6	0	0	0
5081 PFA	392	84	33	28	84	33	28	116	28
5082 PFA	446	159	20	114	105	20	109	141	115
5084 PFA	418	160	90	165	0	54	120	214	200
5091 PFA	421	0	40	0	0	40	0	40	0
Total	**5,817**	**1,066**	**579**	**1,117**	**761**	**354**	**573**	**1,349**	**1,112**

Note: Noncom thinning is noncommercial thinning

Direct and Indirect Effects of Alternatives 2, 3, and 4 (Prescribed burning only)
All action alternatives would implement underburning of natural fuels outside of thinning units within PFAs. Burning treatments within the PFAs would be designed to protect large woody material and overstory trees. Snags and down wood may be consumed by prescribed fire. This should be partially offset by the creation of snags and down wood due to fire-killed trees. The effect of fire on snag retention would likely result in a higher number of hard snags, with a concurrent reduction in soft and hollow snag habitat. Burning also has the potential to remove large snags where they are present prior to treatment, while increasing the relative abundance of smaller snags that result from effects of the fire. Prescribed burning should also stimulate production of herbaceous vegetation for several years after the fire, and shrubby vegetation 3 to 15 years after treatment. These changes in conditions would likely provide foraging habitat for some species that would be prey for goshawk, while potentially altering nesting habitat for some species.

Direct and Indirect Effects of Alternative 2
Objectives of proposed treatments in PFAs are to maintain and develop large trees and to reduce the risk of catastrophic loss of large trees. Harvest and associated noncommercial thinning in treated areas would reduce basal areas to approximately 60 square feet per acre (higher where the density of large trees is high) in high risk areas. Within treated stands, crown closures would range from 40 to 50 percent with small areas greater than 50 percent. Trees larger than 21 inches d.b.h. would not be harvested. Intermingling tree crowns would occasionally occur and canopy gaps would increase. Understory thinning (harvest or juniper thinning) would occur on 18 acres of LOS within the goshawk PFAs. This thinning is intended to improve longevity of dominant and co-dominant trees, and would have the added benefit of creating more open space for flight below the overstory canopy, which is desirable in foraging habitat for goshawks. Stand density would remain higher within RHCAs associated with treated units, maintaining areas of intermingling branches and multi-strata conditions. Juniper cutting would create open grass and shrub dominated areas. Prescribed burning would reduce seedling and sapling stocking, increase height to canopy distance and reduce ground fuels. Grapple piling would reduce ground fuels. Harvest and noncommercial thinning would allow increased growth of residual trees, increasing the development of additional large trees and reduce losses to bark beetles. Reduced stand density would allow increased development, growth and diversity of ground vegetation. Total treatment area under this alternative would be 47 percent of total PFA acres. Commercial harvest exceeding 50 percent of any individual PFA would likely remove excessive amounts of hiding cover and has the potential to displace the existing pair of birds, this occurs on 1 PFA area. Total treatment of any post fledging area exceeding 75 percent would result in canopy closure reductions in excess of recommended levels for post

fledging areas would render them unsuitable. This occurs on two post fledging areas. Timber harvest within PFAs would be designed to meet silvicultural objectives rather than habitat objectives. This alternative would reduce the suitability of habitat for nesting on 1,066 acres within the PFAs in the short term (20% of the total PFA acres). This alternative also has the potential to render two existing occupied territories unsuitable for occupancy due to extensive treatments within individual PFAs. Table 2.10 originally displayed in Chapter 2 displays the treatments by PFA.

Table 2.10 Acres of Treatment within Goshawk Post Fledging Areas (Alternative 2)

Post Fledging Area	Existing Post Fledging Area Acres	Harvest and Associated Treatment Acres	Percent Commercially Treated	Noncommercial Thinning Associated Fuels Treatments Acres	Prescribed Burning Acres	Total acres Treated and Percent Treated	
0937 PFA	418	72	1-25	1	232	305	(50-75%)
0938 PFA	402	81	1-25	63	174	318	(50-75%)
0940 PFA	355	0	0	0	0	0	(0%)
0941 PFA	398	0	0	166	94	260	(50-75%)
0944 PFA	439	113	25-50	9	0	122	(25-50%)
5028 PFA	480	124	25-50	27	104	255	(50-75%)
5029 PFA	417	0	0	43	201	244	(50-75%)
5030 PFA	418	272	>65	81	5	358	(75-99%)
5031 PFA	404	0	0	0	0	0	(0%)
5032 PFA	408	1	0	6	0	7	(1-25%)
5081 PFA	392	84	1-25	33	28	154	(25-50%)
5082 PFA	446	159	25-50	20	114	293	(50-75%)
5084 PFA	418	160	25-50	90	165	415	(75-99%)
5091 PFA	421	0	0	40	0	40	(1-25%)
Totals	**5,817**	**1,066**	**18%**	**579**	**1,117**	**2,762**	**47%**

The effects of the combined treatments (including fuel treatments) would reduce the risk of loss of the residual forest canopy due to high-intensity fire over the next 40 to 50 years. Approximately 2,800 acres with high stocking levels would remain untreated (also containing multiple canopies, clumpiness, and intermingling branches). This alternative would reduce the suitability of habitat for nesting on 1,066 acres within the PFAs in the short term (20% of the total PFA acres).

Cumulative Effects of Alternative 2

Past management activities have altered the amount, quality, and distribution of suitable goshawk habitat on the landscape. Generally, goshawk PFAs have been mapped outside of intensively harvested areas. As a result, PFAs may occur in several patches rather than as a continuous block of forested habitat. Areas that were harvested in the past with prescriptions that included overstory retention provide greater opportunities to recruit larger and more contiguous patches of suitable habitat in the future than previously harvested areas without overstory retention.

On private, forested land within or adjacent to the project area, past timber management has reduced the abundance of overstory trees, snags, and large down logs. These actions have limited the suitability of these timberlands for occupancy by nesting goshawk. However, due to the proximity of goshawks nesting on NFS lands, goshawks may forage within these privately owned forests where they retain enough forest canopy to remain attractive for use by this species. Because the suitability of these privately owned forest areas cannot be assured into the future, goshawk PFAs have only been mapped within the National Forest boundary. For this reason, some of the PFAs are less contiguous, or less concentric around the nest stand than they might be if they were not adjacent to private land boundaries.

The Sherwood prescribed burn of 1,300 acres authorized under a separate decision, primarily within the Hammer Creek Wildlife and Recreation management area would be implemented during calendar year 2004. The project occurs within PFA area 0940. The Sherwood prescribed burn includes mitigations to reduce the

potential for disturbance to nesting goshawks and to retain large diameter trees and structural diversity within the PFA.

There are no other reasonably foreseeable future activities (including livestock grazing) that would affect goshawk habitat within the project area. The effects of previous management activities, such as timber harvest, have been incorporated into the existing condition description and evaluation of habitat. In the event of a high-intensity wildfire, this current goshawk habitat in untreated stands, because of the high densities and multi-strata conditions, would likely incur substantial mortality and no longer be able to function as goshawk habitat. In treated stands with reduced densities, it is less likely that stand replacement would occur and goshawk habitat would remain, though at possibly reduced densities. The effect of such disturbances on crown closure in the long term is dependent on the type, severity, and extent of the event(s).

Direct and Indirect Effects of Alternative 3

This alternative would treat timber stands within PFAs with a prescription designed to maintain or promote habitat conditions preferred by goshawks. No commercial treatment acreage would exceed 50 percent of an individual PFA. Treated areas would be thinned from below to improve forest conditions. Stand level residual basal areas and crown closure would remain higher than in Alternative 2 (approximated 70 to 80 sq. ft. per acre). In order to maintain growth, treated stands would need future thinning sooner. The effects of the combined treatments (including fuel treatments) would still reduce the risk of loss of the residual forest canopy due to high-intensity fire over the next 40 years to 50 years but not as much as in Alternative 2. Trees larger than 21 inches in diameter would not be harvested. The prescription for stands to be treated is intended to improve habitat by removing understory trees, with the result of having more open space for flight below the overstory canopy, and enhanced longevity of dominant trees and growth of co-dominant trees. Treated areas would retain a higher basal area and level of interlocking crowns and dense patches than would occur under Alternative 2. Management of forest stands within PFAs in this alternative is based on Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds et al. 1992. Where current conditions are suitable for goshawk, and opportunities to enhance goshawk habitat development or longevity are limited, treatment is deferred under this alternative.

Table 2.23 Acres of Treatment within Goshawk Post Fledging Areas (Alternative 3)

Post Fledging Area	Existing Post Fledging Area Acres	Harvest and Associated Treatment Acres	Percent Commercially Treated	Noncommercial Thinning Associated Fuels Treatments Acres	Prescribed Burning Acres	Total acres Treated and (Percent Treated)	
0937 PFA	418	70	1-25	0	88	158	(25-50%)
0938 PFA	402	76	1-25	50	35	161	(25-50%)
0940 PFA	355	0	0	0	1	0	(0%)
0941 PFA	398	0	0	76	94	170	(25-50%)
0944 PFA	439	113	25-50	9	0	113	(25-50%)
5028 PFA	480	124	25-50	27	56	207	(25-50%)
5029 PFA	417	0	0	43	39	82	(1-25%)
5030 PFA	418	188	1-25	36	3	227	(50-60%)
5031 PFA	404	0	0	0	0	0	(0%)
5032 PFA	408	1	0	6	0	7	(1-25%)
5081 PFA	392	84	1-25	33	28	145	(25-50%)
5082 PFA	446	105	1-25	20	109	234	(50-60%)
5084 PFA	418	0	0	54	120	174	(25-50%)
5091 PFA	421	0	0	40	0	40	(1-25%)
Totals	**5,817**	**761**	**13%**	**394**	**573**	**1,728**	**30%**

This alternative does not propose commercial harvest on more than 50 percent of any PFA or total treatment area on more than 60 percent of any PFA. This alternative would maintain the suitability of habitat for nesting on the 761 acres harvested within the PFAs (13% of the total PFA acres). This alternative should not render any existing occupied territories to an unsuitable condition within individual PFAs. This alternative is

not expected to reduce hiding cover excessively or result in displacement of existing pairs as long as seasonal restrictions are implemented.

Growth and development of large trees would be less in Alternative 3 due to higher residual basal area and denser clumpiness but greater than Alternative 4. The effects of reduced density on stand growth and vigor would decrease sooner than in Alternative 2. The effects of the combined treatments (including fuel treatments) would still reduce the risk of loss of the residual forest canopy due to high intensity fire over the next 40 to 50 years but not as much as in Alternative 2. Untreated portions of PFAs would have a range of densities, diameter distributions and crown closures.

Cumulative Effects of Alternative 3
Past management activities' impacts would be the same as Alternative 2.

The Sherwood prescribed burn of 1,300 acres authorized under a separate decision, primarily within the Hammer Creek Wildlife and Recreation management area would be implemented calendar year 2004. The project occurs within PFA area 0940. The Sherwood prescribed burn includes mitigations to reduce the potential for disturbance to nesting goshawks and to retain large diameter trees and structural diversity with the PFA.

There are no other reasonably foreseeable future activities (including livestock grazing) that would affect goshawk habitat within the project area. The effects of previous management activities, such as timber harvest, have been incorporated into the existing condition description and evaluation of habitat. In the event of a high intensity wildfire, this current goshawk habitat in untreated stands, because of the high densities and multi-strata conditions, would likely incur substantial mortality and no longer be able to function as goshawk habitat. In treated stands with reduced densities, it is less likely that stand replacement would occur and goshawk habitat would remain, though at possibly reduced densities. The effect of such disturbances on crown closure in the long term is dependent on the type, severity and extent of the event(s).

Direct and Indirect Effects of Alternative 4
This alternative would not commercially treat any stands within goshawk post fledging areas. Only noncommercial thinning, grapple piling and prescribed fire would occur. Stand level residual basal area, canopy closure and clumpiness would remain high. Treated areas would retain a higher basal area and level of interlocking crowns and dense patches that would occur under Alternative 2 or 3. Opportunities to enhance goshawk habitat development or longevity or overstory trees are limited under this alternative due to restricted ability to reduce stocking levels in trees greater than nine inches in diameter. There would be a marginal improvement in growth rates that would last five to fifteen years in the smaller diameter trees. The effects of the combined treatments (including fuel treatments) would slightly reduce the risk of loss of the residual forest canopy due to high intensity fire over the next 20 to 30 years but would be the least of the action alternatives. Approximately 2,800 acres with high stocking levels would remain untreated (also containing multiple canopies, clumpiness, and intermingling branches).

Table 2.36 Acres of Treatment within Goshawk Post Fledging Areas (Alternative 4)

Post Fledging Area	Existing Post Fledging Area Acres	Harvest and Associated Treatment Acres	Percent Commercially Treated	Noncommercial Thinning Associated Fuels Treatments Acres	Prescribed Burning Acres	Total acres Treated and (Percent Treated)	
0937 PFA	418	0	0	3	302	305	(50-75%)
0938 PFA	402	0	0	121	198	319	(75-99%)
0940 PFA	355	0	0	0	1	1	(0%)
0941 PFA	398	0	0	165	94	259	(50-75%)
0944 PFA	439	0	0	58	0	58	(1-25%)
5028 PFA	480	0	0	123	132	255	(50-75%)
5029 PFA	417	0	0	43	39	82	(1-25%)
5030 PFA	418	0	0	325	3	328	(75-99%)
5031 PFA	404	0	0	0	0	0	(0%)
5032 PFA	408	0	0	0	0	0	(0%)
5081 PFA	392	0	0	116	28	144	(25-50%)
5082 PFA	446	0	0	141	115	256	(50-75%)
5084 PFA	418	0	0	214	200	414	(75-99%)
5091 PFA	421	0	0	40	0	40	(1-25%)
Totals	**5,816**	**0**	**0%**	**1,349**	**1,112**	**2,461**	**42%**

This alternative would maintain the suitability of habitat for nesting within eleven of the PFAs and would harvest zero acres within the PFAs (0% of the total PFA acres). This alternative treats more than 75 percent of the acres within three existing occupied territories, creating the potential for adverse impacts to suitability of these PFAs for occupancy in the short term. This alternative has the potential for the displacement of three goshawk pairs due to the amount of treatments proposed.

Cumulative Effects of Alternative 4
Past management activities' impacts would be the same as Alternative 2.

The Sherwood prescribed burn of 1,300 acres authorized under a separate decision, primarily within the Hammer Creek Wildlife and Recreation management area would be implemented calendar year 2004. The project occurs within PFA area 0940. The Sherwood prescribed burn includes mitigations to reduce the potential for disturbance to nesting goshawks and to retain large diameter trees and structural diversity with the PFA.

There are no other reasonably foreseeable future activities (including livestock grazing) that would affect goshawk habitat within the project area. The effects of previous management activities, such as timber harvest, have been incorporated into the existing condition description and evaluation of habitat. In the event of a high intensity wildfire, this current goshawk habitat in untreated stands, because of the high densities and multi-strata conditions, would likely incur substantial mortality and no longer be able to function as goshawk habitat and closely approximates the possible effects of Alternative 1. In the event of a high intensity wildfire, this current goshawk habitat in untreated stands, because of the high densities and multi-strata conditions, would likely incur substantial mortality and no longer be able to function as goshawk habitat. In treated stands with reduced densities in the smaller diameter trees, it is still likely that stand replacement would occur and goshawk habitat would not remain. The effect of such disturbances on crown closure in the long term is dependent on the type, severity and extent of the event(s).

Issue 1D. Elk Security and Calving Habitat - There is a concern that commercial harvest, thinning, and fuels reduction activities and associated actions would have a detrimental impact on elk, including security cover and calving habitat, within the project area.

Current conditions:
Total cover within the West Maurys project area is defined as at least 40 percent crown closure on 40 foot tall trees (LRMP p. 4-258). Satisfactory cover (at least 70% crown closure) is limited in the project area, whereas total cover is not limited. Big game habitat is assessed through the use of the Habitat Effectiveness Index (HEI) model which incorporates quantity and quality of cover, and open road densities to determine the effectiveness of habitat over time.

Measuring Factors:
- HEI for selected Management Areas.
- Amount of satisfactory and marginal cover treated and resultant condition.
- Amount of elk calving areas treated and resultant condition.
- Amount of elk security habitat treated and resultant condition.

Affected Environment
Long-term records indicate that elk were absent from the Ochoco National Forest in 1936 (Bailey 1936). Anecdotal information indicates elk did inhabit the Ochoco National Forest in the mid to late 1800's but were probably extirpated by over-hunting and habitat losses due to heavy grazing pressure. Since that time, elk populations have made steady increases in populations and are found throughout the Ochoco National Forest. Further information regarding Oregon Department of Fish and Wildlife management unit goals can be found in the Wildlife Report and is incorporated by reference. The population dynamics exhibited on the National Forest are influenced by hunting pressure and adjacent land management, and are not exclusively determined by habitat conditions on the National Forest. Habitat conditions may not be the primary factor limiting elk populations on the Ochoco National Forest. Mortality rates due to hunting and disturbance to animals on the public land are factors that also limit the elk population on the National Forest. Bull/cow ratios are most significantly affected by hunting activities and it is hard to determine the effect from management activities. However, the abundance, quality, and distribution of escapement cover and the density of open roads are factors that likely affect survival of animals during hunting seasons.

The HEI for elk was used to analyze and describe the existing habitat condition within the West Maury project area, and the effects of the alternatives. HEI is the total habitat effectiveness for the project area and includes variables for cover quality and quantity along with open road density. Table 3.9 displays percent cover, road density, overall HEI value and the LRMP goal for each management area for which standards apply. Percent cover is the percent of allocation within the project area in marginal and satisfactory thermal cover combined.

Because of the importance of open road density in determining use of areas by elk, this analysis includes evaluation of impacts to security habitat. For this analysis, security habitat is as areas that have an open road density of less than 2 miles per square mile. Potential impacts to mapped elk calving areas are also described. Elk calving areas were mapped prior to this analysis, and include areas with known use by elk during calving season, or expected use based on habitat conditions.

Direct, Indirect, and Cumulative Effects of No Action
No satisfactory cover or marginal cover would be treated under this alternative, and no roads would be closed outside of what would normally occur due to factors present in the environment or lack of funding for maintenance. Percent cover and HEI would remain at the current levels for a period of time. Habitat effectiveness would continue to follow the current trend, with gradual development of additional cover as the canopy of untreated stands continue to close. At the same time the development of understory vegetation would gradually increase the risk of future loss of cover to fire, insects and disease. The year-round open road density is expected to remain at approximately the current level. The winter open road density is expected to remain at current density of 1.39 miles/square mile in general Forest Winter Range and 0.47 miles/square mile in Hammer Creek Wildlife and Recreation Area.

This alternative would maintain the current condition of all existing habitat for big game animals, including elk, in the short term. Stands that currently provide marginal cover would continue to close in and over time more satisfactory (thermal) cover would develop as canopy closure increases. This would improve the cover quality index. The cover quantity index (% cover) would not be improved under this alternative. Over time,

forage would become more limiting as stands close and the deviation of forage to cover ratios from what is thought to be optimal (60% forage to 40% cover) would increase. This would correspond to a continual decrease in the cover quantity (% cover) index. The road density would not be reduced under this alternative and the road density indices would not be improved. There would be no initial increase in HEI in any management allocation, and HEI is expected to continually decrease until one or more disturbance events restore forage availability and abundance.

There is a 1,300 acre wildlife burn planned for the Sherwood Creek drainage, scheduled for 2004. This burn would reduce surface fuels and seedlings and saplings, and improve wildlife forage by stimulating the growth of grass, forb, and shrub species. The objective of the project is to enhance big game forage while retaining current cover acres. This would increase the palatability and forage production for several years after the burn.

Livestock grazing would not alter the components of elk cover or security habitat. Livestock grazing would not alter the amount of acres calculated in the cover to forage ratios in the HEI model. Livestock grazing does have an impact on the amount of available forage and could alter the forage availability and quality. Livestock grazing would reduce the biomass of available forage and may also improve the palatability of the forage by repeatedly stimulating in new growth and by removing dead and dying growth. With utilization standards being met, grazing would result in re-sprouting of new vegetation later in the season, dependent on precipitation amounts, and also encourage higher quality forage later in the season. In the Maurys, elk habitually utilize the lower elevation private land pastures where forage is plentiful. Available forage, especially in the upland areas, would not be a limiting factor for elk populations even with livestock grazing within the project area.

This alternative would not result in disturbance to elk from human activity associated with project implementation. Cover within elk security habitat would be retained until natural disturbance reduces it. Elk calving habitat would continue the trend of increasing density of coniferous cover and decreasing condition of riparian hardwoods and other forage species. However, it would also continue to the trend of decreasing conditions of riparian hardwoods and other forage species which are additional habitat components of calving areas.

Table 3.9 Existing Cover, Road Density and HEI Values

Management Area (MA)	Cover % of MA	Road Density mi./sq. mi	HEI	LRMP HEI Goal (2nd Decade)
General Forest	56	2.42	38	28
General Forest Winter Range	54	1.39	50	6
Hammer Creek WL and Rec	74	0.47	46	6

Action Alternative Descriptions
Table 3.10 summarize the types and acres of treatments by alternative.

Table 3.10 Summary of Acres of Treatment in Elk Security and Calving Habitat by Alternative

Treatments	Alternative 2		Alternative 3		Alternative 4	
	Elk Security Habitat	Elk Calving	Elk Security Habitat	Elk Calving	Elk Security Habitat	Elk Calving
Existing Acres	3,410	3,599	3,410	3,599	3,410	3,599
Commercial Harvest	435	846	73	629	0	0
Noncommercial thinning and Associated Treatments	447	363	412	236	880	1,039
Prescribed Burning	394	190	267	190	396	191
Totals	**1,276**	**1,399**	**752**	**1,055**	**1,276**	**1,230**

Direct and Indirect Effects of Alternatives 2, 3, and 4 (Prescribed burning only)
Action alternatives would implement prescribed natural fuels burning in satisfactory and marginal cover. It is anticipated that canopy closure would not be measurably reduced by underburning alone. Prescribed burning would increase the palatability and production of forage for several years after the burn. Canopy closure reductions that would result in changes to cover are expected to be the result of harvest or thinning treatments. The effects of the action alternatives would be the reduction of existing cover primarily through harvest and thinning treatments, not with prescribed burning.

Direct and Indirect Effects of Alternative 2
Within General Forest (GF), this alternative would reduce satisfactory cover by 885 acres and reduce marginal cover by 2,557 acres. Total cover acres in General Forest (GF) would be reduced by 3,442 acres, resulting in 20% reduction in percent cover. The net result is a 6 percent improvement in the cover quantity index and no change to the cover quality index. Within General Forest Winter Range (GFWR), this alternative would reduce satisfactory cover by 218 acres, and reduce marginal cover by 1,040 acres. Total cover acres in GFWR would be reduced by 1,258 acres, resulting in a 20 percent reduction in percent cover. The net result is a 2 percent decrease in the cover quantity index and no change to the cover quality index. Within Hammer Creek Wildlife and Recreation area, this alternative would reduce satisfactory cover by 11 acres, and reduces marginal cover by 14 acres. Total cover acres in the Hammer Creek area would be reduced by 25 acres, resulting in no decrease of percent cover and no change to the cover quantity or quality indices.

Alternative 2 would reduce open road density within General Forest (MA-F22) from 2.42 to 2.33 miles/square mile and would reduce open road density within General Forest Winter Range (MA-F21) from 1.39 to 1.29 miles/square mile. This improves the road density index by 2 percent in both allocations. Alternative 2 would reduce road density by approximately 0.1 miles/square mile in each of GF and GFWR. Combined with the cover effects described above, HEI would be increased from 38 to 42 in GF, increased from 50 to 51 in GFWR, and no change in Hammer Creek Wildlife and Recreation Area's HEI.

This alternative would commercially harvest 846 acres within elk calving areas, non-commercially thin 363 acres, burn natural fuels on 190 acres within mapped elk calving areas. These, and associated treatments would be seasonally restricted from May 15 to June 30.

Areas with a road density of less than 2 miles/square mile have been identified as potential elk security habitat. This alternative commercially harvests 435 acres in elk security habitat. This alternative proposes non-commercial thinning in 447 acres, and natural fuels burning in 394 acres in elk security habitat.

This alternative would alter the current condition of habitat for big game animals, including elk. Acreage of stands that currently provide marginal and satisfactory cover would be reduced in GF and GFWR. The percentage of total cover comprised of satisfactory cover would be reduced; however the cover quality index would not change. The cover quantity index (% cover) would be improved under this alternative in GF, but would be reduced in GFWR. Forage to cover ratios would be closer to optimal (60% forage to 40% cover) in GF, but further from optimal in GFWR. The road density would be reduced under this alternative and the road density indices would be improved in GF and GFWR. There would be an initial increase in HEI in GF and GFWR, but scores 1 point below Alternative 3 due to removing too much cover (down to less than 40%).

This alternative could result in disturbance to elk from human activity associated with project implementation. Cover within elk security habitat would be reduced on up to 23% of the elk security area. Elk calving habitat would be treated (39% of the area) to reduce density of coniferous cover which could improve the condition of riparian hardwoods and other forage species where they occur, but it would also reduce security cover for animals using the calving areas.

Direct and Indirect Effects of Alternative 3

Alternative 3 would not treat any stands that currently provide high quality cover in stands with canopy closures above 70 percent.

Within General Forest (GF), this alternative would reduce satisfactory cover by 482 acres and reduce marginal cover by 2,270 acres. Total cover acres in GF would be reduced by 2,752 acres, resulting in a 12 percent reduction in percent cover. The net result is an 8 percent improvement in the cover quantity index and no change to the cover quality index. Within General Forest Winter Range (GFWR), this alternative would reduce satisfactory cover by 102 acres, and would reduce marginal cover by 983 acres. Total cover acres in GFWR would be reduced by 1,085 acres, resulting in 17 percent reduction in percent cover. The net result is a 2 percent improvement in the cover quantity index and no change to the cover quality index. Within Hammer Creek Wildlife and Recreation area, this alternative would reduce satisfactory cover by 5 acres, and reduce marginal cover by 7 acres. Total cover acres in Hammer Creek area would be reduced by 12 acres, resulting in no change to percent cover and no change to the cover quantity or quality indices.

Alternative 3 would reduce open road density within General Forest (MA-F22) from 2.42 to 2.33 miles/square mile, and would reduce open road density within General Forest Winter Range (MA-F21) from 1.39 to 1.35 miles/square mile. This improves the road density index by 2 percent in GF and by 1 percent in GFWR. Within General Forest, road work would not be restricted except on roads that are accessed through winter range on roads that are not designated open during the seasonal closure. Road density improvements combined with the cover effects described above, result in HEI being increased from 38 to 43 in GF, and increased from 50 to 52 in GFWR, with no change in Hammer Creek Wildlife and Recreation Area's HEI.

This alternative would commercially harvest 629 acres within elk calving areas, non-commercially thin 236 acres, burn natural fuels on 190 acres within mapped elk calving areas. These, and associated treatments would be seasonally restricted from May 15 to June 30.

Areas with a road density of less than 2 miles/square mile have been identified as potential elk security habitat. This alternative commercially harvests 73 acres in elk security habitat. This alternative proposes non-commercial thinning in 412 acres, and natural fuels burning in 267 acres in elk security habitat.

This alternative would alter the current condition of habitat for big game animals, including elk. Acreage of stands that currently provide marginal and satisfactory cover would be reduced (in GF and GFWR). In GF and GFWR the percentage of total cover comprised of satisfactory cover would be reduced; however, the cover quality index would not change. The cover quantity index (% cover) would be improved under this alternative in GF and in GFWR. Forage to cover ratios would be optimal (60% forage to 40% cover) in GF and near optimal in GFWR. The road density would be reduced under this alternative and the road density indices would be improved in GF and GFWR. There would be an initial increase in HEI in GF and GFWR. In both of these allocations HEI would score 1 point higher in this alternative than in Alternative 2 because it removes the amount of cover needed to balance forage to cover ratios (down to about 40%).

This alternative could result in disturbance to elk from human activity associated with project implementation. Cover within elk security habitat would be reduced on up to 9% of the elk security area. Elk calving habitat would be treated (29% of the area) to reduce density of coniferous cover which could improve the condition of riparian hardwoods and other forage species where they occur, but it would also reduce security cover for animals using the calving areas.

Direct and Indirect Effects of Alternative 4
Within General Forest (GF), this alternative would reduce satisfactory cover by 885 acres and reduce marginal cover by 1,672 acres. Total cover acres in GF would be reduced by 2,557 acres, resulting in 11 percent reduction in percent cover. The net result is an 8 percent improvement in the cover quantity index and no change to the cover quality index. Within General Forest Winter Range (GFWR), this alternative would reduce satisfactory cover by 218 acres, and reduce marginal cover by 822 acres. Total cover acres in GFWR would be reduced by 1,040 acres, resulting in a 17 percent reduction in percent cover. The net result is a 2 percent increase in the cover quantity index and no change to the cover quality index. Within Hammer Creek Wildlife and Recreation area, this alternative would reduce satisfactory cover by 11 acres, and reduces marginal cover by 3 acres. Total cover acres in Hammer Creek area would be reduced by 14 acres, resulting in no decrease of percent cover and no change to the cover quantity or quality indices.

Alternative 4 would reduce open road density within General Forest (MA-F22) from 2.42 to 2.33 miles/square mile and would reduce open road density within General Forest Winter Range (MA-F21) from 1.39 to 1.29 miles/square mile. This improves the road density index by 2% in both allocations. Alternative 4 would reduce road density by approximately 0.1 miles/square mile in each of GF and GFWR. Combined with the cover effects described above, HEI would be increased from 38 to 43 in GF, increased from 50 to 53 in GFWR, and no change in Hammer Creek Wildlife and Recreation Area's HEI.

Seasonal restriction on harvest, thinning, fuels and related activities would be implemented between December 1 and May 1 in General Forest Winter Range and in Winter Range allocations. Within winter range road construction, reconstruction and inactivation would be restricted between December 1 and May 1 of each year. Within General Forest, road work would not be restricted except on roads that are accessed through winter range on roads that are not designated open during the seasonal closure.

This alternative would not commercially harvest any acres within elk calving areas, but would non-commercially thin 1,039 acres, burn natural fuels on 191 acres within mapped elk calving areas. These, and associated treatments would be seasonally restricted from May 15 to June 30.

Areas with a road density of less than 2 miles/square mile have been identified as potential elk security habitat. This alternative would not commercially harvest any acres in elk security habitat. This alternative proposes non-commercial thinning in 880 acres, and natural fuels burning in 396 acres in elk security habitat.

This alternative would alter the current condition of habitat for big game animals, including elk. Acreage of stands that currently provide marginal and satisfactory cover would be reduced in GF and GFWR. The percentage of total cover comprised of satisfactory cover would be reduced; however, the cover quality index would not change. The cover quantity index (% cover) would be improved under this alternative in both GF and GFWR. Forage to cover ratios would be optimal in GF and closer to optimal (60% forage to 40% cover) in GFWR compared to Alternative 1. The road density would be reduced under this alternative and the road density indices would be improved in GF and GFWR. There would be an initial increase in HEI in GF and GFWR. In both of these allocations HEI would score 1 point higher in this alternative than in Alternative 2 because it removes the amount of cover needed to balance forage to cover ratios (down to about 40%), and scores an additional 1 point higher than Alternative 3 due in GFWR due to increases in road closures.

This alternative could result in disturbance to elk from human activity associated with project implementation. Cover within elk security habitat would be reduced on up to 14 percent of the elk security area. Elk calving habitat would be treated (39% of the area) to reduce density of coniferous cover which could improve the condition of riparian hardwoods and other forage species where they occur, but it would also reduce security cover for animals using the calving areas.

Table 2.42 summarizes the current acres and acres treated by alternative and the resulting amounts of cover and road densities by management area.

Table 2.42 Alternative Comparison of Issue 1D - Elk Security Habitat, Cover, and Calving Areas

General Forest (Summer Range)	**Goal**	**Existing Condition**		**Alternative 2 Treatments**	**Alternative 3 Treatments**	**Alternative 4 Treatments**
Cover (acres)		Marginal	**11,032**	2,557	2,270	1,672
		Satisfactory	**2,131**	885	482	885
		Total	13,163	3,442 (9,721 remaining in cover)	2,752 (10,411 remaining in cover)	2,557 (10,606 remaining in cover)
Open Road Density (miles / square mile)	3.0	2.42		2.33	2.33	2.33
Percent Cover	15	56		36	44	45
HEI Value	28	38		42	43	43
General Forest Winter Range	**Goal**	**Existing Condition**		**Alternative 2 Treatments**	**Alternative 3 Treatments**	**Alternative 4 Treatments**
Cover (acres)		Marginal	**3,045**	1,040	983	822
		Satisfactory	**428**	218	102	218
		Total	3,473	1,258 (2,215 remaining in cover)	1,085 (2,388 remaining in cover)	1,040 (2,433 remaining in cover)
Open Road Density (miles / square mile)	Winter – 1.0 Summer – 3.0	1.39		1.29	1.35	1.29
Percent Cover	7	54		34	37	37
HEI Value	6	50		51	52	53
Hammer Creek Wildlife and Recreation	**Goal**	**Existing Condition**		**Alternative 2 Treatments**	**Alternative 3 Treatments**	**Alternative 4 Treatments**
Cover (acres)		Marginal	**1,364**	14	7	3
		Satisfactory	**539**	11	5	11
		Total	1,903	25 (1,878 remaining in cover)	12 (1,891 remaining in cover)	14 (1,889 remaining in cover)
Open Road Density (miles / square mile)	Winter – 1.0 Summer – 3.0	.47		.47	.47	.47
Percent Cover	8	74		74	74	74
HEI Value	6	46		46	46	46
		Existing Condition		**Alternative 2 Treatments**	**Alternative 3 Treatments**	**Alternative 4 Treatments**
Calving Habitat in project area (acres)		3,599		1,399 (846, 363, 190)	1,055 (629, 236, 190)	1,230 (1,039, 191)
Elk Security Habitat (acres)		3,410		1,276 (435, 447, 394)	752 (73, 412, 267)	1,276 (880, 396)

Cumulative Effects of Alternatives 2, 3, and 4
There is a 1,300-acre wildlife burn planned for the Sherwood Creek drainage, scheduled for 2004. This burn would reduce surface fuels and seedlings and saplings, and improve wildlife forage by stimulating the growth of grass, forb, and shrub species. The objective of the project is to enhance big game forage while retaining current cover acres. This would increase the palatability and forage production for several years after the burn.

Livestock grazing would not alter the components of elk cover or security habitat as grazing does not affect conifer cover. Livestock grazing would not alter the amount of acres calculated in the cover to forage ratios in the HEI model. The acres would still be providing cover or forage. Livestock grazing does have an impact on the amount of available forage and could alter forage quality. Livestock grazing would reduce the biomass of available forage and may also improve the palatability of the forage by repeatedly stimulating new growth and by removing dead and dying growth. With utilization standards being met, grazing would result in re-sprouting of new vegetation later in the season, dependent on precipitation amounts, and also encourage higher quality forage later in the season. In the Maurys, elk frequently utilize the lower elevation private land pastures where forage is more palatable. Available forage, especially in the upland areas, would not be a limiting factor for elk populations even with livestock grazing.

On the majority of the privately owned timberland, large overstory trees have been removed through past timber harvest. This has reduced satisfactory cover has been reduced on private lands in the project area. On the other hand, many second growth or residual stands (left over from overstory removal, and juniper stands have not been thinned on private land resulting in marginal cover in those areas. Where intensive timber management and/or juniper removal has occurred on private lands, forage is available to big game as well as livestock. In some areas agricultural practices such as hay cropping, provide seasonal forage areas of high quality. Private land access restrictions often provide more security to big game than the adjacent public lands.

Past management practices in the project area have been incorporated into the current condition regarding acres of marginal and satisfactory cover, elk security habitat, elk calving habitat, and road densities. Past timber harvest in the project area removed cover with regeneration timber harvests. There are no other current or planned vegetation management activities in the project area that would impact elk habitat.

Issue 1E. Old Growth Management Areas (MA-F6) – Fuels Reduction Treatment

(prescribed fire) activities within the Old Growth Management Area (2 areas) and other vegetative management treatments in adjacent pileated woodpecker feeding habitat areas may impact the habitat effectiveness of the old growth management area and the adjacent pileated woodpecker feeding habitat areas.

Current conditions:
There are four Old Growth Management Areas within the West Maurys Project area and range from 283 acres to 509 acres in size. In addition, there are "feeding areas" of approximately 300 acres located adjacent to the old growth stands. In combination, these two systems comprise a "habitat area". There is a total of 1,234 acres designated as feeding habitat areas associated with the four Old Growth Management Areas. A multi-layered canopy with shaded conditions and a large number of dead snags per acre is considered "optimum" for old growth habitat. The feeding habitat areas provide supplemental snags at relatively high levels, about 90 percent.

Fuel loadings within stands within the Old Growth Management Area could be managed to reduce the loss of current stands from wildfire. Additionally, one old growth area currently does not have the site capability of supporting habitat for pileated woodpeckers. A more appropriate species to identify for the area would be white-headed woodpecker which is more associated with late and old growth ponderosa pine stands.

Pileated Woodpecker Feeding Habitat Areas (Management Indicator Species)
Pileated woodpeckers have been established as the management indicator species for Old Growth on the Ochoco National Forest. The pileated woodpeckers prefer closed canopy, late to old growth fir-dominated

habitat. They prefer stands with old growth, grand fir, abundant snags and down logs and with canopy closure of at least 60 percent. The abundance of snags greater than 20 inches in diameter is a good predictor of pileated woodpecker habitat. Pileated woodpeckers favor Douglas-fir and western larch, but use other species in proportion to their availability as foraging substrate. Pileated woodpeckers favor snags at least 15 inches in diameter. Pileated woodpeckers also forage on down logs. These birds glean insects from live Douglas-fir and grand fir in June and July (late instar budworms) and from live western larch from November to January (carpenter ants). Pileated woodpeckers select large, live grand fir trees for night roosting, though they would also use live larch and snags of ponderosa pine, grand fir, larch and Englemann spruce. Hollow interiors of trees or snags resulting from decay rather than excavation, and the presence of Indian paint fungus conks are prevalent in roost trees. The average diameter of roost trees is approximately 28" in diameter at breast height. For nesting, pileated woodpeckers select large snags with heart rot, especially ponderosa pine or western larch. Snags at least 20 inches in diameter, broken off at 30 feet or higher are considered to be the minimum size suitable as nest snags for this species, though studies have shown the most nest trees are greater than 24" in diameter and 60 feet tall or more.

Within the project area, records of use by pileated woodpeckers is limited. To date all pileated woodpeckers observed in the Maurys have been on north facing aspects on grand fir sites.

Measuring Factors:

- the number of acres of Old Growth Management Area treated
- adjacent pileated woodpecker feeding habitat area treated and the resulting description of stand structure and composition.

This following section will discuss the ramifications of treatment within the allocated old growth management areas. Pileated woodpecker feeding habitat area impacts will be discussed after this section.

Affected Environment Old Growth Management Area

Old Growth Management Areas Not Treated

There are two Old Growth Management Areas within the project area that would be left untreated. The Sanford Spring area (OG-D3-11, 293 acres) has lower density, low surface fuel levels and currently healthy stand conditions. The allocated old growth area in Hammer Creek (OG-D3-08, 510 acres) is very dense and at high risk to insect and fire disturbance. Much of this area meets the LOS criterion for large trees. Historically, a range of density conditions occurred in late and old structure and maintaining some dense stands is appropriate at this time.

Old Growth Management Areas Treated

OG-D3-09 (283 acres) located in Friday Creek contains a mosaic of site potential ranging from juniper woodland to Douglas-fir. A small patch of late and old structure is present on the east side in Douglas-fir PAG. The remaining area has variable species composition and structure but does not contain sufficient large trees to meet the LOS criterion. The area contains both multi-strata and single-strata canopy conditions. Stocking of seedling, sapling and poles is reduced due to early 1980s thinning. This has resulted in reduced ladder fuels but excessive surface fuels. The site potential for the area is low and would not support the densities of stands needed for pileated woodpeckers in the long-term. Stocking is still high for the site potential with the result that growth is slow and trees are susceptible to bark beetle mortality. Loss of large trees would probably occur before additional trees grow larger than 21 inches. An active goshawk nest is located on the northern edge near Friday Creek. Much of the area has been designated as goshawk post fledging habitat.

OG-D3-12 (285 acres) is located in the Florida Creek drainage. Site potential has been identified as mostly dry grand Fir and Douglas-fir. The overstory is a mixture of ponderosa pine and Douglas-fir. Small patches meeting the LOS criterion for large trees occur within this allocated Old Growth Management Area. This stand is very dense with three well-defined canopy layers. Due to the existing high density, mortality of large trees has been increasing in recent years. Surface fuel loading is variable but overall high levels coupled with ladder fuels create high fire hazard. Fire ignition within this area during hot, dry and windy conditions would be difficult to stop and would result in loss of old growth habitat.

Direct, Indirect, and Cumulative Effects of No Action
No prescribed fire or other activity would occur in any allocated old growth area. Fuel loadings would continue to increase and the consequent hazard would remain. This action would maintain the existing acres of fir-dominated understories and canopy closure, at least in the short term. Lack of treatment of the understory in these stands would perpetuate development of fir understory conditions with a positive effect on the pileated woodpecker habitat abundance and quality. Over time, high stand densities may lead to declining stand health due to insects and disease, although this may also benefit the pileated woodpecker by increasing its foraging base. Extensive mortality due to insects and disease could also increase the risk of high intensity fire in the future. The effect of such disturbances on pileated woodpecker habitat in the long term is dependent on the type, severity and extent of the event(s). Loss of vigor and resulting mortality would increase with no net increase in LOS. The potential for loss of three of the allocated old growth stands (all except Sanford Spring) to fire during extreme weather is high. There are no other current or reasonably foreseeable future activities that would impact the characteristics of Old Growth Management Area in the project area. Continued livestock grazing would not change coarse woody debris or snag levels and would not change large or small diameter tree densities. Therefore, grazing would not have an impact on pileated woodpecker habitat within old growth management areas.

Description of Alternatives 2, 3, and 4 in Old Growth Management Areas
Table 3.11 displays the proposed treatments within the Old Growth Management Areas.

Table 3.11 Prescribed Fire Treated Acres by Old Growth Management Area

Allocated Old Growth Management Area	Total Acres	Prescribed Burning acreage		
		Alternative 2	Alternative 3	Alternative 4
Sanford Spring (OG-D3-11)	293	0	0	0
Hammer Creek (OG-D3-08)	509	0	0	0
Friday Creek (OG-D3-09)	283	239	0	0
Florida Creek (OG-D3-12)	285	282	0	0
Total	**1370**	**521**	**0**	**0**

Direct, Indirect, and Cumulative Effects of Alternative 2
Prescribed fire would be used to reduce small surface fuels and stocking of seedlings and saplings. The prescription used in both allocated old growth areas would seek to maintain large down wood, large trees and snags and would reduce disturbance to the nesting goshawk in Friday Creek (OG-D3-09) by being conducted outside of the nesting and fledging season. Due to existing stand densities and the long interval since the last underburn, there is some risk to individual large trees and small groups of trees of damage from the prescribed fire. This is not expected to result in the loss of old growth attributes that currently exist. Mortality of individual understory trees would improve overall growth conditions of remaining trees. Pileated woodpecker reproductive habitat would be managed at minimum levels because of the low site productivity and the subsequent reduction in small diameter trees contributing to closed canopy levels.

More mortality from prescribed fire would be expected in Florida Creek (OG-D3-12) in comparison with Friday Creek due to the higher density and larger amount of excess seedling, saplings and poles. This would result in an immediate reduction in surface fuels only to be replaced when the fire-killed trees fall. In studies of similar stand conditions it was found that a single prescribed burn would not reduce long-term fire hazard but would need to be followed by additional treatments. Only one treatment is authorized under this alternative.

The prescribed burn activities would not alter the area from its original intent of providing old growth habitat for dependent species. However, the prescribed burning would reduce small diameter trees needed to provide the multi-canopy layers desired in reproductive habitat for pileated woodpeckers. However, natural fire played a role in these ecosystems and returning fire would provide an opportunity for more natural processes and functions to occur within the old growth management area.

LRMP Amendment
The implementation of Alternative 2 would require an LRMP amendment. Current LRMP direction is contradictory. The LRMP describes under treatment of natural fuels, prescribed fire would normally not be applied in old growth, but where it can be supported by research, directives and desired condition, it can be utilized following appropriate environmental analysis (LRMP p. 4-136). Additionally, when unacceptable damage to resources on adjacent lands or to the old growth resource could occur from insects or diseases, prescribed fire may be used to reduce stand densities and competition that will increase the resiliency of residual large diameter trees (LRMP p.4-152). However, under habitat management, the LRMP states that vegetation management would not be allowed until further research is available on the needs of the dependent species (LRMP p. 4-251).

In 2 of the old growth areas (Friday Creek (OG-D3-09) and Florida Creek (OG-D3-12), existing high densities of trees in the smaller diameters has created conditions where the mortality in larger trees is threatened because of increased competition among trees. Additionally, surface fuel loadings and ladder fuels create conditions for high fire hazard if a wildfire occurred within of adjacent to the area. During hot, dry and windy conditions, wildfire would be difficult to stop and could result in stand replacement with a loss of old growth habitat.

Prescribed fire treatments are proposed within two Old Growth Management Areas (Friday Creek and Florida Creek) for Alternative 2. Additionally, one old growth management area (Friday Creek) has site conditions that would not support pileated woodpecker habitat in the long term. This site does not have the productive conditions that would promote the multi-canopied stands needed for pileated woodpecker reproductive habitat and also be resistant to insect or disease attacks resulting from overstocked conditions. Alternative 2 would still provide habitat for pileated woodpeckers, but at a minimal level. This old growth area (Friday Creek (OG-D3-09)) is approximately 283 acres in size. Approximately 239 acres would be prescribed burned to reduce fuel loadings and stand densities to reduce competition. Florida Creek (OG-D3-12) would also utilize prescribed fire to reduce fuel loadings and stand densities to provide more assurance of maintaining old growth in the long-term. Approximately 282 acres of the 285 total would be treated in Florida Creek.

Alternative 2 Amendment – Treat using prescribed fire in Friday Creek and Florida Creek in the Old Growth Management Area. This would result in 521 total acres being treated. Both areas would be maintained as pileated woodpecker indicator species habitat, with Friday Creek being capable of providing habitat at minimal levels.

Factors to consider
Timing – The LRMP has been in effect since 1989 and is tentatively scheduled to begin the revision process in 2006. These amendments are proposed in the second decade of the plan period and therefore are less likely to be significant. The proposed treatments would take place with the implementation of this alternative within the next 1-5 years.
Location and Size – Alternative 2 – Approximately 521 acres of the Old Growth Management Area would be burned. Treatment objectives have already been discussed above but are meant to promote old growth characteristics and resiliency in the long term and to reduce surface and some ladder fuels to reduce the risk of high-intensity wildfire. All treatments retain options for future management of Old Growth Management Areas.
Goals, Objectives, and Outputs – There would be no change in the long-term relationships between the levels of goods and services projected by the LRMP and the impacts of implementing the alternative because of the few acres being treated and the objectives of the treatments (to maintain old-growth characteristics over time).
Management Prescription – The amendment applies only to this alternative of this project and would not apply to future decisions within the project area. The amendment applies to a one-time use of prescribed fire in the Florida and Friday Creek Old Growth Management Areas. The amendment does not alter the desired future condition of the land or resources or the anticipated goods and services to be produced because of the small amount of acreage to be treated and that options for future management are being maintained.

Pileated Woodpecker Feeding Habitat Area
As already stated, the LRMP stipulates that an area of 300 acres within a 1,000 acre block surrounding allocated Old Growth Management Areas be established to provide pileated woodpecker feeding habitat.

Affected Environment
Approximately 1,234 acres have been designated as pileated woodpecker supplemental feeding habitat associated with each allocated Old Growth area. Forty two percent (781 acres) of the designated feeding habitat is in the dry grand fir plant association group. The remaining area occurs on Douglas-fir, ponderosa pine, and juniper sites. Two of the allocated Old Growth Management Area blocks are not located in or near dry grand fir sites so the feeding habitat designated includes ponderosa pine and juniper sites.

Historically, it was unlikely that pileated woodpecker feeding habitat would have occurred in concentrated blocks of 300 acres within this landscape. Stand conditions that included the larger structure, late seral species with high canopy closure would have ranged from 583 to 1,249 acres distributed across approximately 25,000 acres in small stands.

Approximately six percent (124 acres) of the feeding habitat area currently meets LOS criteria. Hollow grand firs are rare because late seral, large grand fir have not developed in this project area. Some younger stands containing grand fir exhibit low levels of stem disease that may eventually produce hollow trees.

Stand exam data show that 446 acres meet or exceed the desired levels for snags greater than 21 inches in diameter and 725 acres meet levels for snags grater than 9 inches. Snag density ranges from 0 to 14.2 dead trees per acre. Juniper steppe, juniper woodland and non-forest sites (136 acres) would not typically produce pileated woodpecker foraging snags.

Stand basal area ranges from 35 square feet per acre on juniper sites to 146 square feet per acre on mixed conifer sites. Stand structure on most sites is composed of large ponderosa pine and scattered large Douglas-fir over mid-canopy understories of ponderosa pine or mixed conifer. Snag levels are generally plentiful, ranging up to 6 dead trees per acre larger than 21 inches DBH and up to 20 dead trees per acre between 9 and 21 inches DBH.

Stands proposed for treatment are currently at high risk of mortality in the limited late and old structure due to insect and disease factors. These stands are classed as high intensity fire regime due to high stand density, multiple canopies, ladder fuels, and high fuel loading. These stand conditions present a high risk for high intensity fire.

Direct, Indirect, and Cumulative Effects of No Action
No treatments would occur with this alternative in pileated woodpecker feeding habitat. Stands would continue to increase in densities at a slow rate, risk of mortality would increase as densities increase and trees compete for limited resources and risk of high intensity wildfire would increase. Habitat for pileated woodpeckers would be maintained on the existing acres of fir-dominated understories. Current levels of canopy closure would be maintained in the short-term. Lack of treatment of the understory in these stands would perpetuate development of fir understory conditions with a positive effect on the pileated woodpecker habitat and abundance and quality. Over time, high stand densities may lead to declining stand health due to insects and disease, although this may also benefit the pileated woodpecker by increasing its foraging base. Extensive mortality due to insects, disease could also increase the risk high intensity fire in the future. The effect of such disturbances on pileated woodpecker habitat in the long term is dependent on the type, severity and extent of the event(s) but could result in stand replacement with loss of habitat.

There are no additional current or reasonably foreseeable future activities that would have an impact on pileated woodpecker feeding habitat. Livestock grazing would not have an impact on large diameter trees, coarse woody debris, canopy closure or any other components of pileated woodpecker feeding habitat. Past activities have been incorporated into the description of the current levels of habitat. This alternative would maintain the suitability of all existing habitat for pileated woodpeckers in the short term. Over time the suitability for nesting is expected to decline on sites that cannot sustain high densities of conifers. As trees on such sites succumb to insect invasion they would provide a foraging substrate for a variety of woodpeckers, including the pileated.

Description of Alternatives 2, 3, and 4 in Pileated Woodpecker Feeding Habitat Areas
Table 3.12 displays the types and amounts of treatment within the pileated feeding habitat areas.

Table 3.12 Summary of Treatments in Pileated Woodpecker Feeding Habitat Areas, by Alternative

Pileated Feeding Habitat		Alternative 2			Alternative 3			Alternative 4	
Site Number	Acres	Harvest	Noncom. Thinning and fuel treatments	Rx Fire	Harvest	Noncom. Thinning and fuel treatments	Rx Fire	Noncom. Thinning and fuel treatments	Rx Fire
D308	302	37	166	0	12	69	0	202	0
D311	328	148	110	4	98	160	4	258	4
D312	301	187	38	22	6	27	0	225	2
D309	303	77	129	11	0	103	11	205	1
Totals	**1,234**	**449**	**443**	**37**	**116**	**359**	**15**	**890**	**7**

Direct and Indirect Effects of Alternative 2
With the implementation of this alternative, harvest and related treatments would maintain the longevity of large structure on 449 acres. Treated stands would have a residual basal area between 60 and 90 square feet per acre. Canopy closure would range from 40 to 50 percent with small areas exceeding 50 percent. The harvest prescription calls for preferential retention of ponderosa pine and larch, but grand fir and Douglas-fir would also be retained as individuals or clumps within these stands. As the canopy may be reduced to less than 50% crown closure initially after treatment, this alternative would negatively affect the suitability of these stands as foraging habitat for pileated woodpeckers. Canopy closure is expected to recover partially, as the retained trees expand their crowns in diameter and depth in response to the release from competition that results from the thinning. However, as many of these stands are considered to be currently outside of their sustainable density, full recovery of canopy closure to the current level may not be achievable in the future. Thinning of mid-story trees would promote the development of large structure trees over time, ultimately providing a source of recruitment for large snags and down logs. Reducing competition from below is also likely to improve the longevity of existing large trees in the overstory. Thus, this treatment could facilitate the development of potential pileated woodpecker habitat in the long term, but the current habitat suitability (quality) for pileated woodpeckers would be reduced in treated areas.

This alternative also proposes to noncommercially thin (and associated fuels treatment) an additional 443 acres in the designated pileated feeding habitat area. Noncommercial and juniper thinning outside of harvest areas but within pileated feeding habitat would occur in the following units: 67, 100, 101.2, 101.2, 118, 193, 212, 372, 379, 398, 458, 472, 510, 557 and 582. Thinning would reduce the density of suppressed trees in the mid and understory. This would reduce susceptibility to invasion by insects, and thus remove foraging substrate for woodpeckers. However, thinning of these small trees would help to promote the development of larger trees in the stand. Though the treatment would reduce the suitability of stands as habitat for pileated woodpeckers, it could also facilitate the development of higher quality foraging and/or nesting habitat in the long term. The prescription calls for preferential retention of ponderosa pine and larch. Grand fir and Douglas-fir would be retained as individuals or clumps scattered within these stands, especially on north and east facing slopes and in draws.

There would be an additional 37 acres of fuel treatment outside of thinning units within the pileated feeding habitat. Natural fuels burning would occur in units 94, 380, 403, 412, 415, 436 in pileated feeding habitat. This would result in reductions of surface fuels and smaller diameter ladder fuels. Some canopy closure reductions would occur but not to the extent with commercial and noncommercial thinning.

Alternative 2 would maintain the suitability habitat for pileated woodpeckers in untreated stands on 305 acres of pileated feeding habitat area. The habitat suitability for this species would be reduced on the 929 acres treated within pileated feeding habitat area. There is a total of 1,234 acres of pileated feeding habitat area within the project area associated with the allocated Old Growth Management Areas.

Upper Pine Creek area - An area in the upper Pine Creek drainage (General Forest Management Area) would be harvested on 470 acres where current suitable habitat is available for pileated woodpeckers (units 258, 261.2, 282.2, 285, 294, 296, 300, 317, 318, 350, 365, 382, 399, 405, and 410.2). This area is currently being utilized by pileated woodpeckers. There would be 65 acres of noncommercial thinning and associated fuel treatments (units 236, 241, 261.2, 329, and 332). There would be 225 acres of prescribed burning (units 380, 412, and 415). Alternative 2 would reduce the suitability of this habitat for pileated woodpeckers. Alternative 2 is consistent with current LRMP direction.

Direct and Indirect Effects of Alternative 3
With the implementation of this alternative, grand fir sites with more than 3 trees per acre greater than 21 inches diameter at breast height would not be treated at this time in order to maintain existing habitat conditions. This would occur in stands with canopy closure greater than 50 percent and basal area greater than 100 sq. ft. Harvest would occur on 116 acres that have less than 3 trees per acres greater than 21 inches. Residual basal area would range from 60 to 70 square feet per acre and canopy closure would be reduced to 40 to 50 percent on treated stands. An area in the upper Pine Creek drainage (Management Area General Forest) would not be harvested where more suitable habitat is available for pileated woodpeckers (units 258, 261.2, 282.2, 285, 294, 296, 300, 317, 318, 350, 365, 382, 399, 405, and 410.2). This area would provide suitable habitat in the short term, for the low quality pileated woodpecker habitat currently designated at the Friday Creek Old Growth Management Area (OGMA-09). Management objectives for pileated woodpeckers would be better met in the upper Pine Creek area than in and adjacent to OGMA-09. There is no intent to manage this area in a permanent condition for pileated woodpeckers at this time. The following harvest units overlap designated pileated feeding habitat: 62, 63.1, 72.1, 126, 136, 139.1, 203, 347, 393, 393.1, 393.2, 563 and 569.

Harvest units within mapped pileated feeding habitat would be marked to retain additional co-dominant fir trees. Stands would be managed for mid-seral species composition on ponderosa pine and Douglas-fir sites. This prescription is designed to promote the development of pileated woodpecker habitat in pileated feeding habitat areas where it does not currently exist, or to maintain it where it is present. The strategy of this alternative would also focus on developing habitat for this species on sites that have the highest potential to sustain higher tree density and mixed species composition (grand fir sites). Sites which are less capable of developing and maintaining habitat for pileated woodpeckers (ponderosa pine and Douglas-fir sites) would not be managed at excessive densities, but would be managed to retain fir along with pine and larch. This would provide foraging opportunities even though nesting/roosting cover would be reduced in these stands.

This alternative also proposes to noncommercially thin (and associated fuels treatment) an additional 359 acres in the designated pileated feeding habitat areas. Noncommercial or juniper thinning outside of harvest areas but within pileated feeding habitat would occur in the following units: 67, 100, 101.1, 118, 126, 193, 372, 379, 398, 458, 510 and 557. Thinning would reduce the density of suppressed trees in the midstory and understory. This would reduce susceptibility to invasion by insects, and thus remove foraging substrate for woodpeckers. However, thinning of these small trees would help to promote the development of larger trees in the stand. Though the treatment would reduce the suitability of stands as habitat for pileated woodpeckers, it could also facilitate the development of higher quality foraging and/or nesting habitat in the long term. The prescription calls for preferential retention of ponderosa pine and larch. Grand fir and Douglas-fir would be retained as individuals or clumps scattered within these stands, especially on north and east facing slopes and in draws.

There would be an additional 15 acres of fuel treatment outside of thinning units within the pileated feeding habitat. This would result in reductions of surface fuels and smaller diameter ladder fuels. Some canopy closure reductions would occur but not to the extent with commercial and noncommercial thinning.

This alternative would maintain the suitability of habitat for pileated woodpeckers in untreated stands on 744 acres of pileated feeding habitat. The habitat suitability for this species would be reduced, at least in the short term, on 490 acres treated within pileated feeding habitat. There is a total of 1,234 acres of pileated feeding habitat areas within the project area associated with the allocated Old Growth Management Areas.

Upper Pine Creek area - There would be no treatments within this area. Current habitat suitability would be maintained in the short term. There would be no long-term designation of this area as an allocated Old Growth Management Area or as a pileated woodpecker feeding habitat area.

Direct and Indirect Effects of Alternative 4
No commercial harvest would occur with this alternative but trees nine inches and diameter and smaller would be noncommercially thinned. Treated stands would remain dense with canopy closure typically remaining above 50 percent.

Commercial harvest prescriptions to promote the development of pileated woodpecker habitat in pileated feeding habitat where it does not currently exist would not be implemented under this alternative. This alternative proposes noncommercial thinning (and associated fuels treatment) on 890 acres in the designated pileated feeding habitat. Noncommercial thinning would reduce the density of suppressed trees in the understory. This would reduce susceptibility to invasion by insects, and thus remove foraging substrate for woodpeckers. Suitable habitat would be retained it where it is currently present, though foraging substrate would be reduced. Noncommercial prescriptions would help to move stands that do not currently have optimal conditions for pileated woodpecker feeding habitat toward suitable habitat conditions, but not as rapidly as would occur under Alternative 3. The most rapid response to move stands that do not currently have optimal conditions for pileated woodpecker feeding habitat would be in Alternative 2 where commercial and noncommercial thinning would promote growth. Thinning of these small trees would slightly promote the development of larger trees in the stand. Therefore implementation of this alternative could facilitate the development of higher quality foraging and/or nesting habitat in the long term. The following units are within mapped pileated feeding habitat: 62, 63.1, 72.1, 126, 136, 139.1, 205, 347, 393, 393.1, 393.2 and 563.

There would be an additional 7 acres of fuel treatment outside of thinning units within the pileated feeding habitat area in units 94 and 403. Fuel treatments would be more difficult because stands would still be consistently multi-strata canopies with ladder fuels and ground fuels to treat. Prescribed fire treatments would result in more damage to residual trees because of surface fuel loadings and ladder fuels that would not be removed with commercial thinning operations and subsequent noncommercial thinning activities. However, this would create additional foraging substrate after activities occurred.

This alternative would maintain the current level of suitability of habitat for pileated woodpeckers in untreated stands on 337 acres of pileated feeding habitat. The suitability for this species would be retained, though foraging substrate would be reduced on 897 acres treated within pileated feeding habitat.

Upper Pine Creek area - There would be noncommercial thinning in suitable pileated woodpecker habitat in the upper Pine Creek drainage. This area provide substitute habitat, in the short term, for the low quality pileated woodpecker habitat currently designated at the Friday Creek Old Growth Management Area (OGMA-09). This noncommercial thinning would not substantially alter the suitability of the area for use by pileated woodpeckers, as overstory canopy closure would be maintained and potential foraging substrate would remain. Though a slightly lesser abundance of foraging substrate would be retained in upper Pine Creek than under Alternatives 1 and 3, the resiliency of the overstory trees would be improved slightly compared to Alternatives 1 and 3 but would be substantially improved in Alternative 2. The following noncommercial thinning units are in upper Pine Creek: 258, 261.2, 282.2, 285, 294, 296, 303, 317, 318, 350, 365, 382, 399, 405 and 410.2.

Summary of Direct and Indirect Effects of Alternatives 2, 3, and 4
Alternative 2 treats more pileated woodpecker feeding habitat than Alternative 3. Negative impacts to the suitability of habitat would occur with Alternative 2 but not with Alternative 3 because prescriptions in Alternative 3 are designed to maintain habitat in the short-term and defer treatments in areas of upper Pine Creek. Alternative 4 would treat similar acres as Alternative 2 but would not treat any trees over nine inches in diameter. Current canopy closure levels in large diameter trees would be maintained, in the short term but would be susceptible to mortality due to high competition levels. Alternative 2 provides future potential habitat by reducing competition among trees and promoting the development of large diameter trees in the long term.

Cumulative Effects of Alternatives 2, 3, and 4
Alternatives 3 and 4 would maintain the suitability of all existing habitat for pileated woodpeckers in the short term. Over time, the suitability for nesting is expected to decline on sites that cannot sustain high densities of conifers. As trees on such sites succumb to insect invasion they would provide a foraging substrate for a variety of woodpeckers, including pileated woodpeckers. Alternative 2 would provide long-term habitat by reducing competition in the large diameter trees and promoting the development of large diameter trees where they currently do not exist.

Past regeneration and commercial thinning harvest treatments have reduced overall suitable pileated woodpecker habitat in the project area. See the Wildlife Report for more specific details on acreage figures by treatment type. In the future, it is expected that thinning treatments would continue to remove true fir from forested stands, resulting in increased domination of pine and larch, more open forest conditions, and single stratum stand structure on more acres than is currently present. This would reduce the quality of pileated woodpecker habitat in the long term, though total reproductive habitat would increase as dominant tree size becomes larger. At the same time, stands that have developed densities and species compositions that are not sustainable due to site capability, would be brought closer to a sustainable level with future management actions. At the watershed scale, the abundance and distribution of pileated woodpecker habitat would move closer to what is believed to have been the historic condition. Habitat for pileated woodpeckers would be concentrated on sites that are more likely to sustain such stand densities and species distributions, and would be eliminated from sites that are less likely to sustain it in the long term. On privately owned timberland in the project area, past timber management has reduced the abundance of overstory trees, snags, and large down logs. These actions have limited the suitability of these timberlands for occupancy by pileated woodpeckers.

There are no other currently or reasonably foreseeable future activities which would impact pileated feeding habitat area within the project area. Livestock grazing would not have an impact on large diameter trees, coarse woody debris, canopy closure, or any other components of pileated woodpecker feeding habitat. Past activities have been incorporated into the description of the current levels of habitat.

Key Issue 2: Water Yield

Issue 2: Vegetation management would affect water yield by increasing the rate of water delivery to streams. Since peak flows now occur earlier than they did historically, water flow from higher elevations is "flashier" and can coincide with peak flows from lower elevations. Timber harvest and noncommercial vegetation treatment decreases leaf area index and can lead to increased water yields and changes in the timing of flows.

Newsome and Gibson Creek drainages currently have a high percentage of headcuts indicating that the hydrologic system is not functioning properly. This is probably due to the loss of deciduous streamside vegetation from grazing and past timber harvest with little stream buffering. Reduced vegetative cover in riparian habitat conservation areas leads to increased bank instability and in conjunction with an intense rain event, stream headcutting would occur. Any increase in water yield in these drainages would increase the amount and rate of headcutting. A value of 20 EHA would indicate little to no potential increase in water yield.

Measuring Factor:
Effects to water yield will be measured by EHA percentages in all watersheds and in Newsome Creek and Gibson Creek drainages.

Affected Environment
Drainages in the project area normally have peak annual flows in March through April as a result of snowmelt. Peak annual flows as a result of rain-on-snow events in early winter have produced some of the highest flows in the project area over the last 50 years. Peak annual floods can also result from intensive convective thunderstorms that cause flash floods during the spring and summer. The probability of having a flash flood increases as the elevation and precipitation decrease primarily as a response to vegetation and ground cover. Forest canopy tends to buffer the intensity of thunderstorms at higher elevations. Peak flows are probably higher than historically due to loss of floodplain storage due to entrenched channels and soil loss,

compaction, timber harvest, and road construction which can cause flashier responses. This has been offset somewhat by increased understory canopy cover.

Base flows were probably higher prior to watershed alterations which have occurred over the last 150 years. Stream entrenchment has reduced storage potential in alluvial aquifers. Upland storage has been lost due to road construction, erosion, and compaction. Prior to European settlement, frequent fires maintained lower evapotranspiration and interception rates and water storage in wetlands and beaver ponds contributed to base flows. Increases in base flow due to removing trees tend to be short term (5 to 10 years) and return to pre-disturbance levels as other vegetation utilizes the increase - grasses and shrubs in juniper stands and primarily remaining trees in higher precipitation zones.

Stream surveys have identified numerous headcuts in the project area making the streams susceptible to increased flows. Headcuts were treated in Preemption Creek in 2003 and are planned on Rickman Creek in 2004. Previous work was accomplished on Klootchman Creek, Gibson Creek, and Newsome Creek.

Equivalent Harvest Area (EHA) will be used to evaluate the risk to water quality and stream bank stability. The EHA is a model that estimates the area which when harvested (or any treatment which reduces vegetation) produces hydrological effects similar to 1-acre of clearcut. The Ochoco National Forest Land and Resource Management Plan (LRMP) assigned an EHA threshold of 35 percent to watersheds that flowed into the Crooked River between the Bowman Dam on Prineville Reservoir and the confluence of the North Fork Crooked River. The threshold value identifies the upper limit that is compatible with watershed sensitivity, without incurring damage in a major storm event and is the level to determine forest plan consistency. The assigned threshold of 35 percent indicates low sensitivity. However, the high incidence of headcuts in the streams in the project area indicates that the watersheds are highly sensitive and a threshold of 25 percent may be more appropriate and was utilized to identify potential areas of concern, especially in drainages at the subwatershed and drainage scale. No intent is made for a forest plan amendment but only as an analysis tool to indicate smaller subwatersheds with a potential for higher risk. The EHA threshold should not be interpreted as a point above which detrimental impacts will occur but as a point above which detrimental impacts may occur, should a 10-year or greater storm or melt event take place (Anderson, 1989).

The EHA model was developed to evaluate third, fourth, and fifth field order drainages. Stream order is a term used to characterize the branching of streams from the top of the drainage. A first order stream is an unbranched tributary. Second order streams are initiated by the confluence of two first order streams; third order streams start at the confluence of two second order streams, etc. While the model was developed to evaluate third through fifth order drainages and has been primarily used to evaluate watersheds and sub-watersheds, most of the research cited in support of the model was collected on drainages less than 400 acres. Headwater streams are especially sensitive to increases in flows due to faster delivery of water, less opportunity for channel storage, and greater chance of flow synchronization. Therefore, water yield effects resulting from proposed treatments analyzed by the EHA model should also reflect effects to the second or third order drainages of concern in the project area.

Direct, Indirect and Cumulative Effects of No Action

EHA from past harvest would continue to recover. Vegetation would continue to increase. All watersheds and subwatersheds are at low risk during the period being evaluated except for the Twin Buttes subwatershed, Drake Creek subwatershed, and Headwaters Bear Creek subwatershed. These subwatersheds are at a higher risk due to past timber harvest.

In Newsome and Gibson Creek drainages, vegetation would continue to increase and EHA would continue to decrease. Existing EHA levels are below 20 percent. See Table 3.14 for estimations of EHA into the future based on vegetative recovery.

No increase in the cumulative water yield or peak flows would occur as a result of this alternative or additional reasonably foreseeable future actions. EHA from past harvest would continue to recover as canopy cover and leaf area index increase. All watersheds and subwatersheds are at low risk during the period being evaluated.

The majority of the project area has high fuel loadings and high crown densities. Over time, without disturbance, fuel loading in stands would continue to increase, which would result in a higher risk of high intensity fire. In the long term, there is potential for indirect effects associated with the higher fuel loadings that would carry a high-intensity wildfire. If a large scale high intensity fire was to occur, there would be an increase in EHA commensurate with the size and intensity of the fire as leaf area index and vegetative cover would decrease. Water yields would increase with a high probability of increased erosion and subsequent sedimentation. It is difficult to predict the time, or the scale and intensity at which such an event might occur.

It is reasonably foreseeable that cattle would continue grazing in the allotments in the project area. The Forest Service is currently developing a proposal to update the five Allotment Management Plans (AMPs) in the Maurys. The AMP updates will be analyzed over the next 1-2 years; any changes to livestock grazing as a result of that analysis will not be made until after a decision is made on the West Maury Fuels and Vegetation Management project. Upward trends in riparian condition are expected to continue due to changes in the range utilization standards in the Grazing Implementation Monitoring Module (IIT, 2000). These utilization standards are used to determine when livestock are to be removed from pastures. It is reasonably foreseeable that forthcoming changes that will result in improved channel condition will include activities such as moving water troughs out of riparian areas, fencing or enlarging exclosures at springs, and developing more water sources in the uplands. Livestock grazing has little effect on EHA; their primary influence on EHA is on stream bank condition which is one of the factors used to determine what the channel response will be to changes in flow.

Insect, disease, and wind throw can reduce canopy but the concentration and area impacted are usually small and dispersed in the watersheds in the project area and were not included in the model. Other management activities that remove trees that do not affect EHA are: removing hazard trees from developed campgrounds, removing hazard trees adjacent to system roads, juniper thinning in low precipitation zones, and the Christmas tree program. These activities would not remove enough vegetative cover to cause any increases in water yield.

Reasonably foreseeable riparian planting and headcut repair would occur on the following creeks in the project area:

Newsome Creek – Approximately 1.0 mile of planting with 15 headcut repair structures.
Gibson Creek – Approximately 1.25 miles of planting with 12 headcut repair structures.
Sanford Creek – Approximately 0.5 mile of planting.
East Fork Shotgun Creek – Approximately 0.25 mile of planting with numerous headcut structures.
Cow Creek - 4 headcut repair structures.

Riparian planting and headcut repair activities, as with livestock grazing, primarily affect channel stability and influence what the channel response will be to changes in stream flow. Headcut repair activities immediately reduce the risk of higher flows destabilizing the stream channel. Riparian planting provides a longer term, self-maintaining treatment for stabilizing stream channels; however, riparian planting activities are not very effective until vegetation becomes established, usually 4 to 5 years.

There are no other past, present, or reasonably foreseeable future actions that would result in a measurable effect on EHA.

Direct, Indirect, and Cumulative Effects of Alternatives 2, 3, and 4

Timber harvest (not occurring in Alternative 4) and noncommercial thinning can reduce interception and evapotranspiration, increase snow accumulation, and change snow melt rate and timing. Prescribed fire can reduce interception by burning surface fuels and vegetation; reduce evapotranspiration by killing or burning grasses, shrubs, and small trees; and change the timing and rate of snowmelt. These increases would be partially offset by increased uptake by remaining trees and vegetation. The reduction in interception and evapotranspiration and rate of snowmelt resulting from prescribed spring and fall burning should not result in any measurable increase in flows from areas being treated due to the low intensity of the burn.

The EHA model does not measure direct effects; it is based on the principal that reduced canopy closure would reduce interception and evapotranspiration and would increase snow accumulation. Increases in

water yield are nearly always higher on north slopes than on south slopes. Snowmelt rates are dependent on elevation and aspect. At the elevations found in the project area, the snowmelt rate decreases with increases in canopy density, with the reduction being greatest in units with southerly aspects.

The probability of an event (flood) occurring can be increased by increasing the runoff efficiency of a drainage by road construction, increasing the snow pack through unit size and distribution, increasing snow melt rate through reducing canopy closure, or increasing the amount of water available by removing vegetation. Measurable increases in flow should start showing up when the EHA reaches about 20 percent (Hibbert 1965) and should be roughly proportional to the percentage of the area above that value.

The EHA model evaluates water yield effects of past and proposed harvest treatments, fires, and proposed noncommercial thinning in the West Maury project area. It is estimated that about 85 percent of the forested land in the project area has been at least lightly harvested in the past. About 75 percent of this was harvested with ground based equipment. The model evaluated all timber harvest in the project area over the last 26 years. Overstory removal and regeneration harvest prior to this is still affecting water yield, but should have substantially recovered. Roads can reduce canopy and leaf area index but the area is small. The LRMP open road density standard and guidelines of 3 miles per square mile results in less than a 1 percent EHA. This is less than the accuracy of the model and if roads were included, only sections that were in forested plant associations could be evaluated and roads in units would have to be removed from the calculation so the area was not double counted. The primary effects of roads are increased runoff efficiency resulting from extension of the drainage system and erosion from the road surface, cut and fill slopes. Natural fuels treatment normally only kills seedlings and saplings and without connected noncommercial thinning, does not remove enough of the canopy to affect the EHA.

Harvest treatments on private lands below the National Forest boundary have been similar to those on the National Forest. A table of the percentage of forested Plant Association Groups (PAGs) on National Forest System (NFS) and Private lands within the affected subwatersheds follows:

Table 3.13 Percentage of NFS and Private/Other Lands Within the Project Area

	Forest Service (ac)*	Private/Other (ac)*
Upper Crooked River Watershed		
Drake Cr. Subwatershed	5632 (94%)	337 (6%)
Twin Buttes Subwatershed	1493 (96%)	59 (4%)
Pine Cr. Subwatershed	5258 (95%)	270 (5%)
Conant Cr. Subwatershed	186 (21%)	696 (79%)
Newsome Cr. Subwatershed	9234 (91%)	876 (9%)
Prineville Reservoir Watershed		
Sanford Cr. Subwatershed	716 (31%)	1606 (69%)
Bear Creek Watershed		
Ltl. Bear Cr. Subwatershed	1160 (72%)	450 (28%)
Upr. Bear Cr. Subwatershed	1597 (77%)	478 (23%)
Hdwtrs. Bear Cr. Subwtrshd.	8924 (92%)	810 (8%)
Camp Creek Watershed		
Indian Cr. Subwatershed	4379 (91%)	427 (8%)

Area does not include juniper associations because the small amount of water yield increase resulting from juniper thinning is rapidly taken up by grasses, forbs, and shrubs, and it does not have much affect on peak flows.

Based on species composition and past harvest activity, any future logging on private lands would probably be selective harvest. While no known harvest is currently taking place on adjacent lands in affected subwatersheds, it is reasonably foreseeable that it would occur in the future. Based on the projected EHAs on Forest Service administered lands, past harvest on private lands, the percent of forested plant association groups on private lands, and subwatershed configuration (subwatersheds with multiple tributaries flowing into the Crooked River have less affect than a self contained subwatershed such as Pine Creek), two subwatersheds were determined to be of concern: Sanford Creek and Headwaters Bear Creek. With the maximum EHA on Sanford Creek Forest Service administered land, under any of the action alternatives, at

12.4 percent and mixed ownership below the National Forest boundary, there is low risk of enough harvest on private lands occurring to produce a measurable increase in flow before substantial recovery of harvest proposed under the West Maury EIS. While less than 10 percent of the Headwaters Bear Creek Subwatershed is on private land, it is a concern because of projected EHAs on the National Forest. There is little likelihood of harvest on the private land at this time because the owner is currently running a guide service on his land.

It is reasonably foreseeable that livestock would continue grazing in the allotments in the project area. The Forest Service is currently developing a proposal to update the five AMPs in the Maurys. The AMP updates will be analyzed over the next 1-2 years; any changes to livestock grazing as a result of that analysis will not be made until after a decision is made on the West Maury Fuels and Vegetation Management project. Upward trends in riparian condition are expected to continue due to changes in the range utilization standards in the Grazing Implementation Monitoring Module (IIT 2000). These utilization standards are used to determine when livestock are to be removed from pastures. It is reasonably foreseeable that forthcoming changes that will result in improved channel condition will include activities such as moving water troughs out of riparian areas, fencing or enlarging exclosures at springs, and developing more water sources in the uplands. Livestock grazing has little effect on EHA; their primary influence on EHA is on stream bank condition which is one of the factors used to determine what the channel response will be to changes in flow.

There are no other past, present, or reasonably foreseeable future actions that would affect EHA that have not already been incorporated.

Table 3.14 displays the EHA levels that would occur with the implementation of the alternatives, including No Action, in the four watersheds within the project area. Additional information at the subwatershed and drainage level is provided in the Water Quality Report.

If one of the action alternatives with commercial harvest is selected, it is assumed the timber sale would be offered in 2005. EHA calculations assume all harvest activities, in Alternatives 2 and 3, would take place between 2005 and 2007 and noncommercial and fuels treatments would be completed by 2012 for all action alternatives. Natural fuels treatment is assumed to not remove enough canopy to produce a measurable increase in water yield.

No watersheds resulted in levels exceeding LRMP standards and guidelines (35%). Only Bear Creek Watershed indicates levels above the 25 percent level and only for a few years in Alternatives 2 and 3. Measurable increases in flow should start showing up when the EHA reaches about 20 percent (Hibbert, 1965) and should be roughly proportional to the percentage of the area above that value. The following Table 3.15 displays the watersheds and subwatersheds related to the EHA categories that are above thresholds.

Table 3.14 EHA Percents by Watershed, Year, and Alternative

Watershed	Alternative	2004	2005	2006	2007	2008	2009	2010	2011	2012
Upper Crooked River Watershed	1	21.4	19.4	17.8	16.8	16.1	15.5	15.0	14.5	14.0
	2		20.2	19.3	19.0	18.3	17.7	17.1	16.5	15.9
	3		20.0	18.9	18.4	17.7	17.1	16.5	15.9	15.4
	4		19.4	18.0	17.1	16.6	16.1	15.7	15.2	14.6
Prineville Reservoir Watershed (Sanford Creek)	1	2.0	1.8	1.8	1.7	1.7	1.5	1.5	1.4	1.4
	2		5.4	9.1	12.4	12.4	12.1	11.7	11.3	10.7
	3		4.7	7.5	10.3	10.3	10.0	9.8	9.3	8.9
	4		1.8	2.0	2.1	2.2	2.4	2.5	2.4	2.2
Bear Creek Watershed	1	23.9	23.0	21.9	20.7	19.0	17.3	16.0	15.4	14.7
	2		**25.6**	**26.9**	**28.1**	**26.4**	24.5	22.8	21.8	20.8
	3		24.8	**25.4**	**25.9**	24.2	22.4	20.9	20.0	19.1
	4		23.0	22.2	21.4	20.1	18.8	17.7	17.0	16.2
Camp Creek Watershed	1	13.4	12.9	12.4	12.0	11.5	11.0	10.6	10.1	9.6
	2		13.2	13.0	12.8	12.4	11.9	11.4	10.8	10.4
	3		13.2	13.0	12.8	12.4	11.9	11.4	10.8	10.4
	4		12.9	12.4	12.0	11.6	11.1	10.7	10.2	9.7
Newsome Creek Drainage	1	18.4	15.8	14.5	13.9	13.4	12.8	12.3	11.9	11.4
	2		17.2	17.3	18.1	17.6	17.1	16.5	15.8	15.1
	3		16.7	16.2	16.5	16.1	15.6	15.1	14.6	14.0
	4		15.8	14.7	14.4	14.1	13.7	13.4	12.9	12.4
Gibson Creek Drainage	1	5.4	5.3	5.1	5.0	4.9	4.8	4.7	4.5	4.5
	2		9.4	13.5	17.4	17.3	17.1	16.5	15.6	14.8
	3		9.1	12.8	16.5	16.4	16.2	15.8	15.2	14.4
	4		5.3	5.8	6.3	6.8	7.3	7.7	7.4	7.1

Table 3.15 Comparison of the Alternatives for Number of Years in EHA Category

	Alternative	Years EHA > 35% Forest Plan Threshold	Years EHA > 30% (mod sensitivity)	Years EHA > 25% (high sensitivity)
Twin Butte Sub WS	1	1	2	5
	2	1	2	6
	3	1	2	6
	4	1	2	5
Drake Cr Sub WS	1	-	-	1
	2	-	-	2
	3	-	-	2
	4	-	-	1
Bear Cr Watershed	1	-	-	0
	2	-	-	4
	3	-	-	2
	4	-	-	0
Headwaters Bear Creek Sub WS	1	-	-	2
	2	-	4	7
	3	-	1	5
	4	-	-	3

Direct and Indirect Effects of Alternative 2

Commercial treatments and noncommercial thinning would reduce ladder fuels and reduce the number of stands at high risk from insects and disease. Fuels treatment would reduce the amount of area susceptible to stand replacement wildfire, reducing the acreage of mixed-intensity fire regime by 15 percent and high-intensity fire regime by 37 percent. Equivalent Harvest Area (EHA) from past harvest would continue to

recover. All watersheds and subwatersheds in the project area are at low risk during the period being evaluated except for the Twin Buttes subwatershed, Drake Creek subwatershed, and Headwaters Bear Creek subwatershed listed in Table 3.15 due to past harvest practices. The following watersheds were evaluated at the lower 25 percent level.

Twin Buttes Subwatershed – This subwatershed consists of a number of small drainages that flow directly into the Crooked River. On the National Forest, most of this subwatershed is located east of Drake Creek on Keeney and Tom Vawn Creeks. The area that is in the West Maury Project area is small and is on a drainage that has not had any treatment since the 1960s. With the treatment of unit 18, there would be negligible effects on the Crooked River. Delaying treatment until 2006 would allow the EHA for the subwatershed to fall below 35 percent.

Drake Creek Subwatershed – Most of this subwatershed is east of the project area. The subwatershed has high sensitivity based on headcutting. Harvesting the units proposed under this alternative would increase the time the subwatershed was at moderate risk from 1 to 2 years. The EHA for the Shotgun Creek Drainage, which is in the project area, remains below 25 percent in this alternative. Unit 204 is on the East Fork of Shotgun Creek which has extensive headcutting.

Bear Creek Watershed - Harvesting the units proposed under this alternative would increase the time the watershed was at moderate risk from 0 to 4 years. Until it fills, Antelope Reservoir has a major buffering affect on flows in Beaver Creek. Harvest in the Headwaters Bear Creek Subwatershed is responsible for most of the potential increased flow to the watershed.

Headwaters Bear Creek Subwatershed - Harvesting the units proposed under this alternative would increase the time the subwatershed was at high risk to 4 years and moderate risk from 2 to 3 years. Headcuts on Klootchman and Preemption Creek have been treated. Channel stabilization is proposed on Rickman Creek in 2004. EHA analysis on the Klootchman Creek Drainage indicates it is at low risk. Until it fills, Antelope Reservoir has a major buffering affect on flows in Beaver Creek.

Newsome Creek and Gibson Creek Drainages – Stream surveys found numerous headcuts in these drainages. Harvest in these drainages in the 1960s would have substantially recovered based on growth rates for vegetation. There are several small headcuts on lower Newsome Creek, those that are active are above most of the harvest activity proposed and do not need treatment prior to harvest. The active headcut on Gibson Creek just downstream from the 1620-130 road junction would be treated prior to harvest of units 166, 198, 226, 240 and 254. Environmental analysis is currently being conducted to treat these areas prior to the decision of this environmental analysis. Cross drainage would also be implemented on the 1620 road across from the headcut, on the drainage coming in from the west in Gibson Creek (section 27 downstream from 1620140 road). EHA levels for Alternative 2 would be higher than those in Alternatives 3 or 4. EHA levels remain below 20 percent.

The Upper Crooked River, Bear Creek, Camp Creek, and Prineville Reservoir Watersheds are under the Forest Plan EHA threshold of 35 percent.

Direct and Indirect Effects of Alternative 3

Commercial treatments and noncommercial thinning would reduce ladder fuels and reduce the number of stands at high risk from insects and disease. Fuels treatment would reduce the amount of area susceptible to stand replacement wildfire, reducing the area in mixed fire intensity by 12 percent and that in high fire intensity by 31 percent. Equivalent Harvest Area (EHA) from past harvest would continue to recover as canopy cover and leaf area index increase. All watersheds and subwatersheds in the project area are at low risk during the period being evaluated except for the Twin Buttes subwatershed, Drake Creek subwatershed, and Headwaters Bear Creek subwatershed listed in Table 3.15 due to past harvest practices. Effects are similar as Alternative 2 except for the differences described below:

Twin Buttes Subwatershed – Same as Alternative 2.

Drake Creek Subwatershed – Same as Alternative 2.

Bear Creek Watershed – Harvesting the units proposed under this alternative would increase the time the subwatershed was at moderate risk to 2 years. This would be 2 years less than Alternative 2 but 2 years more than Alternative 4. Until it fills, Antelope Reservoir has a major buffering affect on flows in Beaver Creek. Harvest in the Headwaters Bear Creek Subwatershed would be responsible for most of the potential increased flow to the watershed.

Headwaters Bear Creek Subwatershed - Harvesting the units proposed under this alternative would increase the time the subwatershed was at high risk to 1 year and moderate risk from 2 to 5 years. This is less time than Alternative 2. Due to sensitivity to increased flows, 800 acres of tractor and skyline harvest units were dropped in the Headwaters Bear Creek subwatershed in Alternative 3. This resulted in a 25 percent reduction in new EHA effects. The following units were dropped: 253, 384, 410.2, 411, 483, 533, 563, 569, 578, 591, 595, 598, and 601. Headcuts on Klootchman and Preemption Creek have been treated. Channel stabilization is proposed on Rickman Creek in 2004. EHA analysis on the Klootchman Creek Drainage indicates it is at low risk. Until it fills, Antelope Reservoir has a major buffering affect on flows in Beaver Creek.

Newsome Creek and Gibson Creek Drainages – Stream surveys found numerous headcuts in these drainages. Harvest in these drainages in the 1960s would have substantially recovered based on growth rates for vegetation. There are several small headcuts on lower Newsome Creek, those that are active are above most of the harvest activity proposed and do not need treatment prior to harvest. The active headcut on Gibson Creek just downstream from the 1620-130 road junction would be treated prior to harvest of units 166, 198, 226, 240 and 254. Environmental analysis is currently being conducted to treat these areas prior to the decision of this environmental analysis. Cross drainage would also be implemented on the 1620 road across from the headcut, on the drainage coming in from the west in Gibson Creek (section 27 downstream from 1620140 road). EHA levels would be slightly lower than levels in Alternative 2 but slightly higher than levels in Alternative 4. EHA levels remain below 20 percent.

The Upper Crooked River, Bear Creek, Camp Creek, and Prineville Reservoir Watersheds are under the Forest Plan EHA threshold of 35 percent.

Direct and Indirect Effects Alternative 4

Noncommercial thinning would slightly reduce ladder fuels and slightly reduce the number of stands at high risk from insects and disease. Fuels treatment would reduce the amount of area susceptible to stand replacement wildfire, reducing the area in Mixed Intensity Fire Regimes by 8 percent and that in high intensity fire regimes by 26 percent. Equivalent Harvest Area (EHA) from past harvest would continue to recover as canopy cover and leaf area index increase. All watersheds and subwatersheds in the project area are at low risk during the period being evaluated, except for the Twin Buttes subwatershed, Drake Creek subwatershed, and Headwaters Bear Creek subwatershed listed in Table 3.15 due to past harvest practices. Effects are similar as Alternative 1 except for the differences described below:

Twin Buttes Subwatershed – Same as Alternative 1 (No Action). There would be no change from the existing condition.

Drake Creek Subwatershed – Same as Alternative 1. There would be no change from the existing condition.

Bear Creek Watershed – Same as Alternative 1. There would be no change from the existing condition.

Headwaters Bear Creek Subwatershed – Noncommercial thinning of the units proposed under this alternative would increase the time the subwatershed was at moderate risk from 2 years to 3 years. This is less time than Alternatives 2 or 3. Headcuts on Klootchman and Preemption Creek have been treated. Channel stabilization is proposed on Rickman Creek in 2004. EHA analysis on the

Klootchman Creek Drainage indicates it is at low risk. Until it fills, Antelope Reservoir has a major buffering affect on flows in Beaver Creek.

Newsome Creek and Gibson Creek drainages – Stream surveys found numerous headcuts in these drainages however, noncommercial thinning activities would not result in measurable increased flows. EHA levels remain below 20 percent.

Cumulative Effects of Alternatives 2, 3, and 4
All watersheds would continue to recover as past regeneration harvest areas continually increase in canopy cover and leaf area index. Stands with high tree densities and high fuel loadings would be treated to reduce the risk of stand replacement in the event of a wildfire. Alternative 2 treats more stands with high densities than Alternative 3 and Alternative 4 therefore the risk is lower in Alternative 2. It is expected that in the event of a wildfire, the reduction of ladder fuels and less dense stands would contribute to less mortality in large trees and tree canopy cover would not be affected to the extent as in Alternative 1. Riparian planting will not start being effective at stabilizing stream banks, for at least 4 to 5 years, until vegetation becomes established.

Resource Conditions Relative to the Purpose and Need

Vegetation

Purpose and Need for Action
There is a need to move the seral and structural conditions of forest stands towards their historic ranges of variability, maintaining and increasing broadleaf and shrub communities, maintaining and increasing late and old structured stands, and increasing the resistance of forest stands to insects, disease and high intensity wildfire.

Vegetation Analysis Process
The Maury Mountains Watershed Analysis (2001) included an extensive look at forest vegetation conditions, and the relationships between those conditions and changes in fire hazard, insect and disease dynamics, wildlife habitats, and riparian health. Vegetation patterns and occurrence within the project area are different now than what existed historically. Changes to the health, structure, composition, distribution, and function of forest stands have altered the natural processes that maintained a stable ecosystem, such as fire and natural erosion. These have affected watershed resiliency, wildlife habitat diversity and amount, water quality, visual quality, the availability of forest products, and fuel loadings and fire behavior.

Currently, more area is covered by dense stands of small trees than was present historically. Stands dominated by large trees are fewer than were present historically. Species composition of forest stands has shifted from early seral to late seral. Upland slopes once covered by shrub and grass communities have converted to juniper and ponderosa pine.

The Viable Ecosystems model provides a process to apply ecosystem standards to project-level planning. This system compares existing vegetation with site potential (or biophysical environment). The model focuses on relationships between combinations of vegetation structure and species composition, and habitat requirements for animals, insects, and plants. The Viable Ecosystems model stratifies the environmental gradient using plant associations. The Viable Ecosystems Management Guide (Draft) (Simpson et al. 1994) was used within the Maury Mountains Watershed Analysis to characterize and compare seral structural conditions to HRV and contains a description of Viable Ecosystems and analysis methods and tools used to conduct the analysis.

Plant associations are a land classification based on the probable plant community that would develop in the absence of disturbance influences. Between 1992 and 1994 plant associations were mapped for the entire Ochoco National Forest. For the Viable Ecosystem model, the plant associations have been grouped according to similar disturbance regimes creating seven plant association groups (PAGs) in the project area.

Non-forest (including riparian) plant associations occur within the watershed and were also grouped into upland grass, scabland grass, meadows, and rock. Non-forest PAGs were not analyzed by composition

because the plant succession and disturbance processes have not been described to date. The following Table 3.16 displays the acres by PAG within the West Maury Project Area.

Table 3.16 Plant Association Groups (PAG)

Plant Association Group	Acres
Dry Grand fir	5,947
Douglas-fir	9,017
Moist Ponderosa Pine	7,148
Dry Ponderosa Pine	6,678
Western Juniper Woodland	7,382
Western Juniper Steppe	603
Non-forest	1,199
Total	37,974

Each PAG is characterized by seral structural stages, successional processes and disturbance regimes. Seral/structural stages are defined by species composition, size/structure, and canopy closures.

Seral stages are determined by percent species composition of shade intolerant species and organized into three stages: E (early), M (mid), and L (late). The structural stage classification is based on the largest structural class that forms 30% or more of the canopy closure. There are five structural stages: 1 (grass/forb/shrub), 2 (seedling and sapling, trees less than 4.9 inches DBH), 3 (pole, trees between 5 and 8.9 inches DBH), 4 (small, trees between 9 - 20.9 inches DBH), and 5 (medium and large, trees greater than 21 inches DBH). The existing canopy closure is defined by the "a" or "b" seral/structural stage coding. Multi-story or "a" stands are those stands with a canopy closure greater than 55%. Single-story or "b" stands are those stands with a canopy closure of less than 55%. Further discussions on how Historical Range of Variability is derived and the detailed information for each plant association group can be found in the Forest Vegetation Analysis Report. Table 3.17 displays the definitions of the seral / structural stages.

Table 3.17 Seral / Structural Matrix and Definitions (Seral Structural Stages)

Structure Class	Species Composition		
	Early	Mid	Late
Grass, forb, shrub (trees may be present but not dominant)	E1	M1	L1
Seedling, sapling (less than 4.9 inches DBH)	E2	M2	L2
Pole (between 5 and 8.9 inches DBH), high density (a)	E3a	M3a	L3a
Pole, low density (b)	E3b	M3b	L3b
Small (between 9 and 20.9 inches DBH), high density (a)	E4a	M4a	L4a
Small, low density (b)	E4b	M4b	L4b
Medium/large (21 inches DBH and larger), high density (a)	E5a	M5a	L5a
Medium/large, low density (b)	E5b	M5b	L5b

Affected Environment

In most plant association groups, large structural stages are deficient (structure code 5). The grass, forb, shrub stage (E1) is also deficient in the dry ponderosa pine, juniper woodland and juniper steppe groups. Excess stages in most groups include pole and small trees especially in dense stands (stands with average diameters of 5 to 20.9 inch diameters with more than 55 percent crown closure).

The consequences of this imbalance include less large tree habitat for those species with this requirement and less shrub and grassland habitat. Dense stands increase the rate of loss of large trees due to competition-related stress. The risk of uncharacteristically severe fire intensity is high. The landscape is less resilient to intense precipitation events resulting in less water storage and more erosion.

Using the Viable Ecosystems model to assess the landscape vegetation throughout the watershed, the Maury Mountains Watershed Analysis identified silvicultural treatments aimed at adjusting seral/structural stages from outside the HRV to within (or closer to) the HRV. Alternative 2 was developed to move the distribution of seral structural stages toward the HRV.

Direct and Indirect Effects of No Action
This Alternative would create no immediate changes in the seral structural distribution in any PAG. The proportion of dense young stands (3a and 4a) structures would continue to increase, large overstory trees would continue to decline. Although growth would occur that may increase the number of large trees, overtime competition related mortality increases the amount of dead and down wood in these same stands. Growth would be slower on individual trees increasing the time to develop into large trees. Increased ground and ladder fuels and high crown closure would maintain a high risk of intense fire behavior. At the same time, increasing and sustained high stand density would reduce the amount of ground vegetation that is important for soil protection and forage. The seral structural stages do not move materially toward HRV and would not meet the purpose and need for this project.

Based on stand development assumptions, the number of seral/structural stages within HRV would change over time. In 20 years, an estimated 20 seral structural stages would be within HRV, 19 would be above HRV, and 21 would be below HRV. The proportion of dense stand conditions would be increased from present conditions. Projection to 50 years shows a continued increase in the proportion of dense stand conditions outside HRV but some larger structure stages begin to meet HRV. It is unlikely that the high proportion of dense stand conditions could be maintained for 50 years. It is more likely that many of these stands would be replaced through large scale, intense fire events.

Cumulative Effects of No Action
There are no other reasonably foreseeable future activities that would result in changes to vegetation seral structure conditions within the project area. All effects of previous activities have been incorporated into the current condition and description of vegetation. Maintaining current stand densities, ladder fuels and surface fuels continue the conditions that perpetuate the risk of stand loss in the event of high intensity wildfire. While wildfire behavior is dependent on weather conditions and start location, fuel continuity contributes to a higher risk of stand loss should a wildfire occur under adverse conditions such as high wind speeds, low moisture conditions and in high fuel loadings.

Description of Actions in Alternatives 2, 3, and 4
Proposed thinning treatments are designed to reduce tree density and improve growth of the residual trees, enhance forest health, or recover potential mortality resulting from inter-tree competition. Thinning would more quickly restore historic seral/structural stage conditions and improve growing conditions for larger trees than either no action or prescribed fire alone. Thinning contributes to the primary purposes of fuel treatment: decreasing the probability of crown fires, reducing the area burned by unwanted fires, decreasing the severity of the impacts, enhancing effectiveness and safety, and reducing costs.

Trees larger than 21 inches d.b.h. would not be harvested in any prescription except when necessary to provide safe working conditions or during road construction (these would be isolated instances). Stands proposed for treatment include a combination of commercial harvest, noncommercial thinning and prescribed fire or grapple piling in Alternatives 2 and 3. There would be no commercial harvest in Alternative 4. There would be little change in dense stands dominated by trees with diameters more than 9 inches d.b.h. in this alternative.

Numerous studies have shown increased growth and vigor of remaining trees following density management treatments (Oliver 1979; Barrett 1981 and 1982; Larson 1983; and Cochran 1999). Other studies have shown reduced susceptibility to many insect and disease problems that are density related (Roth and Barrett 1985, and Filip 1990). Further studies show moderated fire hazard and lower crown fire potential as a result of thinning and fuel treatment (Omi 2002 and Pollet 2002).

A detailed description of the types of treatments in each alternative has been discussed in Chapter 2 and will not be repeated here. Each alternative varies in the amounts and types of treatments depending on the objective of each alternative. In Alternative 2, stands selected for treatment contain a mosaic of seral structural stages but include a large proportion of pole and small size trees and dense “a” stocking conditions. Most stands selected also contain varying amounts of large structure from scattered groups of large trees to areas meeting Late and Old acreage criterion. In Alternative 3, the same stands were selected

for treatment; however, individual units were deferred from management at this time if the stand conditions better met the short-term objectives relative to the wildlife or water yield issues. In addition, prescriptions in stands selected for treatment were also adjusted to better meet short-term wildlife objectives. In Alternative 4, the same high density stands were selected for treatment as Alternative 2, however, no commercial treatments would occur and treatments would focus on noncommercial thinning, grapple piling and prescribed fire treatments.

Direct and Indirect Effects of Alternative 2
This alternative reduces the proportion of dense stands and increases the open condition, allowing increased growth rates and faster development of large structure. Treatments would decrease stand density by reducing understory trees, reduce ladder fuels, reduce ground fuels and lower canopy closure. These changes would result in higher growth rates, lower incidence of insect and disease mortality, faster development of large trees, reduced risk of high intensity fire.

Treatments in stands with large trees would improve health and vigor of the large tree component increasing the potential longevity of such trees. Treatments would reduce the risk of loss of LOS to severe fire events. Juniper cutting in low site pine and juniper plant association groups would restore grass and shrub land improving habitat for certain wildlife species and increase soil cover and protection on these more erosive sites.

Direct and Indirect Effects of Alternative 3
This alternative is designed to defer treatment on many stands with dense "a" conditions especially if large trees are present. Alternative 3 treats fewer acres so fewer acres would experience decreased stand density, reduced ladder fuels, reduced ground fuels and lower canopy closure. Modified prescriptions in some stands would result in less growth and hazard reduction. Alternative 3 would result in higher growth rates, lower incidence of insect and disease mortality, faster development of large trees and reduced risk of high intensity fire but at a lower level than Alternative 2 but higher than Alternative 4. Development of LOS will be less than in Alternative 2. Alternative 3 would be similar to Alternative 2 in juniper thinning and prescribed fire treatments. Alternative 3 would produce approximately 40% less open structural conditions than Alternative 2.

Direct and Indirect Effects of Alternative 4
The result of this alternative would be a slight to no improvement in growth rates leading to LOS development and a shorter duration of improved growth rates. The risk of loss of LOS would remain relatively high due to dense stand conditions and loss of individual tree vigor. Fuels hazards relative to ladder fuels, high crown closure and increasing mortality would remain high. Over time the proportion of dense stand conditions would increase, increasing the risk of larger uncharacteristic fires.

While precommercial thinning does reduce stocking and improves growth rates on residual trees, stands with additional proposed harvest in Alternatives 2 and 3 have high stocking of trees between nine and 21 inches in diameter. Increasing the precommercial thinning diameter to include the larger excess trees would create fuel loadings too high to reduce with prescribed burning, increase costs of grapple piling or other fuels treatments.

The following Figures compare the changes to seral structural stages by plant association group and alternative and provide a visual description of the effects of the alternatives discussed above. The lines on the graphs also depict the range of historic variability and how the alternatives move seral structural stages from the existing condition (Alternative 1) with treatments by each alternative.

Figure 3.1 Dry Grand Fir Changes to Seral Structural Stages by Alternative in Relation to HRV

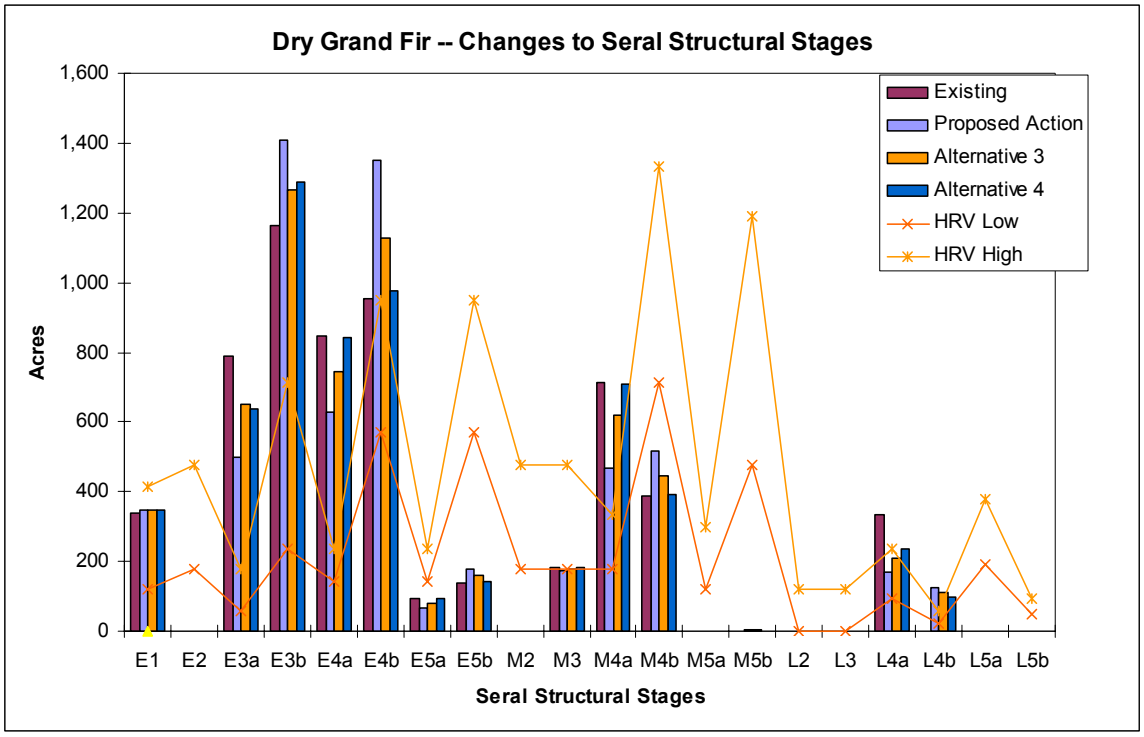


Figure 3.2 Douglas-fir Changes to Seral Structural Stages by Alternative in Relation to HRV

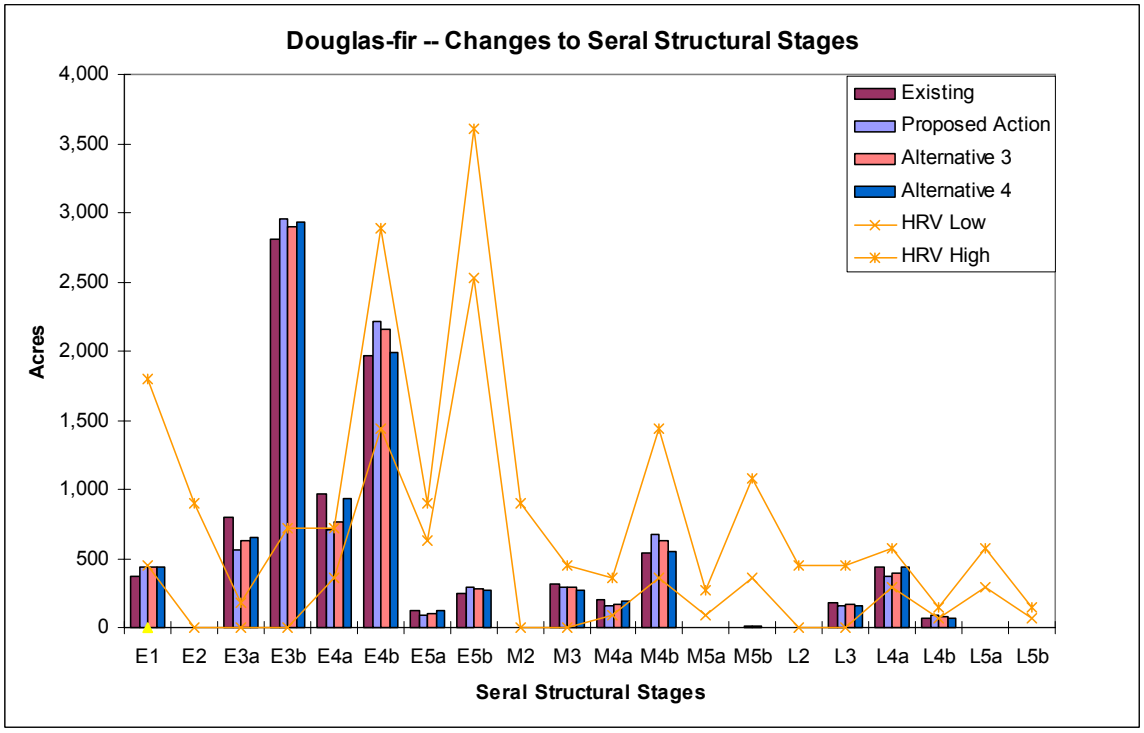


Figure 3.3 Moist Ponderosa Pine Changes to Seral Structural Stages by Alternative in Relation to HRV

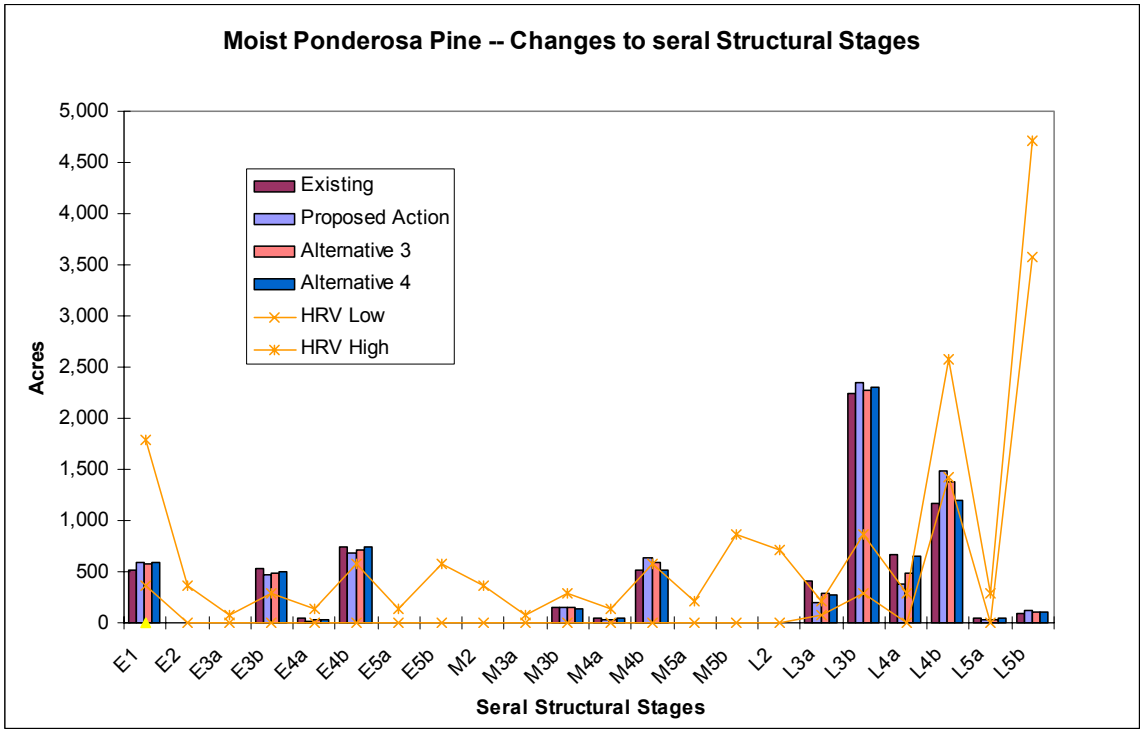


Figure 3.4 Dry Ponderosa Pine Changes to Seral Structural Stages by Alternative in Relation to HRV

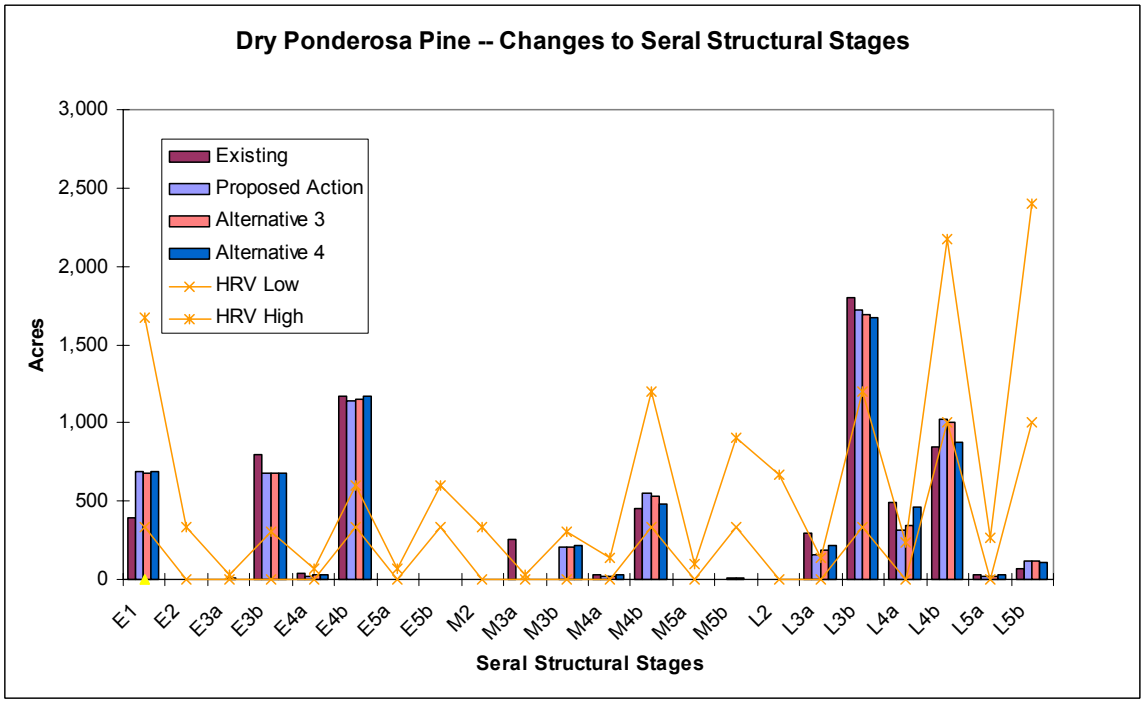


Figure 3.5 Juniper Woodland Changes to Seral Structural Stages by Alternative in Relation to HRV

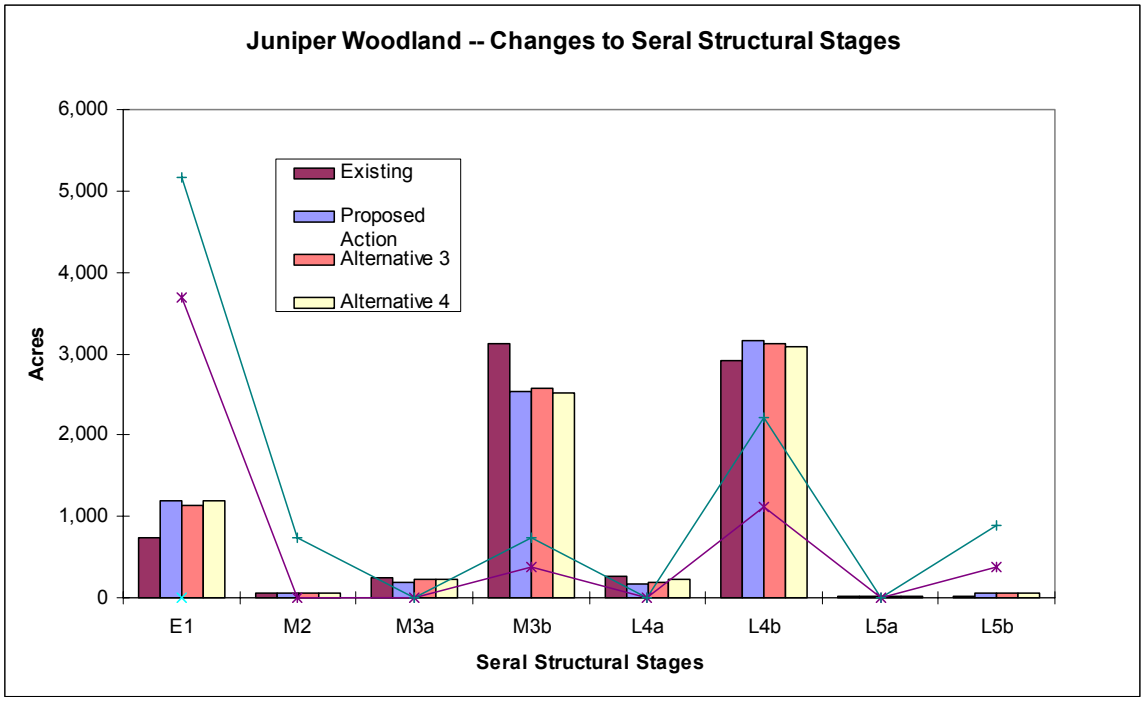
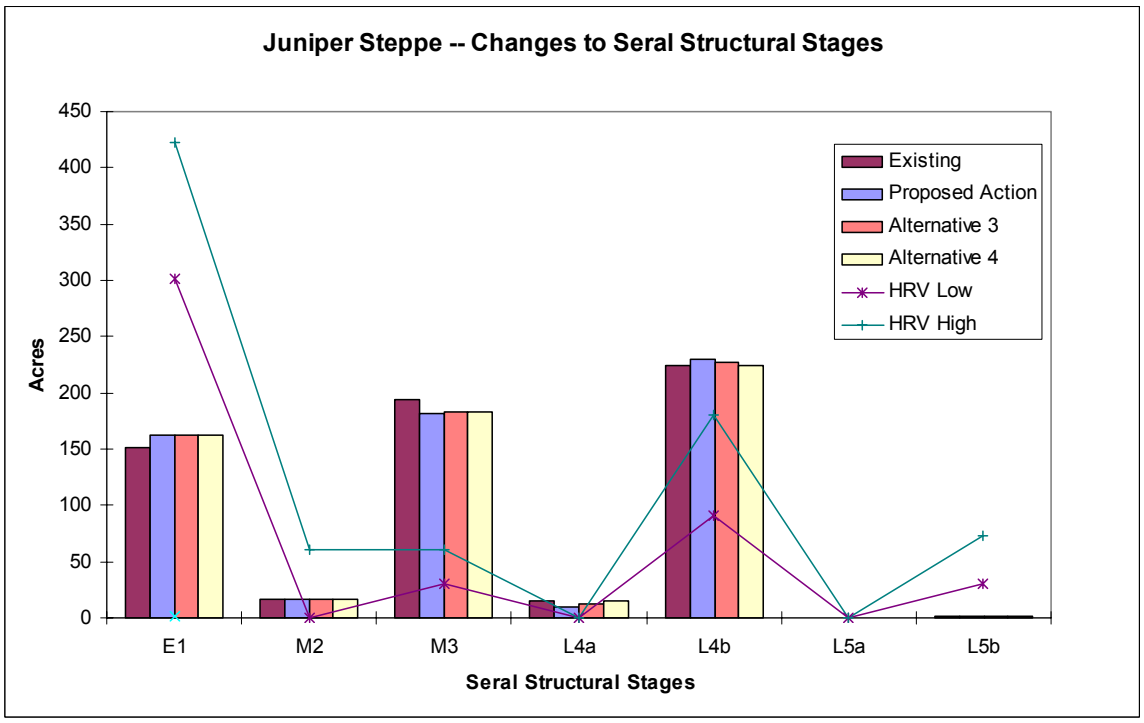


Figure 3.6 Juniper Steppe Changes to Seral Structural Stages by Alternative in Relation to HRV



There are two primary processes that affect the movement of one seral structural stage to another. Species composition changes tend to favor shade tolerant species and move stages from early seral to late seral. Growth moves stages from small structure to larger structural stages. Although some insects and disease disturbances are species' specific and can move early seral to mid or late seral, natural disturbance processes (including fire, insects and diseases, and flooding) tend to move stages backward from mid or late seral to early seral. The magnitude of movement depends on the intensity of the disturbance. Some disturbances, such as low intensity fire, may not affect the dominant stand character, but serve to maintain the existing stage.

Successional and structural change through time was estimated using the Viable Ecosystems model. This model accounts for multi-directional change (multiple pathway succession) through time, but does not include future disturbances. The model includes density dependent growth effects.

Canopy closure data from satellite imagery was used to apply growth rates in two categories (more and less than 55% canopy closure) within dry grand fir, Douglas-fir, and moist ponderosa pine PAGs. These growth rates directly correspond to rates of change in structure in the Viable Ecosystem seral/structural stages. Canopy closures less than 55 percent received an average 20 percent growth rate bonus over stands which have canopy closures greater than 55 percent. This estimate corresponds with density and spacing studies (Oliver 1979, Barrett 1982, Cochran 1993, and Cochran 1999) where growth rate increases from thinning varied between 15-25 percent depending on stand density and little gains were realized when canopy closure was not reduced below 50-60 percent. Where thinning prescriptions are modified to retain higher stocking levels a lower growth rate has been applied.

The projected amounts within, above, or below HRV are based on stand development assumptions for the various seral structural stages. The 20 and 50-year time intervals were chosen to demonstrate development over time. These projections indicate that all alternatives move toward the HRV for the first 20 years after harvest. Between 20 and 50 years after harvest, the larger structure stages continue to increase throughout the watershed. The smaller structural stages tend to decline below the HRV. Individual plant association group trends are more clearly detailed in the Forest Vegetation Analysis Report. The dry ponderosa pine, and western juniper PAGS would follow similar trends although at a slower rate.

Long-Term Effects of Alternative 2: In 20 years, an estimated 23 seral structural stages would be within HRV, 17 would be above HRV, and 20 would be below HRV. In all PAGs the proportion of open small-sized stands will remain higher than in Alternatives 1 and 3 allowing continued growth and development of large structure at a higher rate. By 50 years, without further disturbance, dense stand conditions would reduce growth slowing the further development of large structure. Within the DGF PAG, four of six large structural categories would meet or exceed HRV. Density control between 20 and 50 years would need to be continued in order to maintain progress.

Long-Term Effects of Alternative 3: In 20 years, an estimated 23 seral structural stages would be within HRV, 17 would be above HRV, and 20 would be below HRV (similar to the Proposed Action). However, the proportion of dense small-sized stands will remain higher than in Alternative 2 but lower than Alternative 1. Some stands thinned now would still have accelerated growth but at a lower rate than the Proposed action. Large tree mortality in dense stands would reduce the amount of large structure. More stands would need density control to improve growth and reduce the risk of wildfire. By 50 years, in the DGF PAG three of six large structural categories would meet or exceed HRV.

Long-Term Effects of Alternative 4: Long-term results would be similar to the Alternative 1. In 20 years, an estimated 20 seral structural stages would be within HRV, 19 would be above HRV, and 21 would be below HRV. The proportion of dense stand conditions would be increased from present conditions. Projection to 50 years shows a continued increase in the proportion of dense stand conditions outside HRV but some larger structure stages begin to meet HRV. It is unlikely that the high proportion of dense stand conditions could be maintained for 50 years. It is more likely that many of these stands would be replaced through large scale, intense fire events.

Further more detailed information on projections by specific PAG and seral / structure stages can be found in the Forest Vegetation Analysis Report and is incorporated by reference.

Cumulative Effects of Alternatives 2, 3, and 4
There are no other reasonably foreseeable future activities that would affect seral structural stages within the project area. The effects of previous management activities, such as vegetation management, have been incorporated into the existing condition description and evaluation of seral structural conditions. In the event of a high intensity wildfire, there would be less risk of stand loss in Alternative 2 because of the density and fuel reduction treatments. Alternative 3 would be similar to Alternative 2 in the areas that would have similar treatments, but in those stands with less intense density treatments to provide short-term wildlife habitat, the risk of stand loss would be higher than Alternative 2. Alternative 4 provides even less density management and does not treat trees larger than nine inches in diameter therefore high stand densities would remain and the risk of stand loss in the event of a wildfire approaches Alternative 1 more than any other action alternative. Where wildfire occurs and the intensity would also be highly dependent on current weather conditions at the time of fire start.

Forest Health (Insects and Disease)

A major factor of the overall health of the forest is the vigor of the trees and other forest vegetation. If the majority of the trees in a given area have densities that result in stagnated stands, they become vulnerable to insects and disease. Competition from intermediate and suppressed trees in ponderosa pine stands reduces growth of dominant and co-dominant trees (Cochran 1993). This is important given the existing low amount of large trees and the time and growth needed to develop large structure. Table 3.18 illustrates the amount of area at risk within the project area and compares level of treatment by alternative. It also displays the number of acres resulting in recommended stocking levels necessary to increase growth rates. Juniper thinning or fuels treatments are not included in the acreage figures in the Table 3.18 because these treatments only increase growth rates minimally and are more of a tool to reduce fuel loadings or remove younger juniper trees.

Table 3.18 Comparison of Alternatives to Forested Stand Conditions and Risk

Condition and Risk	Total Acres in Project Area		Acres treated where risk is reduced and stocking managed (First set of numbers is total acres treated, bolded set of numbers is acres treated where risk is reduced and stocking managed)			
	Acres	Percent	Alt. 1	Alternative 2	Alternative 3	Alternative 4
Stands at high risk due to density (Basal area greater than 115 sq. ft.)	10,695	37%	0	4,779 acres 45% of existing acres treated **4,779 acres** **45%* resulting in recommended stocking levels**	3,412 acres 32% of existing acres treated **2,730 acres** **26%* resulting in recommended stocking levels**	4,333 acres 41% of existing acres treated **374 acres** **3% * resulting in recommended stocking levels**
Moderate risk (Basal Area greater than 75 sq. ft.)	10,561	37%	0	5,175 acres 49% of existing acres treated **5,175 acres** **49%* resulting in recommended stocking levels**	3,839 acres 36% of existing acres treated **3,071 acres** **29%* resulting in recommended stocking levels**	3,943 acres 37% of existing acres treated **871 acres** **8% * resulting in recommended stocking levels**
Low risk at this time but stocking control will benefit long-term growth and vigor	2,470	9%	0	1,723 acres 70% of existing acres treated **1,723 acres** **70%* resulting in recommended stocking levels**	1,595 acres 65% of existing acres treated **1,595 acres** **65%* resulting in recommended stocking levels**	1,195 acres 48% of existing acres treated **1,195 acres** **48%* resulting in recommended stocking levels**
Stands within recommended stocking guidelines with low risk at this time	4,996	17%	0	0	0	0
Total Acres Treated **Total Effective Treatment**	28,722		0	11,677 acres treated **11,677 acres* treated resulting in recommended stocking levels**	8,849 acres treated **7,396 acres* treated resulting in recommended stocking levels**	9,471 acres treated **2,440 acres* treated resulting in recommended stocking levels**
Total Percent of Stands at Risk Resulting in Recommended Stocking Levels			0%	49%	31%	10%

* Proportion of treatments that would result in recommended stocking and associated increased growth and risk reduction.

Treatment of stands at high risk would provide the greatest return in terms of growth and vigor gains and the highest potential for development of LOS structure. Treatment prescription adjustments in Alternative 3 in wildlife emphasis areas would not result in the same increased growth rates as Alternative 2. Treating only trees nine inches in diameter and smaller in Alternative 4 would result in increased growth rates in the smaller diameter trees and low risk stands but would not improve long-term growth or reduce risk substantially to large diameter trees since competition at the larger diameters would remain. It would not be desirable to treat all at-risk stands at once because it is important to maintain a diverse landscape.

Insect or Disease Incidence
A variety of disturbance agents exist or were known to exist within the project area. The more readily apparent are bark beetles, dwarf mistletoes, western spruce budworm and root diseases. The following summarizes the current condition and effects of the alternative treatments on the major disturbance agents identified. Further more detailed information can be found in the Forest Vegetation Analysis Report and is incorporated by reference.

Bark Beetles
Aerial insect and disease surveys for years 1996 through 2003 show numerous active mortality centers due to bark beetle feeding. Stand exams and field reconnaissance also identified bark beetle activity and susceptible stand conditions.

Mountain pine beetle (*Dendroctonus ponderosae*) and western pine beetle (*Dendroctonus brevicomis* Leconte) occur in the project area. Ponderosa pine is a susceptible host in overstocked stands. Bark beetle mortality is symptomatic of over-stocked stand conditions that create competition stress and reduce tree vigor (Schmid et al. 1994). Thinning has been shown to be effective in reducing bark beetle susceptibility in stands. Table 3.19 compares alternative treatments by level of bark beetle activity.

Also occurring in the project area are bark beetles such as Douglas-fir beetle (*Dentroctonus pseudotsugae*) and the fir engraver (*Scolytus ventralis*). Both of these insects are regarded as secondary pests because they attack trees that are weakened and stressed. Factors such as drought, defoliation, overstocking and disease can result in outbreaks of these insects that can cause severe mortality within a stand. Since 1992 increased mortality of Douglas-fir and grand fir due to these bark beetles has been observed.

Table 3.19 Comparison of Alternative Treatments to Level of Bark Beetle Activity

Level of activity	Acres Affected	Alternative 1	Alternative 2	Alternative 3	Alternative 4
High activity and mortality	501	0	319	163	319
Low to moderate activity	15,050	0	4,727	4,009	3,702
Totals	**15,551**	**0**	**5,046**	**4,172**	**4,021**

Alternative 1: No treatments would occur in Alternative 1. Overstocked stand conditions contributing to bark beetle infestation would remain and increase with time. Trees would continue to die from bark beetle feeding contributing to snag habitat and foraging opportunities for wildlife but also higher fuel loads and loss of old growth trees**.**

Alternative 2: In this alternative proposed harvest and precommercial thinning treatments would reduce susceptibility to future attacks by bark beetles. These treatments help by reducing stocking to levels that allow individual trees to grow and increase vigor sufficiently to withstand bark beetle attack. Stocking control would help maintain the existing large tree component that is deficient in many areas.

Alternatives 3: Fewer thinning treatments would occur in this alternative so fewer acres would have reduced susceptibility to bark beetle infestation. Most treatments dropped from Alternative 3 are located in the most densely stocked stands with the highest risk of mortality. In addition, modified thinning prescriptions within goshawk post-fledging areas would maintain higher stocking levels so conditions conducive to forest pathogen related mortality would return sooner. Thinned areas of relatively low basal area that contain clumps of ponderosa pine whose diameters are adequate for bark beetle attack will continue to be at risk (McCambridge).

Alternative 4: In this alternative, precommercial thinning treatments would slightly reduce the amount of area highly susceptible to future bark beetles attacks. Stocking would remain above recommended levels in most stands and would not result in sufficient growth to reduce individual tree susceptibility to bark beetle attack.

Dwarf Mistletoes
Ponderosa pine dwarf mistletoe (*Arceuthobium campylopodum*) decreases tree vigor, reduces growth, and increases susceptibility to other pathogens. Infections in trees of the upper canopies spread readily to trees in the lower canopies. Douglas-fir dwarf mistletoe (*Arceuthobium douglasii*) causes growth loss, reduced wood quality, topkill and mortality.

Dwarf mistletoes accelerate the movement to mid and late seral species compositions by reducing the vigor of infected early seral species and increasing the competitive edge of later seral (shade tolerant) species. Dwarf mistletoes cause branch structure to broom creating nest and hiding sites for many animals. Some animals forage on dwarf mistletoe plants.

Dwarf mistletoe management can be directed at either prevention or reduction. The most effective treatment for dwarf mistletoe control is to remove infected overstory trees. However, removal of large trees would not help meet large tree objectives. Where harvest (HIM, HSG, HSL) or noncommercial thinning is planned, stocking control can effectively reduce some growth loss, improve vigor and reduce re-infection (Roth 1985). Treated stands would have a better chance of developing more large structure that is currently deficient. Table 3.20 shows the amount of area with dwarf mistletoe infection where the risk of dwarf mistletoe damage would be reduced.

Table 3.20 Area Affected by Dwarf Mistletoe Treated by Alternative

Dwarf Mistletoe Severity	Acres Affected	Alt. 1	Alternative 2	Alternative 3	Alternative 4
Severe infections, 2 or more species, most trees infected	2,805	0	1,086	626	967
Moderate to light infections, 1 or 2 species infected	15,465	0	5,620	3,934	5,111
Totals	18,270	0	6,706	4,560	6,078

Alternative 1: No thinning would occur. Dwarf mistletoes in untreated stands would continue to spread and cause growth loss and contribute to mortality. Development of large structure would be slowed. Stands not treated would contribute to higher risk of intense fire.

Alternative 2: Approximately 36 percent of infected stands would be thinned in this alternative. Dwarf mistletoe would not be eradicated from these stands but reduced. More open stands would reduce the spread of mistletoe. Growth rates would improve allowing height growth to outpace mistletoe infection.

Alternative 3: This alternative would treat 25 percent of infected stands. Higher stocking levels required in Goshawk post fledging areas means treatments would be less effective in reducing mistletoe infection and spread.

Alternative 4: In this alternative approximately 34 percent of infected stands would be noncommercially thinned. Thinning would not remove infected trees larger than 9 inches in diameter resulting in rapid re-infection and spread of the disease. Noncommercial thinning would allow some growth to occur but would not result in a long-term reduction in dwarf mistletoe.

Western Spruce Budworm
The western spruce budworm (*Choristoneura occidentalis*) is a defoliating insect which predominately feeds on Douglas-fir, grand fir and western larch. From 1990 through 1992, budworm defoliation in stands within the grand fir and Douglas-fir plant association groups resulted in high levels of damaged or killed Douglas-fir and grand fir. The widespread trend toward species compositions dominated by Douglas-fir and grand fir (mid and late seral stages) has contributed to more frequent and severe epidemics. Large amounts mortality as a result of budworm epidemics contributes to high fuel loadings and fire hazard, with high risk of severe wildfire.

In the summer of 1992, all areas within the project area with a component of Douglas-fir and/or grand fir had visible defoliation and topkill. No budworm defoliation has been found since the summer of 1992. Foliage recovery has been rapid. However, trees with topkill have lost much potential for height growth and remain susceptible to bark beetle attack. In addition, habitat conditions that promoted an epidemic population of budworm remain.

Basic management strategies focus on damage prevention by reducing stand density to maintain vigor, and favoring early seral species such as ponderosa pine and western larch. The risk of future western spruce budworm damage is decreased in stands with an early seral species composition and stocking control (Brookes, 1985). Treatments also reduce the area of risk of future defoliation epidemics and may reduce the overall potential for the build-up of defoliator populations (Carlson 1989).

Alternative 1: No thinning would occur. Factors that effect stand susceptibility would still occur. These factors are:

- Dense stands of Douglas-fir and grand fir with large amounts of foliage on which to feed;
- Mature, multi-storied host stands experience more damage since larvae drop down after depleting their food supply. If they land on foliage of an intermediate crown, they have a better opportunity to complete their life cycle. Budworm predation also decreases in multi-story canopies.
- Trees stressed by overstocking and competition are less vigorous, making them more susceptible to insect attacks and less able to recover from defoliation.
- Large continuous blocks of host species support large budworm populations.

Alternative 2: Harvest and noncommercial thinning included in this alternative would reduce the amount of host species (Douglas-fir and grand fir) and favor retention of ponderosa pine and western larch. Thinning, both commercial and noncommercial, would reduce dense stand and multiple canopy conditions that contribute to budworm habitat and improves tree vigor and the ability to recover from defoliation.

Alternative 3: Fewer dense multi-strata stands would be thinned in this alternative which would maintain a larger amount of budworm habitat. Fewer damaged trees would be cut.

Alternative 4: In this alternative, precommercial thinning without commercial harvest would slightly reduce stand density but would not measurably reduce host species. In some stands, noncommercial thinning may accelerate the development of host species when smaller ponderosa pine or western larch would be removed to help meet density objectives.

Root Diseases

Armellaria root disease fungus (*Armellaria* sp.) is common in this area and is found in most plant associations. Hosts include most tree species found in the project area. However, ponderosa pine appears most affected (especially because large, old trees are very susceptible). The fungus causes mortality, wood decay and growth reduction. It often infects and kills trees already weakened by competition, other pests, or climatic factors. It can infect healthy trees and increase their susceptibility to attacks by other fungi or insects (especially ponderosa pine with western pine beetle). Vigorously growing trees can be infected but can often confine the fungi and limit the extent of the infection (Hadfield 1986).

Although root disease was detected on only 800 acres during stand exams, it is a common component of forest communities and occurs in most stands.

Where maintenance and development of large structure are desired silviculturally, treatment includes reducing competition stress by stocking control and favoring resistant conifer components of the stand (Filip 1990). This can reduce the spread of root disease so that existing large trees persist longer and more trees can develop.

Susceptibility to root rot and stem decays increase with later seral species. Root rots and stem decays in late seral stands contribute to the late seral character and improve the quality of certain wildlife habitats

requiring late seral conditions. In order to meet HRV for late seral stages in the Viable Ecosystem Model guidelines, not all stands with high levels of root rot and other insect and disease conditions would be treated at this time. Table 3.21 displays the acreage by alternative where the risk of root and stem disease damage will be reduced. A higher risk of mortality from root disease remains in stands not treated.

Table 3.21 Area Affected by Root Disease Treated by Alternative

Root Disease	Alternative 1	Alternative 2	Alternative 3	Alternative 4
806 acres	0	279	160	240*

Noncommercial thinning in Alternative 4 would not be an effective treatment to reduce root rot risk because it could accelerate the development of late seral species compositions which are more susceptible to root disease.

Management Area Allocations Descriptions and Effects (and other allocations not discussed previously)

Cumulative Effects of Alternative 1 for All Management Areas
Stand densities would remain high. In the event of a wildfire, those stands with high densities and ladder fuels would be at a greater risk of stand loss and high rates of mortality. Continued grazing in the project area would have little cumulative effect on forested vegetation because cattle would not directly or indirectly cause mortality in trees.

Cumulative Effects for All Management Areas for Alternatives 2, 3, and 4
For all discussions with effects of the Action Alternatives, there are no additional reasonably foreseeable future actions that would affect vegetative conditions within the project area. Previous vegetation management has been incorporated into the description of the existing condition. Since more acres are treated in Alternative 2 than the other action alternatives and those acres treated are treated more intensely, resultant growth rates would be increased and the risk of mortality to large diameter trees would be reduced. Alternative 3 treats similar acres as Alternative 2, but the intensity of density control is less to maintain high canopy closures for specific wildlife species that favor dense conditions. Both surface and ladder fuels would also be reduced to a greater extent in Alternative 2 than in Alternative 3 and to a much lesser extent in Alternative 4. In the event of a wildfire, stand loss would be at highest risk in stands that did not have extensive treatments therefore Alternative 4 would retain the greatest risk to stand loss from wildfire.

Continued grazing in the project area would have little cumulative effect on forested vegetation because cattle would not directly or indirectly cause mortality in trees. None of the action alternatives propose regeneration harvests where cattle could potentially cause reforestation failures.

Old Growth Management Area
The description of treatments and effects has already been discussed under Issue 1E.

Eagle Roosting Management Areas
The effects to eagles have already been discussed in the Threatened, Endangered, Proposed, and Region 6 Sensitive Species section later in this Chapter. A discussion of treatments within this management area to vegetation has not been done and will be discussed here.

Affected Environment
Two Eagle Roosting Management Areas have been allocated by the LRMP and are located at the Ochoco National Forest boundary on Pine and Shotgun Creeks. The desired condition for the Eagle Roosting areas is to provide large, open crown ponderosa pine or Douglas-fir trees adjacent to feeding habitat areas. Vegetation treatments include understory thinning within an uneven-aged diameter distribution to maintain and promote growth of large trees (LRMP target diameters are between 36 and 40 inches d.b.h.). The objective is to manage residues to reduce the risk of destructive fires.

Both areas contain a mosaic of Douglas-fir, dry pine and western juniper plant associations. The sites are droughty with shallow, rocky soils. Current vegetation includes open stands of young juniper and ponderosa pine, grass and shrub areas, and stringers of denser conifers near streams and up side draws. Small groups of large ponderosa pine and Douglas-fir occur in the stringers. These have been identified as suitable roost sites for wintering bald eagles.

Forest cover has expanded and become denser compared to historic conditions on most of the eagle roosting areas. Multiple canopies have developed beneath the large overstory trees located in the draws increasing stand density to levels that impair vigor and health of the large trees. These trees are at increasingly higher risk of mortality due to competition related stress, bark beetles, dwarf mistletoe and crown fire.

Direct, Indirect and Cumulative Effects of No Action
With this alternative large tree vigor would continue to decline. Risk of mortality from high intensity wildfire due to increases in ladder and ground fuels would remain high. Long-term maintenance of roosting stands would be at risk in the long-term.

Direct and Indirect Effects of Alternatives 2 and 3
Treatments in both Alternative 2 and 3 are essentially the same. Harvest and associated treatments would occur on approximately five acres near Pine Creek. Selected merchantable trees less than 21 inches DBH would be cut and removed. Noncommercial thinning with associated prescribed fire would occur on an additional 50 acres. Alternative 2 includes eight acres of additional prescribed fire. Thinning treatments would reduce understory conifer stocking improving large tree vigor. Prescribed fire would reduce accumulated and harvest-related ground fuels. Reduced stand density and prescribed fire would reduce the potential for high intensity fire thus reducing long-term risk. Outside of the designated eagle roosting areas, both action alternatives propose similar treatments in other suitable and potential roosting areas that will help maintain large tree roosting opportunities.

Direct and Indirect Effects of Alternative 4
This Alternative would treat 55 acres of precommercial thinning and eight acres of prescribed fire. Treatments would be slightly less effective in reducing risk to overstory roost trees that in Alternative 2 or Alternative 3. Therefore the level of risk of mortality in large diameter trees would more closely resemble Alternative 1 than Alternative 2 or 3.

Developed Recreation
The LRMP direction for developed campgrounds specifies management of ponderosa pine stands to encourage large trees and open park-like stands. Vegetation treatments are proposed in and around Antelope Reservoir Campground (371 acres). A mosaic of moist ponderosa pine, dry ponderosa pine and juniper woodland characterizes site potential. These sites are dry with shallow soils. The current stand is uneven-aged with scattered old overstory ponderosa pine over a mixture of ponderosa pine and western juniper of varying size and age. Stocking density of both pine and juniper is high considering the low site quality associated with these plant communities. Competition related stress is apparent in shortened needles, lower crown ratios and very low growth rates. Bark beetles, including western pine beetle, mountain pine beetle and red turpentine beetle, are active in the area with considerable recent mortality of the large pine component.

Direct, Indirect and Cumulative Effects of All Alternatives
No harvest, precommercial thinning or fuel treatment would occur in Alternative 1 (No Action). High stand density conditions would remain with the risk of mortality from overstocking and high intensity wildfire remaining high.

Both Alternatives 2 and 3 include commercial harvest and prescribed fire in and around Antelope Campground. Thinning would occur around large trees and in dense clumps to reduce overall stocking to about 40 square feet basal area per acre. Created slash would be treated by hand-piling concentrations and underburning. The fire prescription would seek to reduce scorching of residual trees and shrubs. Residual

canopy closure would be about 40 percent. Fewer large trees would die as a result of competition stress reducing potential hazard trees in a developed recreation site and reducing potential for high intensity fire.

Only prescribed fire would occur in and around Antelope Campground in Alternative 4. This activity would not be effective in reducing stocking and would not reduce competition stress. Large trees would continue to be at risk of mortality. Surface fuels would be reduced in the area reducing the hazard in the campground to a certain extent.

Dispersed Recreation
Direct, Indirect and Cumulative Effects of All Alternatives
The West Maury project area contains a variety of dispersed campsites used mostly during hunting season. Most are located adjacent to springs or streams. In Alternative 1 (No Action) no vegetation management would occur in or near dispersed recreation sites. Dense stand conditions and competition would increase tree mortality. Dead trees in and around dispersed sites increase both safety and fire hazards.

Several sites are located in stands where activities are proposed in Alternatives 2, 3 and 4. Harvest, precommercial thinning and fuel treatments are designed to improve forest health, stand vigor and reduce fuels hazards. Hazard trees would be removed consistent with LRMP direction. Evidence of activities would be noticeable during and immediately following implementation. Activities would be designed to avoid equipment use on camping sites. In Alternative 4, only noncommercial thinning and fuel reduction treatments would occur. Without harvest, treatments would be less effective in improving forest health, stand vigor and fuels reductions.

LRMP direction specifies that stream management objectives take precedence over dispersed recreation sites. Road decommissioning in Sanford Creek and Hammer Creek are proposed because of adjacent vegetation activities and would improve riparian conditions. However, these treatments would prevent access to dispersed sites located near these streams.

Riparian Habitat Conservation Areas
The INFISH established RHCAs and standards for management activities. The standard for silvicultural practices includes treatments "to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives." Riparian management objectives include decreasing the level of fuel loadings within reserves and increasing the deciduous tree and shrub component to reflect historical species composition and to increase shade. Increasing the deciduous component would be accomplished by thinning the coniferous species overstory to reduce competition.

The West Maury project area contains 3,961 acres in Riparian Habitat Conservation Areas (RHCA). General RHCA widths are displayed in the following Table 3.22.

Table 3.22 Acres by Riparian Habitat Conservation Area and Buffer Width

Stream Class	Acres	RHCA Category	Buffer Width Each side
1 also (I)	0	1	300 ft.
2 also (II)	2,878	1	300 ft.
3 also (III)	494	2	150 ft.
4 also (IV)	589	4	50 ft.
Total	3,961		

Desired vegetation characteristics include variable stocking, large trees providing root strength in the riparian area, multiple age classes, healthy, full crowns for shade, room for shrub and deciduous trees, and healthy aspen clones.

While many vegetative conditions occur within RHCAs at this time, units selected for potential treatments have high stocking levels with multiple canopies and/or aspen or other deciduous vegetation at risk of replacement by conifers. Current stocking averages 360 trees per acre and ranges to more than 2,000 trees per acre. Stocking levels to maintain healthy stand conditions within RHCAs should be less than 200 trees per acre. At higher stocking levels, existing large trees are at risk of competition-related mortality factors. Broadleaf shrubs, trees and ground vegetation are shaded out of the stand.

In Alternative 1 no treatments would occur. Stand density would remain high. Large trees would be more likely to die from competition-related stress. Broadleaf shrubs and trees would decline under increasing conifer competition.

In Alternatives 2 and 3, commercial harvest would be in small portions of RHCAs in Pine Creek, Antelope Creek and within other aspen stands. Selected understory trees would be removed to reduce dwarf mistletoe infections from spreading and to maintain existing large trees and to promote aspen and other broadleaf tree communities. Stream channel shade would not be reduced. No commercial harvest would occur in Alternative 4. Noncommercial treatments would be less effective in Pine Creek, Antelope Creek and within aspen stands.

All action alternatives would include non-commercial thinning treatments within RHCAs at different levels. Noncommercial thinning prescriptions would be modified specifically for RHCA objectives (to meet stream management objectives). Stream shade on Class II and III streams would not be reduced except where shade reduction would be necessary to maintain the presence of aspen.

Prescribed fire would occur in RHCAs. Higher levels of ground fuels would remain in the RHCAs than in the upland stands maintaining surface roughness to slow runoff near streams and large logs for channel stability. Short distances along Pine Creek would have lower tree stocking and fuel levels to provide less continuous fuel loadings. These areas of reduced fuel concentrations would reduce the risk of intense fires burning the entire of RHCA at one time. See also Riparian / Wetlands section in this Chapter for additional impacts to RHCAs.

Hammer Creek Wildlife and Recreation Management Area
This area from Mule Deer Ridge east to Sherwood Creek has been designated in the LRMP for diverse wildlife habitat where open road density is minimal. Proposed activities would be used to maintain or improve habitat diversity and aesthetic qualities of the area. The Hammer Creek Trail occurs between Sherwood Creek up to Mule Deer Ridge.

Prescribed burning on 1,300 acres is proposed in a separate planning document (Sherwood Prescribed Burn categorical exclusion, 2004). This project would occur between road 16 in Sherwood creek and the ridge to the east all within the Hammer Creek management allocation.

No additional actions would occur in Alternative 1. Stands would remain densely stocked which would increase mortality of large trees, maintain a higher fire hazard and provide no fuel break on Mule Deer Ridge.

In Alternative 2, 15 acres would be commercially harvested, noncommercial thinned and grappled piled. An additional 137 acres in other units would be noncommercial thinned and prescribed burned. Seventy-five acres would have prescribed fire use only. Units selected for treatment are located on the edge of the allocated area where there is road access. Treatments would promote the longevity of the existing large trees and promote development of additional large trees within an uneven-aged structure. Most stands to be treated are on Mule Deer ridge and would provide a safe, wide area of reduced concentration of fuels between dense at-risk stands in the Hammer Creek drainage and other parts of the project area. These areas had previous harvest entries before 1970.

No harvest would be proposed in Alternative 3. Noncommercial thinning would occur on 55 acres and prescribed burning on 75 acres. Treatments are similar to Alternative 2.

Alternative 4 would result in effects similar to Alternative 2 except where commercial harvest would not occur. In this area, treatment would be less effective and reducing competition and improving growth. Fuel hazard reduction would be less.

The Hammer Creek Trail is within three proposed treatment units. These stands are uneven-aged ponderosa pine with occasional Douglas-fir. Stocking is high with dense thickets of pole-sized pine.

Mountain pine beetle activity has been moderately high in the area since the mid-1990's. A portion of the overstory pine was removed in previous harvest. In Alternative 2, harvest, noncommercial thinning and grapple piling would occur adjacent to one trailhead and a portion of the trail. In Alternative 4, the same stands would be treated as Alternative 2 except there would be no commercial harvest. Stands adjacent to approximately 1 mile of trail would be noncommercial thinned and prescribed burned as part of the fuel break on Mule Deer Ridge. Thinning would result in more open stands but retain structural diversity. Small stumps and skid roads associated with commercial harvest would be evident adjacent to the trail.

General Forest Winter Range and General Forest
A detailed discussion on cover effects to elk can be found under Issue 1D. Any further discussion will not be included here. Additional information on vegetation characteristics and effects of the alternatives can be found in the Forest Vegetation Analysis Report. Thermal cover would be maintained in all alternatives, with Alternative 1 providing the most and Alternative 2 providing the least thermal cover with Alternative 3 and Alternative 4 closely resembling levels in Alternative 1.

The LRMP emphasis for General Forest is to produce timber and forage while meeting Forest-wide standards and guidelines. To this end, LRMP guidelines include rotation ages of 130 years for ponderosa pine and 90 years for mixed conifer in even-aged silvicultural systems. Target diameters range from 16 inches to 20 inches d.b.h. These guidelines have been amended by the Regional Forester's Forest Plan Amendment 2 (Eastside Screens). The Interim Ecosystem and Wildlife standards speak to treating stands to restore seral structural stages toward the historic range of variability in addition for leaving options for future management of late and old structured stands. In addition, in watersheds deficient in LOS retain all live trees greater than or equal to 21 inches d.b.h.

The overall majority of treatments for the West Maurys project would occur in these two land allocations for all action alternatives. Both of these land allocations provide an emphasis to manage for timber production. In addition to timber production, management activities would be designed and implemented to recognize big game habitat needs in the General Forest Winter Range. The Forest-wide standards and guidelines for Forest Health also includes direction for the prevention of stand and fuels conditions that would provide favorable habitat conditions for pests to increase above endemic levels. The West Maurys project was developed to respond to this direction in the LRMP and is reflected in where the majority of treatment acres are located for all action alternatives. Table 2.43 inChapter 2 displays the treatments for the alternatives by management area allocation.

Proposed thinning treatments (both commercial and noncommercial) are designed to reduce tree density and thereby improve growth of the residual trees, enhance forest health, or recover potential mortality resulting from inter-tree competition. Thinning would more quickly restore historic seral/structural stage conditions and improve growing conditions for larger trees than either no action or prescribed fire alone. Thinning contributes to the primary purposes of fuel treatment: decreasing the probability of crown fires, reducing the area burned by unwanted fires, decreasing the severity of the impacts, enhancing effectiveness and safety, and reducing costs. More thinning resulting in recommended stocking levels would occur with Alternative 2 than Alternative 3. Alternative 2 would meet the objectives of management in these two management areas because of the amount of treated acres and the highest amount of acres resulting in recommended stocking levels. Alternative 4 would result in the least amount of acres resulting in recommended stocking levels and would be least effective at meeting desired conditions for these two management areas. See Table 3.18 (page 150) for a comparison of the Alternatives and how well treatments meet recommended stocking levels.

Visual Management Corridors
The LRMP specifies visual management corridors along forest road 16 and road 17 within the West Maury project area. The visual quality objective is partial retention for both roads. The LRMP guideline for vegetation management on ponderosa pine sites is to provide a combination of multiple age class stands and open park-like stands of ponderosa pine and maintain diversity of species and structure in mixed conifer sites.

All local plant association groups are represented within the visual management corridors. Mixed conifer sites are found on the northern portions of the corridors where these roads are located next to streams. Douglas-fir, ponderosa pine, and western juniper sites form a mosaic in the remaining portions of the corridors. A variety of species compositions and structures are found. Stands selected for treatment have high densities in the understory trees with increasing competition stress in the large overstory trees.

In Alternative 1 (No Action), no vegetation management would occur in Visual Management Corridors. Stands would remain densely stocked which would increase mortality of large trees and maintain a higher fire hazard.

In Alternative 2, approximately 671 acres would have commercial harvest, noncommercial thinning and fuel treatments in 18 separate units within the Visual Management Corridors. No harvest would occur where the corridors are located in riparian habitat conservation areas except for units 8, 21 and 445. An additional 649 acres of noncommercial thinning and 376 acres of fuel treatments are proposed. Thinning treatments would promote development of open park-like stands dominated by ponderosa pine, reduce dwarf mistletoe infected trees, maintain the presence of western larch and remove conifers from aspen stands located in the corridors. Prescribed fire and grapple piling would reduce ground fuels. Stands located in riparian areas would have higher residual stocking.

Alternative 3 would treat approximately 651 acres with commercial harvest, noncommercial thinning and fuel treatments. An additional 578 acres would have noncommercial thinning with associated fuel treatments and 336 acres would have only prescribed burning. Since much of the visual management corridors overlap goshawk post fledging areas, many stands would remain more densely stocked than in Alternative 2.

Alternative 4 would treat approximately 1,145 acres with noncommercial thinning and 494 acres with prescribed burning. Noncommercial thinning would reduce understory canopy densities but would not result in open park-like stands because no trees more than 9 inches d.b.h. would be thinned. There would be more stands in over stocked conditions and subsequent increases in growth rates and resiliency to insects and diseases would not occur in these stands. In younger stands with noncommercial thinning, growth rates would increase and the development of larger diameter trees would occur at a faster rate than Alternative 1.

All treatments for all alternatives would meet partial retention objectives as no regeneration harvest would be proposed and treatments would be visually subordinate to the casual forest visitor once disturbed soils were revegetated. Treatments would resemble historical structural conditions. For commercial harvest, trees would be marked in such a way as to be visually discreet and not readily evident to the casual forest visitor. Mitigations have been included in Chapter 2, Mitigations, Design Criteria, and Resource Protection Measures.

Fuels Management and Fire Regimes

Purpose and Need for the Action (Chapter 1)

There is a need to move the distribution of fire regimes towards their historic ranges of variability, decreasing the amount of high-intensity fire conditions and increasing the amount of low-intensity fire conditions, and a need to maintain low-intensity fire conditions where they already exist.

Affected Environment

The Maury Mountains Watershed Analysis (2001) included an extensive look at forest fuels and vegetation conditions, and the relationships between those conditions and changes in fire hazard, insect and disease dynamics, wildlife habitat and riparian health. Vegetation patterns and occurrence within the analysis area are different now than what existed historically.

Douglas C. Ingram, an early Ochoco National Forest ranger, described forest conditions in the Maury Mountains in his 1918 Land Classification Report:

"This district is peculiar in that it consists of a timbered ridge extending west and east and entirely surrounded by an open sagebrush country. The south slopes, which comprise fully 2/3 of the area, are quite openly timbered, being covered principally with yellow pine, with here and there very good juniper on the open ridges. Some small fir timber is found in the canyons. The fire risk on the south slopes is not great, owing to the open character of the timber and the absence of undergrowth. Conditions are very much different on the north slopes which are very much steeper, heavily timbered and the greater portion covered with down timber and undergrowth. Fires starting in these north slopes spread rapidly and are quite difficult to control."

Fire regimes describe the role fire plays in an ecosystem in terms of fire frequency and fire intensity (Agee 1993). In the low intensity fire regime, in which fire occurs frequently, fire intensity is generally low because there is less fuel to support a fire. In the mixed intensity and stand replacement (high intensity) fire regimes, in which fire occurs less frequently, fire intensities tend to be higher because there is more time between fires for surface fuel and ladder fuels to accumulate. Table 3.23 displays fire regimes and the effects of fire in those fire regimes on vegetation.

Table 3.23 Fire Regime Intensity and Vegetative Effects

Fire Regime	Average Frequency	Effects on Vegetation
Low Intensity	15 years	More than 70% of the basal area or more than 90% of the canopy cover that existed prior to the fire still remains after the fire.
Mixed Intensity	50 years	Fires of intermediate effects, often resulting from a mosaic of varying conditions.
High intensity (Stand Replacement)	115 years	Less than 20% of the basal area or less than 10% of the canopy cover of the overstory remains after the fire.

Historically, the dominant fire regime in the Maury Mountains was a regime of low-intensity fire with an average fire return interval of less than 25 years. As fuel loadings and stand densities have increased, mostly due to fire exclusion, forest conditions have become more susceptible to high-intensity fires; the number of acres in the moderate and high-intensity fire regimes has increased, while the number of acres in the low-intensity fire regime has decreased. The historic range of the low-intensity fire regime in the West Maurys project area is estimated at 14,791 acres to 27,655 acres. The amount of the West Maurys project area currently in the low-intensity fire regime is 8,408 acres.

Each fire regime has a historic range of variability (HRV) (Powell 2000). The historic range of fire regimes is linked to the seral/structural stages of plant association groups (Hall 1989, and Johnson and Clausnitzer 1992) as described in the Viable Ecosystems Management Guide (Simpson et al. 1994) for the Ochoco National Forest. The HRVs described in Viable Ecosystems are based on U.S. Geological Survey land survey notes from the 1870s, fire histories, the 1915 Forest Establishment Report for the Ochoco National Forest, stand exams, scientific publications and journals, and the professional judgment of forest botanists, silviculturalists, and fire ecologists.

The following table displays fire regime HRVs and their current distribution in the West Maurys project area. The importance of HRV is not in any specific number but in how much of one regime exists relative to other regimes.

Table 3.24 Historic Range of Variability of Fire Regimes and Current Condition Acreages

Fire Regimes	Historical Range of Variability (acres)		Current Condition - Alternative 1 (acres)
	Low	High	
Low Intensity	14,791	27,655	8,408
Mixed Intensity	3,934	13,850	14,105
High Intensity	1,004	10,511	4,216

Note: Table 3.24 only includes forested acreage and does not include acres of non-forest or juniper stands.

A hazard is something in an environment that could cause the loss of something else in that environment. Forest fuels are considered hazardous if, when they burn in a wildfire, they cause the unwanted loss of trees, soils, habitat, property, or other forest resources. Fuels are also considered hazardous if their volume and continuity forces firefighters to employ suppression tactics that are less safe than other tactics. Therefore, the primary purpose of fuels reduction is to reduce the intensity of future wildfires and to reduce fuels to levels where they are not a hazard to forest resources when they burn.

Fuels are arranged horizontally and vertically. Vertical fuels are called "ladder" fuels; these are trees in the forest understory which provide a ladder for fire to move from the forest floor to the forest overstory. In the semi-arid, low-elevation, historically pine-dominated forests of the West Maurys project area, frequent low-intensity fires kept forest stands open, and ladder fuels to a minimum. When fire is kept out of forest stands, ladder fuels increase and stands become more dense, which increases the likelihood of high-intensity wildfire, which kills the entire stand.

Horizontally arranged fuels are called "surface" fuels. The amount of surface fuels on a site is referred to as a fuel load, and is measured in tons per acre. The greater the fuel load, the more intensely a fire can burn. Fuel size also relates to fire intensity; small diameter fuels (less than 3 inches in diameter) are the primary influence on surface fire rate-of-spread and flame lengths. The guideline on the Ochoco National Forest for surface fuels is to manage for an average fuel load of less than 5 tons per acre for fuels less than 3 inches in diameter (LRMP 1991 p. 4-156). Large diameter fuels (greater than 3 inches in diameter) are the primary influence on fire duration; the guideline for large fuels is to manage for less than 10 tons per acre.

Ladder fuels and surface fuels are factors of fire regimes, which describe the role fire plays in an ecosystem in terms of frequency and intensity. Reducing ladder fuels and surface fuels increases the potential for frequent, low-intensity fires, and decreases the potential for infrequent, high-intensity (stand replacement) fires, moving forest stands from one fire regime to another.

Surface fuels consist of "natural fuels" which accumulate naturally, and "activity" fuels which are a product of mechanical vegetative management. Natural fuels and activity fuels in the West Maurys project area would be reduced with prescribed fire, either by underburning, or by piling the fuel and burning the piles. Ladder fuels would be reduced by thinning trees mechanically (with chainsaws) and then underburning to treat the slash (branches and small trees), or by underburning alone (thinning with fire). However, with the exception of junipers, underburning alone is not an appropriate tool for reducing trees more than 3 inches in diameter, because the amount of heat required to kill these trees would cause unacceptable damage to the overstory. Underburning also prunes the lower branches of larger trees, increasing the distance from the forest floor to the crowns of those trees, making them less susceptible to high-intensity wildfire.

By reducing ladder fuels and surface fuels, the proposed activities would:

1) Reduce damage to forest resources by reducing the potential for crown fire, reducing the potential for crown scorch (which kills trees by scorching their needles with convective heat), reducing the potential for radiant heat damage to cambium (the inner bark of trees, where diameter growth occurs), and reducing the potential for radiant heat damage to soils and tree roots (Saveland and Nuenschwander 1989);
2) Reduce suppression costs;
3) Increase firefighter safety by reducing potential fire intensity (rate of spread and flame length) which reduces a wildfire's resistance to control. Low fire intensities allow for direct fireline construction (close to the edge of a fire), which is a safer suppression tactic than indirect fireline construction.

Mechanical thinning creates a potential short-term increase in hazard in exchange for a long-term reduction in hazard. Although the threat of high-intensity fire is greatly reduced by thinning, the slash created by thinning is a potential hazard until it is treated by burning. High fuel moisture in green slash makes it unavailable to burn, unless a wildfire occurs under extreme conditions (Rothermel et al. 1986). After the

slash has dried out and turned red, it is available to burn. Should a wildfire occur during this time, the additional heat generated by the increased fuel load has the potential to cause undesired effects to the surrounding stand, soils, and other resources. This hazard is mitigated by either lopping (cutting) the slash to reduce the height of the fuel bed under 24 inches, or by piling the slash; both treatments reduce fire intensity. In units that have been lopped, after 2 or 3 years the slash gets further compacted by winter snows and can be burned with a low-intensity underburn without causing undesired fire effects. This delay also allows for the redistribution of nutrients from the slash back into the soil (Graham et al. 1999).

Direct, Indirect and Cumulative Effects of No Action Alternative
Currently, the percent of forested area within the low-intensity fire regime is below HRV (see Table 3.25), and the amount within the mixed-intensity fire regime is approaching the upper limits of its historic range. Under the no-action alternative, the amount of forested acres within the mixed and high-intensity fire regimes are expected to increase as fuel accumulates faster than it decomposes and the number of trees per acre in the understory increases. These changes would increase the risk of landscape-scale crown fire, and associated severe effects to fish and wildlife habitat, soil productivity, late and old structured habitat, and air quality.

There is a 1,300 acre wildlife burn planned for the Sherwood Creek drainage. The Sherwood burn is scheduled to be completed in 2004. This burn will reduce surface fuels, seedlings, and saplings, and improve wildlife forage by stimulating the growth of grass, forb, and shrub species. Changes in fire regimes as a result of this project would not be discernable at the landscape scale.

Livestock grazing in the project area could impede achieving prescribed fire objectives in open stands with light surface fuels by reducing the surface fuel layer needed to carry fire through the stand during low-intensity burning conditions. Livestock grazing does not affect potential fire intensity in closed canopy, multi-storied stands with heavy surface fuel loading. Livestock grazing does not affect the distribution of fire regimes in the West Maurys project area because grazing does not alter stand structure and density.

Most accidental human-caused fires in the West Maurys project area are caused by hunters, and because they occur in the spring and fall are insignificant in size (usually less than 1/10 acre) and effect. Smoke from prescribed fires can impact hunter camps, especially in the late evening/early morning hours as smoke pools in drainages and other low spots.

There are no other planned activities that would affect the distribution of fire regimes in the project area.

Direct and Indirect Effects of Alternatives 2, 3 and 4
All alternatives were designed to reduce fuel loadings and stand densities to move conditions from mixed and high fire regimes to low and mixed fire regimes, respectively. Alternative 2 treats more acreage with commercial harvest, non-commercial thinning, fuel reduction activities, and prescribed fire than Alternative 3. Alternative 4 treats trees 9 inches d.b.h. and smaller and would not reduce ladder fuels in stands with multiple canopy layers. The anticipated changes in fire regime acreage are depicted in Table 3.25.

Table 3.25 Effects of Vegetative Treatments on Fire Regime by Alternative

FIRE REGIME	Historical Range of Variability (acres)		Alternative 1 Current Condition	Alternative 2	Alternative 3	Alternative 4
	Low	High				
Low Intensity	14,791	27,655	8,408	12,142	11,467	10,655
Mixed Intensity	3,934	13,850	14,105	11,920	12,379	12,913
High Intensity	1,004	10,511	4,216	2,641	2,894	3,132

Table 3.26 Comparison of Effects on Stand Condition and Risk of High-Intensity Fire by Alternative

Stand Condition and Risk of High-Intensity Fire	Total of Forested Stands in West Maurys		Acres treated where high-intensity risk is reduced and low-intensity risk maintained (percentage treated is of total acres. i.e. 45% of 10,659 = 4,779)						
			Alt. 1	Alt. 2		Alt. 3		Alt. 4	
	(acres)	(%)		(acres)	(%)	(acres)	(%)	(acres)	(%)
Stands at high risk due to closed canopy, abundant ladder fuels, heavy surface fuel loads	10,695	30	0	4,779	45	3,412 2,730	32 26*	4,333 374	41 3*
Moderate risk – Stand has missed one or two maintenance fires; closed canopy, surface and ladder fuels are increasing	10,561	30	0	5,175	49	3,839 3,071	36 29*	3,943 871	37 8*
Low risk, open stands that need thinning and burning to maintain low intensity conditions	9,320	26	0	3,652	39	2,972	32	2,954	32
Total Total Effective Treatment	30,576			13,606 13,606*		10,223 8,773*		11,230 4,199*	

Note: The number of acres in each stand description category described above are derived from stand exam data. The number of acres in each fire regime category are derived from pixel-based data from satellite imagery, and updated to reflect in-growth. While there is a direct correlation between stand condition and fire regimes, due to the techniques used for gathering the data, the acre figures do not match.

Note: This table does not include non-forest acres or juniper stands being treated with cutting or prescribed fire. Alternatives 3 and 4 do not include 600 acres of prescribed fire in designated old growth.

Table 3.26 compares the effects of the alternatives on forested stands. These effects are summarized below.

- Forested stands that have a high risk of high-intensity wildfire have closed canopies, abundant ladder fuels, and heavy surface fuel loads. In most cases, these stands are a mosaic of mixed and high-intensity conditions.
- Forested stands at moderate risk have missed one or two maintenance fires; surface and ladder fuels are increasing, and canopies are closing. These stands are a mosaic of all fire intensity conditions.
- Low risk stands are mostly open, with generally low surface fuels loads, and ladder fuels are seedling/sapling size. These stands need thinning and burning to maintain low intensity conditions.

Direct and Indirect Effects of Alternative 2 and 3

Alternatives 2 and 3 would use commercial thinning of trees from 9 inches to 21 inches d.b.h., noncommercial thinning of trees under 9 inches d.b.h., and prescribed fire. This combination of treatments would reduce the potential for high-intensity fire by decreasing crown density (making crown fire less probable), would increase canopy base height (requiring longer flame lengths to initiate tree torching), and would reduce surface fuels (reducing flame lengths of surface fires).

Alternatives 2 and 3 would increase the proportion of forested area within the low-intensity fire regime, reduce the proportion of forested area within the high-intensity fire regime, and maintain low-intensity fire conditions in those areas where they already exist. These changes are a result of reductions in surface fuels, ladder fuels, and stand density, and an increase in the proportion of fire-resistant Ponderosa pine.

Alternative 2 would move more acres with mixed and high-intensity fire conditions into a low-intensity fire condition than Alternative 3; fewer acres after treatment would support a crown fire (See total effective treatment percents in Table 3.26). Alternative 2 would move the distribution of fire regimes across the landscape closer to the historic range found in the West Maurys project area than Alternative 3.

Direct and Indirect Effects of Alternative 4
Alternative 4 would use noncommercial thinning of trees less than 9 inches d.b.h. and prescribed fire. This combination of treatments would maintain low-intensity fire conditions where they exist. This combination of treatments would not substantially lower the risk of high-intensity wildfire in mixed and high-intensity stands. Treating the fuels generated by noncommercial thinning in closed canopy stands will be more expensive, and potentially more damaging to the stand.

It is expected that stands would be treated with prescribed fire approximately every 10 years following treatment to maintain low-intensity conditions, mimicking natural fire cycles. Projections of post-treatment conditions of similar projects, in similar forest types, with silvicultural and fuels prescriptions similar to Alternative 2, found over 70 percent of treated stands remaining in a low-hazard condition 30 years after treatment. A comparative study, following only noncommercial thinning in multi-storied, heavily-stocked stands, found that only 13 percent of treated acres rated low intensity after treatment, and only 3 percent of treated acres rated low intensity 30 years after treatment. This study was conducted in ponderosa pine and dry mixed conifer forests similar to those in the West Maurys project area (Fiedler et al. 2001).

Cumulative Effects of Alternatives 2, 3, and 4
There is a 1,300-acre wildlife burn planned for the Sherwood Creek drainage, scheduled for 2004. This burn would reduce surface fuels, seedlings, and saplings, and improve wildlife forage by stimulating the growth of grass, forb, and shrub species. Changes in fire regimes as a result of this project would not be discernable at the landscape scale.

Livestock grazing can impede achieving prescribed fire objectives in open stands with light surface fuels by reducing the surface fuel layer needed to carry fire through the stand during low-intensity burning conditions. Livestock grazing does not affect potential fire intensity in closed canopy, multi-storied stands with heavy surface fuel loading. Livestock grazing does not affect on the distribution of fire regimes because grazing does not alter stand structure and density.

Most accidental human-caused fires in the West Maurys are caused by hunters, and because they occur in the spring and fall are insignificant in size (usually less than 1/10 acre) and effect. Smoke from prescribed fires can impact hunter camps, especially in the late evening/early morning hours as smoke pools in drainages and other low spots.

There are no other planned activities that would affect the distribution of fire regimes in the project area.

Forest Wood Products and Seasonal Jobs

Purpose and Need for Action (Chapter 1)
There is a need to provide wood products to contribute to the health of the local and regional economies (Ochoco National Forest Land and Resource Management Plan, pg 4-31 to 4-32) consistent with Management Area and Forest-wide standards and guidelines and to provide opportunities for employment and income.

Affected Environment
For the purposes of describing socio-economics effects on the economy, the economy was considered to be all of central Oregon. The effects to the local economies are based on the estimated number of jobs created.

The bulk of the area and communities potentially influenced by actions on the Ochoco National Forest lie within Deschutes, Crook, and Jefferson, the southern most part of Wheeler, eastern most part of Grant, and the northern most sections of Klamath and Lake Counties (Zone of Influence or Zone). The major population centers within the Zone are: Prineville (7,356), Bend (52,029), Redmond (13,481), and Madras (5,078) (U.S Department of Commerce, Bureau of Census, Decennial Census of Population and Housing, 2001). The total population for the 5-county area during the 2000 Census totaled 234,235. Populations and change for the region and by each individual county are displayed in Table 3.27.

Table 3.27 Central Oregon Population Growth

County	Population		Change	Percent
	1990 Census Data	2000 Census Data		
Jefferson Co.	13,676	19,009	5,333	39%
Deschutes Co.	74,958	115,367	40,409	53.9%
Crook Co.	14,111	19,182	5,071	35.9%
Wheeler	1,380	1,550	170	11%
Grant	7,855	7,950	95	1.2%
Klamath Co.	57,702	63,755	6,053	10.5%
Lake Co.	7,176	7,422	245	3.3%
Totals Central and South Central Oregon	176,907	234,235	57,328	32%

Sources: US Bureau of the Census, Vital Records, Oregon Health Division

Future population projections mimic that of the past decade. Deschutes, Crook, and Jefferson Counties are expected to continue with aggressive growth, where as the more rural counties, Wheeler, Grant, and Lake are projected to grow quite slowly, if at all.

Jobs

According to the 2000 Census, estimated civilian labor force is:

- Crook, 7,525, up 12 percent since the 1990 census;
- Deschutes, 57,614, up 40 percent since the 1990 census,
- Jefferson, 8,570, up 31 percent since the 1990 census,
- Wheeler, 598, up 14 percent since the 1990 census,
- Klamath, 28,753, up 6 percent since the 1990 census;
- Grant, 4,051, down 4 percent since the 1990 census, and
- Lake, 3,371, down 9 percent since the 1990.

Where as the labor force in Oregon as a whole increased 18 percent. In Crook County the three largest sectors were trade (1,640), lumber and wood products (1,510), and government (1,180). Since then, with the closure of additional sawmills employment in the lumber and wood products sectors is closer to 1,000. In Deschutes County the three largest sectors were Finance/Insurance/Real-estate (14,170), trade (13,080), and government (6,900). In Jefferson County the three largest sectors were government (2,460), trade (1250), and lumber and wood products (1,150). In Wheeler County the three largest sectors were government (200), trade (50), and finance/insurance/real-estate (20). In Klamath County the three largest sectors were finance/insurance/real-estate (5,580), trade (5,510), and government (5,400). In Grant County the three largest sectors were government (1,101), trade (500), and finance/insurance/real-estate (430). In Lake County the three largest sectors were government (940), trade (500), and lumber and wood products (290). (U.S Department of Commerce, Bureau of Economic Analysis 2001).

Unemployment rates in the individual counties were:

- Crook, 9.1 percent;
- Deschutes, 6.4 percent;
- Jefferson, 6.5 percent;
- Wheeler, 10 percent;
- Klamath, 8.7 percent;
- Grant, 12.1 percent; and
- Lake, 10.1 percent.

The unemployment rate in Oregon as a whole was 5.7 percent (U.S Department of Commerce, Bureau of Census, Decennial Census of Population and Housing, 2001). Since then the economy has weakened. As of February 2004 unemployment rates in the individual counties were: Crook 12 percent, Deschutes 8.7 percent, Jefferson 9.7 percent, Wheeler 10.8 percent, Klamath 12.7 percent, Grant 16 percent, and Lake 15.4 percent. The unemployment rate in Oregon as a whole was 7.1 percent (Labor Trends 2004)

The economies of Deschutes and Jefferson are the most robust in the Zone. In Deschutes County although there has been an increase in the number of jobs created, the huge increase in the labor force (up 40%) has negated much of this success, at least in terms of the unemployment rate. But, due to Deschutes and Jefferson County's diversity, both economies are expected to maintain very strong. On the other hand, in Klamath County, due to it heavy reliance on lumber and wood products, and agriculture, both of which are highly seasonal; and Crook, with its overall low economic diversity, dominated by one manufacturing sector industry (lumber and wood products) and one wholesale trade sector company (Les Schwab), have had their economies lag behind Oregon's as a whole. Future projections call for continued growth and diversification of their economies. Wheeler (little agricultural economy), Grant (heavy reliance on lumber and wood products), and Lake (heavy reliance on lumber and wood products, and agriculture) Counties economies, due to their small size and lack of diversity, have had there economies lag substantially behind Oregon's as a whole. Future projections call for continued slow growth in these three economies (U.S Department of Commerce, Bureau of Census, County Business Patterns, 2001; Oregon Employment Department, 1992).

Although the past decade has seen a significant reduction in employment within the lumber and wood products industry, the lumber and wood products industry is still an important contributor to the local economies. In Crook County (2000), 1,510 people were employed in the lumber and wood products industry. This accounted for 25 percent of all wage and salary employment in the county, and represented the third highest paying job in the county. Since then, the remaining sawmills have closed and the number of wood product jobs has decreased to around a 1,000. And almost all these jobs are located in the logging and secondary wood products sectors. In Deschutes County, 4,770 people were employed in the lumber and wood products industry. This accounted for 10 percent of all wage and salary employment, and represented the seventh highest paying job in the county. In Jefferson County, 1,150 people were employed in the lumber and wood products industry. This accounts for 19 percent of all wage and salary employment, and represents the third highest paying job in the county. In Klamath County, 3,180 people were employed in the lumber and wood products industry. This accounts for 19 percent of all wage and salary employment, and represents the second highest paying job in the county. In Grant County, 370 people were employed in the lumber and wood products industry. This accounts for 14 percent of all wage and salary employment (because of the limited industry base in the manufacturing sector, the State does not separate out the lumber and wood products from the other manufacturing employment. This number represents all manufacturing employment), and represents the third highest paying job in the county. In Lake County, 290 people were employed in the lumber and wood products industry. This accounts for 13 percent of all wage and salary employment, and represents the third highest paying job in the county. Wheeler County has no manufacturing sector industries (U.S Department of Commerce, Bureau of Economic Analysis, 2001).

Job and Personal Income Effects

Timber harvest (lumber and wood products) would affect employment and income in three ways: (1) direct effects attributable to employment associated with the harvesting, transportation, and manufacturing, (2) Indirect effects attributable to industries that supply materials, equipment, and services to these activities, and (3) induced effects attributable to personal spending by the owners, employees, families, and related industries. Employment and personal income impacts were made from estimates derived from Gebert (2002) and Philips (2004).

Table 3.28 shows the annual estimated job and income impacts by alternative. These estimates are for commercial forest products, noncommercial thinning, and piling of small woody debris (slash); they do not include the employment and income impacts of the alternatives with respect to the road construction, road reconstruction, and road decommissioning, or prescribed fire treatment. In addition, no attempt has been made to value what has been termed ecosystem service values. This type of analysis, if done at all, is more appropriate at the Forest Plan level not at the project level.

Direct and Indirect Effects Assumptions
Because much of the economic activity associated with forest products is in the manufacturing (over half of the direct effects described above) and there is no certainty on where this manufacturing would occur (may not be processed even within the zone), it is not possible to predict where many of these jobs would exist.

Job totals shown in the table are based on State-wide relationships and not necessarily the expected impact in any one county. Because of this the estimated jobs and income figures in Table 3.28 are likely to be higher than what one would expect in a less developed rural economy. For example, the indirect and induced jobs described above would be less in a rural economy such as Crook's as money "leaks" out of the local economy to Redmond, Bend, and the Willamette Valley.

Table 3.28 Annual Employments and Income Maintained or Created

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Estimated Timber Volume to be Harvested	0	25.9 million board feet	16.0 million board feet	0
Jobs, forest products	0	411	254	0
Income, forest products (1000$)	0	$14,100	$8,700	0
Jobs, noncommercial thinning / slash piling	0	18	14	17

Direct and Indirect Effects of No Action
No proposed activities would be implemented therefore no jobs would be created. There would be no direct benefits to the local, regional or the State's economies. This alternative may have negative impacts to local and regional economies because forest product jobs would not be maintained. The ability to substitute this material from another source is questionable given the current availability of timber, especially from Federal lands. As noted in the affected environment section, Crook County no longer has any primary manufacturing capacity. And as noted above over half of the direct jobs supported by the harvesting, transporting and processing of timber are associated with primary manufacturing. However since the activities would take place in Crook County, it is likely that many of the logging jobs that would be supported under Alternatives 2 and 3 would in fact be associated with Crook County's logging industry. It is also unlikely that many of these local logging jobs would be supported by another harvest activity on the Ochoco National Forest or within the Zone. With Crook County' unemployment rate hovering around 12% this could increase the unemployment rate an additional percentage or two. This would further exacerbate the downward pressures on all facets of Crook's economy.

The economic activity associated with road work, and vegetation and fuel treatments would not occur under this alternative. Except for the prescribed fire treatments (these are usually accomplished with local Forest resources), many of the jobs associated with these activities, especially the noncommercial thinning and slash piling, are accomplished through the use of contracting and many resources are from outside the Zone.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Alternative 4, as with the No Action Alternative (Alternative 1), proposes no commercial harvest activities. Since most of the economic activity associated with an alternative is tied directly to these activities the economic effects would be similar to the No Action Alternative. Alternatives 2 and 3 do propose commercial harvest activities and therefore would contribute to the local, regional and the State's economies. Table 3.28 displays the expected level of harvest in million board feet and the number of timber and related jobs that would be created or maintained by alternative. The estimated jobs would occur over several (3 -7) years as timber is harvested and processed. Given the major restructuring of the woods product industries over the past 10 to 15 years it's likely that these would not be new jobs but jobs needed to support current levels of employment in the forest products industry. As noted in the affected environment section, Crook County no longer has any primary manufacturing capacity. Over half of the direct jobs supported by the harvesting, transporting and processing of timber are associated with the

primary manufacturing. Assuming all the logging activities would be associated with Crook County (there is no certainty that this would be the case) one would expect approximately 136 jobs not the 411 listed in the table and 1,218,000 dollars not the 14.1 million of income under Alternative 1; and 84 jobs vs. the 254 and 752,500,000 dollars of income vs. 8.7 million under Alternative 3.

In addition to the employment and income figures from harvesting and manufacturing of wood products, the vegetation and fuel treatments, and road work would also generate jobs and income over the next 3 to ten years. While no estimate of jobs and income from the road work and prescribed fire it is estimated that Alternatives 2's $2.1 million, 3's $1.4 million and Alternative 4's $.53 million investment in road work along with 14,000, 10,700, and 13,700 acres of fuel treatments respectively would generate both jobs and income.

As noted earlier, it is reasonable to expect a good proportion of the noncommercial thinning work would go to minority-based small businesses, as they have in the past. The vast majority of these businesses and their employees are based along the I-5 corridor, so most of the disposable income from these activities would not flow into local communities. There would be some local economic activity generated from these activities but it may be outside the area. The primary services needed by the workers would be food and shelter. Local businesses that can supply food (grocery stores and restaurants) and other services would capture most of the money being spent by the workers in the area. Some businesses may need to increase their employment, either by temporarily adding employees, or giving present employees more hours. This would likely result in increased local household incomes during implementation of project activities. Since these businesses have supported similar workforces in the past, capitol expansion would probably not be required.

Within the social context presented above, the action alternatives developed for this project have the potential to bring in workers from the outside to perform logging, reforestation, and related activities. While the outside workforce is more likely to be racially diverse than the local resident population, the residents have worked effectively with and supported anticipated fluctuations in the workforce expected with the implementation of an action-based alternative.

Cumulative Effects of All Alternatives

Overall the economic influence from implementation of any of the alternatives is likely to be minimal within the economic context of the zone as a whole. Trends in employment indicate increased employment, primarily in construction, services, and trade. This would help ameliorate adverse economic impacts under Alternative1 and 4. However, with the strong likelihood that much of the logging and transportation activity would be directly tied to Crook County's logging industry; the County's economy is likely to suffer regardless of the overall economic trends within the County and the Zone as a whole. Alternatives 2 and 3 which do provide commercial wood products in addition to economic activities associated with the other management activities, along with these same overall economic trends, will help strengthen local, particularly Crook's, and regional economies. In the context of larger economies, regional or State-wide scales, the amount lost under Alternatives 1 and 4, or the amount provided in Alternatives 2 and 3, would not generate very much economic activity.

Other Environmental Resources

Air Quality

Affected Environment

Air quality can be affected by both wildfire and activity fuels burning. National Ambient Air Quality Standards have been developed and include standards for total suspended particulates (solid material contained in smoke). The Oregon Department of Environmental Quality is responsible for assuring compliance with the Clean Air Act. In 1994, the U.S. Forest Service, in cooperation with the Oregon Department of Environmental Quality, the Oregon Department of Forestry and the Bureau of Land Management, signed a Memorandum of Understanding (MOU) to establish a framework for implementing an air quality program in Northeast Oregon. The MOU includes a prescribed fire emission limit of 15,000 tons of PM 10 per year for the national forests of the Blue Mountains (Malheur, Ochoco, Umatilla, and Wallowa-Whitman). (PM 10 are particulate matter that measure 10 microns in diameter or less, and are

small enough to enter the human respiratory system.) All prescribed burning on these forests is coordinated with the Oregon State Department of Environmental Quality and the Oregon Department of Forestry through the State of Oregon smoke management program.

There has been no prescribed burning in the Maury Mountains since November 1999 (not including the 2004 project season). Winds in the project area are typically from the southwest to northeast during the spring and fall prescribed burning periods. Inversions are common at night in the fall in the Paulina valley, but tend to dissipate by mid-morning as surface temperatures increase due to solar heating.

Direct, Indirect and Cumulative Effects of No Action
There would be no emissions produced from prescribed burning related to the West Maurys project. In the event of a high intensity wildfire, smoke emissions would exceed desired levels.

There is a 1,300 acre wildlife enhancement underburn planned for the spring and fall of 2004 in the Sherwood Creek drainage. Prescribed burning on the West Maurys project is not expected to start until the spring of 2005 at the earliest, therefore there would be no cumulative additional smoke.

There would be no other past, present or reasonably foreseeable future projects that would affect air quality.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Table 3.29 displays an estimate of annual PM10 emissions from prescribed fire over the 10-year implementation period.

Table 3.29 Projected Annual PM10 Emissions from Prescribed Fire

Project Year	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
% of Project	10%	10%	10%	15%	15%	10%	10%	10%	5%	5%
Alternative 2										
Natural Fuels	53.3	53.3	53.3	80.1	80.1	53.3	53.3	53.3	26.7	26.7
Activity Fuels	169.9	169.9	169.9	254.8	254.8	169.9	169.9	169.9	84.9	84.9
Pile Burning	73.8	73.8	73.8	110.7	110.7	73.8	73.8	73.8	36.9	36.9
Total PM10	297.0	297.0	297.0	445.6	445.6	297.0	297.0	297.0	148.5	148.5
Alternative 3										
Natural Fuels	41.0	41.0	41.0	61.5	61.5	41.0	41.0	41.0	20.5	20.5
Activity Fuels	134.6	134.6	134.6	201.9	201.9	134.6	134.6	134.6	67.3	67.3
Pile Burning	51.0	51.0	51.0	76.5	76.5	51.0	51.0	51.0	25.5	25.5
Total PM10	226.6	226.6	226.6	339.9	339.9	226.6	226.6	226.6	113.3	113.3
Alternative 4										
Natural Fuels	51.2	51.2	51.2	76.8	76.8	51.2	51.2	51.2	25.6	25.6
Activity Fuels	169.9	169.9	169.9	254.8	254.8	169.9	169.9	169.9	84.9	84.9
Pile Burning	51.3	51.3	51.3	110.7	110.7	51.3	51.3	51.3	25.6	25.6
Total PM10	272.4	272.4	272.4	445.6	445.6	272.4	272.4	272.4	136.1	136.1

The highest estimated annual PM10 emission rate is 445.6 tons (Alternatives 2 and 4, years 4 and 5), which is less than 3 percent of the annual emission limit for the Blue Mountains.

Due to the location of the project area and local weather patterns, smoke from prescribed fire would not affect Class I wilderness areas or urban Special Protection Zones. The nearest Class I wilderness is the Strawberry Mountain Wilderness, 75 miles to the east. The nearest Special Protection Zone is Bend, 40 miles to the west, into the prevailing winds. Prescribed fire operations would be suspended during persistent inversion conditions, which would increase the potential for smoke pooling in the Paulina valley. Impact from smoke could affect widely scattered individual dwellings in the Paulina valley, and would be short term.

Cumulative Effects of Action Alternatives
There is a 1,300-acre wildlife enhancement underburn planned for the spring and fall of 2004 in the Sherwood Creek drainage. Prescribed burning on the West Maurys project is not expected to start until the spring of 2005 at the earliest; therefore there would be no cumulative additional smoke.

During the summer months, there are occasional smoke intrusions into the Prineville area from agricultural burning in Crook and Jefferson County, and from wildfires on lands to the west (prevalent wind direction is from the west during the summer months). Prescribed burning in the West Maurys project area would occur during the spring and fall, and would not coincide with those intrusions.

There would be no other past, present or reasonably foreseeable future projects that would affect air quality.

Threatened, Endangered, Proposed, and Region 6 Sensitive Species

Biological Evaluations have been prepared for **Wildlife, Fisheries** and **Botanical** species. More detailed information on species' habitat and impacts from the alternatives can be found in these reports. A summary of the determinations for all species can be found in **Appendix A** of this document.

Threatened, Endangered, and Region 6 Sensitive Species

Wildlife

Threatened, Endangered, and Sensitive (TES) wildlife species that are documented or suspected to occur on Ochoco National Forest are listed below. Highlighted species are those known to occur or with potential habitat within the project area.

Canada lynx (Threatened)
Northern Bald Eagle (Threatened)
Wolverine (R-6 Sensitive)
Upland sandpiper (R-6 Sensitive)
Western sage grouse (R-6 Sensitive)
Peregrine Falcon (R-6 Sensitive)
Bufflehead (R-6 Sensitive)
Pygmy Rabbit (R-6 Sensitive)
Gray Flycatcher (R-6 Sensitive)
Tricolored Blackbird (R-6 Sensitive)

There are no endangered species known or expected to occur on Ochoco National Forest.

Northern bald eagle (a threatened species) is known to occur within the project area. Three sensitive species (wolverine, bufflehead, and gray flycatcher) are known to occur or there is potential habitat within the project area.

The Deschutes and Ochoco Forest-wide Programmatic Biological Assessment (BA) addresses program activities that may affect, but are not likely to adversely affect listed species. Canada lynx habitat was remapped in 2001. As a result, due to insufficient quantities of primary habitat, Key Linkage Areas (KLA) and Lynx Analysis Units (LAU) are not currently mapped on Ochoco National Forest. In addition, The Deschutes and Ochoco National Forests requested informal consultation (March 30, 2001) on continued implementation of their respective Land and Resource Management Plans (LRMPs) with LAUs mapped in accordance with the 2000 Lynx Conservation Assessment and Strategy, August 2000 (LCAS).

The U. S. Fish and Wildlife Service (USFWS) gave concurrence that the mapping was consistent with the current mapping direction, and that implementing forest plans using the current mapping would result in "may affect, but not likely to adversely affect" (NLAA) conflict determinations (May 24 and June 22, 2001). Project Design Criteria (PDC) only apply within LAUs and KLAs. Therefore, there is no need to address the Interagency Programmatic BA (2001-2003) Project Design Criteria for lynx on this project.

Five sensitive species were not addressed because there is no or only low probability habitat in the project area, these species are Peregrine falcon, upland sandpiper, western sage grouse, tricolored blackbird, and pygmy rabbit. For these reasons, there would be no impact from any of the alternatives to the species listed.

The project area contains potential habitat for bald eagle, wolverine, gray flycatcher, and bufflehead. The bald eagle is known to occur within the project area.

Northern Bald Eagle (Threatened)

Bald eagles utilize large trees for nesting, and they forage in a variety of habitats, particularly water bodies, wetlands and riparian meadows. There are two known bald eagle nests (alternate nests for a single pair) within one Bald Eagle Management Area (BEMA), and two mapped winter roosts (Eagle Roosting Area - ERA) within the project area.

Effects to vegetation in the Bald Eagle Roosting Management Area have already been discussed under the Vegetation / Management Area section previously in this Chapter.

Bald Eagle Management Area (BEMA) – This is not an allocated management area in the LRMP. However, the "Joint Aquatic and Terrestrial Programmatic Biological Assessment for Federal Lands within Deschutes Basin administered by the Bureau of Land Management Prineville Office and the Deschutes and Ochoco National Forests, June 2003-June 2006" identifies the need to provide bald eagle management areas around known nest sites to streamline consultation. All vegetation manipulations need to promote the development of large trees capable of supporting future bald eagle nesting, perching, and roosting regardless of other land allocations in the BEMA. The purpose of vegetation management is to initiate long-term stand management to achieve bald eagle habitat objectives.

Bald Eagles have been nesting near Antelope Reservoir. The general vegetation patterns in the BEMA create a mosaic of open sagebrush covered hills and conifer stands on north slopes and swales. Two nests are located in large, old ponderosa pine trees occurring in small draws. The nest sites had become dense with in-growth of young understory trees and accumulated ground fuels. This has increased the risk to the nest trees from bark beetle-related mortality and high-intensity wildfire. Non-commercial thinning and hand piling was recently completed around one of the nest trees. Outside the project area but within the area of influence, there are two additional bald eagle nests. One of these is located approximately 2-1/2 miles east of the project area and the other one is located approximately 6 miles north of the project area.

No activities would occur in Alternative 1 (No Action). Stands would remain at high risk of mortality and increasing risk of high intensity fire including crown fire.

In Alternative 2 harvest and related treatments are proposed within 1/2-mile of nest trees. Prescribed burning is proposed around both nest trees. Treatments would reduce the risk of bark beetle mortality by reducing stand density and reducing the risk of high-intensity fire around the nest trees by removing ladder and surface fuels. These actions increase the potential longevity of these nest trees.

In Alternative 3 harvest and related treatments are proposed within 1/2-mile of the nest trees. Prescribed burning would occur around one nest tree reducing risk at this site. The other nest tree would remain at higher risk.

In Alternative 4 noncommercial treatments are proposed within 1/2-mile of nest trees. Prescribed burning is proposed around both nest trees. Treatments would reduce competition among trees but only slightly. Nest trees would remain at a higher risk of loss than Alternatives 2 or 3.

This project meets the Project Design Criteria in the Programmatic Biological Assessment for bald eagle nesting and roosting areas by design to have retention of all trees greater than 21 inches d.b.h., retention of all potential roost snags in the Bald Eagle Management Area, and with implementation of seasonal restrictions, which is consistent with the Pacific Bald Eagle Recovery Plan. For these reasons, the

determination for this project is May affect but not likely to adversely affect for all action alternatives because there would be no adverse effect to habitat and potential disturbance would be mitigated. The determination for the No Action Alternative is no effect because there would be no effect to habitat and no change in potential disturbance levels. Seasonal restrictions have been included in Mitigations, Design Criteria and Resource Protection Measures in Chapter 2.

California wolverine (R-6 Sensitive).

California wolverine utilize rocks, talus, and large log habitat for denning, and they forage in a variety of habitats, usually in remote locations. There are no known wolverine dens near the project area. However, there have been sightings of wolverine on Lookout Mountain Ranger District between 1969 and 1994. The nearest recorded sighting was approximately 4 miles away from the project area.

The project does not alter rock, talus habitat, but could alter large wood accumulations and vegetation, which could alter prey habitat. The project has a very low probability of disturbing any wolverine due to the relatively low potential for occupancy of habitat present in the project area. The alternatives that reduce open road density, could improve habitat conditions by reducing potential for human disturbance. However, none of the proposed alternatives reduce road density substantially enough to result in a significant change in habitat suitability for this species. For these reasons, the determination for this project is May Impact Individuals or Habitat, not likely to contribute to a trend toward federal listing (MIIH) for all action alternatives. The determination for the No Action Alternative is No impact (NI) as there would be no effect to habitat and no change in potential disturbance levels.

Gray Flycatchers (R-6 Sensitive).

Gray flycatchers utilize open stands in arid woodlands, or shrub communities, where there is small tree sized big sagebrush. They may breed and forage in juniper, pine-juniper, aspen, tall sagebrush/bunchgrass or mountain mahogany stands, and they also forage in riparian woodlands and shrub/grassland communities. Such habitats are present in the vicinity of the project area. No sightings of this species have been recorded in the project area, but they are expected to occur there. Within the project area, they would be expected to occur in juniper and big sage brush habitats with a well developed shrub layer.

Habitat for this species is present in the project area. Disturbance from silvicultural treatments and prescribed burning could disrupt activities of individuals during implementation and there is some potential for direct mortality. When these activities occur in the spring and summer, reproduction may be disrupted. However, this species evolved in an environment in which fire was an integral part of the ecosystem, so birds capable of flight should be able to escape entrapment. Birds that are displaced early in the nesting season may re-nest, or become non-reproductive during that nesting season. When thinning or burning occurs in the fall, the activities would be outside of the nesting season, and potentially after these birds have left Oregon for the fall migration. Thinning and burning would reduce coniferous canopy closure and water uptake, allowing more light and moisture to be available to the understory vegetation. This could improve habitat overtime by allowing shrub understories to develop. Burning can also reduce nesting structure in the short term by removing tall shrubs.

The Breeding Bird Atlas (Adamus et al. 2001) indicates that this species population is presently increasing and that this species is widely distributed across its range. Lower elevation areas, below the forest boundary are the core reproductive habitats for this species. For these reasons the determination is May Impact Individuals or Habitat, not likely to contribute to a trend toward federal listing (MIIH) for all action alternatives. The determination for the No Action Alternative is No impact (NI).

Bufflehead (R-6 Sensitive).

The bufflehead uses deep water lakes in mountainous forested areas, nesting in tree cavities close to water. They also use lowland lakes and estuaries in the winter. There is a moderately sized reservoir within the project area and two small reservoir ponds are present in the vicinity of the project area. Though this species has been documented on Ochoco National Forest, only one sighting of this species was recorded on Lookout Mountain Ranger District in 2003 during the fall migration.

Potential habitat for this species is present in or near the project area, but it has marginal suitability as nesting areas due to level of human activity and a shortage of potential nesting sites (snags). Project activities could result in changes in snag density in stands near the lakeshore. The reservoir habitat may be used as stop-over sites during migration, or in the winter when they are free of ice. Project activities would not occur during this time, and the project should not alter lake or lakeshore habitat. For these reasons, the determination is May Impact Individuals or Habitat, not likely to contribute to a trend toward federal listing (MIIH) for all action alternatives. The determination for the No Action Alternative is No impact (NI) as there would be no effect to habitat and no change in potential disturbance levels during the most likely time of occupancy.

Fisheries

Two aquatic species are federally listed as threatened and are known to occur on the Ochoco National Forest and Crooked River National Grassland. These species are: bull trout (*Salvelinus confluentus*) and Mid-Columbia River steelhead trout (*Oncorhynchus mykiss* ssp.). There are no endangered aquatic species on the Ochoco National Forest. Several species from the R-6 Regional Forester's sensitive species are known to occur on the Ochoco National Forest and include: redband trout (*Oncorhynchus mykiss* ssp.), Malheur mottled sculpin (*Cottus bairdi*), West Slope cutthroat trout (*Oncorhynchus clarki lewisi*), Columbia spotted frog (*Rana luteiventris*), and Mid-Columbia River spring chinook salmon (*Oncorhynchus tshawytscha*). Mid-Columbia River spring chinook salmon EFH (essential fish habitat) is also located on the Ochoco National Forest.

The following species were not considered further because there is no passage for the species to the project area, they are not known to exist in the project area or there is no habitat for the species in the project area. These species are:

- Bull trout are known to occur in Squaw Creek in the Crooked River National Grasslands but do not occur within the project area and have no passage to the project area.
- Mid-Columbia River steelhead trout are known to occur throughout the main stem lower Deschutes River below Pelton Regulating Dam and in most tributaries below the dam as well as in Trout Creek and Badger Creek on the Lookout Mountain Ranger District. They also occur in the John Day River Basin. They may have been in the project area before downstream dams were built.
- Malheur mottled sculpin are presently only in some streams on the Emigrant Creek Ranger District in Harney Basin, Malheur National Forest.
- West Slope cutthroat trout have not been found in the project area and are not known to occur.
- Mid-Columbia River spring chinook salmon historically may have been in the project area before downstream dams were built.
- Mid-Columbia River spring chinook salmon and EFH (essential fish habitat) is not known to have been historically within the project area (USDA 2003).

The definition for adverse effects in INFISH was utilized in the fisheries analysis. This definition states "adverse effects include short- or long-term, direct or indirect management related impacts of an individual or cumulative nature, such as mortality, reduced growth, or other adverse physiological changes; harassment of fish; physical disturbance of redds; reduced reproductive success; delayed or premature migration; or other adverse behavioral changes. Adverse effects to designated critical habitat include effects to any of the essential features of critical habitat that would diminish the value of the habitat for the survival of native inland fish."

Redband Trout and Columbia spotted frog

There is redband trout habitat and Columbia spotted frog habitat within the West Maurys project area. (Note: Management Indicator Species rainbow trout *Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*) are similar to redband trout in habitat needs and responses to management actions therefore redband trout will act as a surrogate for rainbow and brook trout. Effects to redband trout described in this section will also apply to rainbow and brook trout as Management Indicator Species).

Redband trout is the only salmonid species currently present within the project area.

Stuart et al. (1996) reviewed numerous characteristics of redband trout in the Crooked River Basin, including previous genetic analyses. The review shows clearly that redband trout in the Crooked River group into three distinct geographic clusters. One group of related population occurs in the lower Crooked River (below bowman Dam) and includes populations from the lower main stem Crooked River, as well as McKay Creek, Mill Creek, Mark's Creek, and Ochoco Creek. A second group of related populations occurs in the main stem Crooked River above Prineville Reservoir and Bowman Dam and the various small tributaries in this section including Bear Creek and Pine Creek. The third group of related populations occurs in the north and middle forks of the Crooked River and their various headwater tributaries.

Interior redband remain in the Crooked River and its tributaries today. The population numbers have decreased over time and non-native species have been introduced. Lower numbers of redband have resulted from the loss of riparian vegetation, particularly hardwood trees, bank erosion, entrenched streams, loss of beaver and woody debris, modified stream channels from narrow and deep to steeper slopes. Straighter channels due to degradation are accompanied by increased bank erosion, increased sediment transport, increased sediment deposition in depositional areas, and loss of floodplains.

It is estimated that most of the sediment in the streams in the West Maurys project area results from in-channel erosion such as bank erosion, head cuts, and channel scour. Channel destabilization can result from changes in peak flows, sediment load, and livestock impacts, but down cutting in the Crooked River and Bear Creek appear to be a major cause of the instability. Potential increases from in-channel sources resulting from harvest and natural disturbance induced runoff have already been discussed under Issue 2.

Historically, Columbia spotted frogs were found at elevations ranging from near sea level to 7,370 feet. Their range extended from southeast Alaska through British Columbia, eastern Washington and Oregon to northeast California and eastward to western Montana and Wyoming, and northern Utah. Spotted frogs breed in very shallow water at the edge of ponds or streams, in flooded meadows, or in water pooled on top of flattened, dead vegetation at the edge of a pond, in early to mid-spring, generally from the end of March to the end of May depending on temperature. Informal surveys have revealed that there are known populations in the West Maury project area. Further surveys need to be conducted to identify specific populations within the project area. However, in the location of the proposed activities, Columbia spotted frogs were considered present because formal surveys have not been completed. Spotted frog habitat would be protected in Alternatives 2, 3, and 4 through mitigation measures and design features for treatments in RHCAs. These mitigation measures include no heavy equipment in RHCAs (unless on an existing road), and treatment prescriptions designed to promote shade, increase large wood recruitment in streams, increase the deciduous component of RHCAs and to reduce fuel loadings to approximate historical levels.

Affected Environment

A detailed description of the affected environment can be found in the Resource Report and Biological Evaluation for Aquatic Species. The description following is a summary of the affected environment section in the report.

The Ochoco National Forest has completed Bottom Line Surveys, Level II Surveys, and temperature monitoring on the principal drainages on Forest Service administered lands. The Bottom Line Survey collects data on cut banks, woody debris, pools, shade and other variables in 100-foot sections along stream reaches. The Bureau of Land Management completed inventories for most streams on BLM land adjacent to the project area during the 1970s. Bottom Line Survey data for streams indicate that most mountain streams have low occurrence of pools, woody debris, shade, high width-to-depth ratio, and entrenchment ratios.

Hydrological and water resource conditions in the analysis area vary from good to severely degraded, with most streams being in a poor to fair condition. Some areas show improving trends and substantial progress has been made to control degradation, but many areas remain in poor condition with no signs of improvement and some areas show downward trends.

The streams in the West Maurys Project area lack stable stream components such as woody riparian vegetation, large wood, pools, entrenchment, and previous down cutting. For example, stream surveys completed in 1991 and in 1998 are showing a leveling trend but not increasing towards improvement to meet stable stream components. Hunting, camping, off-road vehicle use, and driving on roads would continue by forest visitors. These activities occur within RHCAs as many of the forest roads in the Maury Mountains are located within RHCAs.

Recovery on streams of the Ochoco National Forest is anticipated, but improvement has been slow or non-existent. Severe degradation of the mountain or forest streams may have occurred in response to early grazing practices, and intensive harvest and road construction in the 1940's initiated or accelerated degradation. Reform and restoration efforts during recent years include numerous road closures and obliterations, reductions in allotted livestock numbers, improvements in pasture systems, reform or elimination of timber harvest practices, and planting of riparian hardwood vegetation. Erosion control structures or woody debris have been placed in various reaches of most of the principal streams during recent years.

Channel stabilization and recovery on the Ochoco NF are proceeding slowly if at all and the upward direction of trends remains uncertain. Sediment loads from upland and channel sources are probably lower now than in the past several decades. There are generally few visible indications of improvement in floodplain functions, water storage, peak flows or base flows, although such improvements should accrue from the past restoration efforts. A notable exception is lower Klootchman Creek, which entrenched several decades ago and has developed a new, stable floodplain system. Recovery rates appear to be much slower on the steeper mountain streams than on lower-gradient streams of the project area.

Beaver, riparian hardwoods, and flooding streams are interdependent. Successful propagation of beaver requires the presence of palatable hardwood vegetation, such as willows and aspen. The restoration of willow and aspen populations requires that existence of suitable riparian conditions, such as abundant soil moisture, that were generally lost when entrenchment occurred.

Low summer base flows present a conflict between economic and ecological interests. Late summer conditions stress aquatic and wetland communities. The use of irrigation withdrawals during late summer reduces summer base flows, and the widespread loss of riparian vegetation increases heating rates. The elimination of beaver dams has eliminated many pools that retained water during dry months. Summer water temperatures are higher, and fewer areas of refugia are available to support aquatic populations during severe conditions. Restoration of entrenched streams may improve natural irrigation and water storage in some valley reaches, thereby reducing needs for irrigation, and restoration of riparian vegetation. Beaver dams would improve the quality of summer habitat for trout and other components of the aquatic ecosystem.

Direct, Indirect, and Cumulative Effects of No Action

Commercial timber harvest, associated activities, and other vegetative treatments would not occur. On-going uses in the project area, such as road maintenance, noxious weed treatments, livestock grazing and recreation use would continue. Restoration projects, such as riparian planting and head cut repair authorized in other documents, would be implemented. Fish population distribution throughout the project area would still be limited by 1) stream flow, 2) both man-made and natural barriers, 3) stream gradient, and 4) rearing and spawning habitat quality and quantity. The primary reason for the decline in production of salmonids throughout the project area has been the loss of instream habitats and declining water quality. Populations of existing salmonids (redband trout) would not begin to increase until the channel structure improves and water temperatures decrease. It is estimated that most of the sediment in the streams in the West Maury project area is coming from in-channel erosion such as bank erosion, head cuts, and channel scour.

Although the alternative does not harvest timber, there is some risk that insect and disease mortality may reduce stream shading. If this mortality is light to moderate, it may be beneficial (i.e., natural thinning). Dead trees which fall into or adjacent to the channel, would add to the channel stability, catch sediment, and provide cover and structure to the channel. This would help to provide cool clean water, provide

structure to develop pools, increase the amount of cover for fish, and help retain water for late season flows. However, large amounts of dead and dying trees from insect and disease in the riparian areas could also burn at high intensity and reduce stream shading, increase water temperature, and decrease potential for large wood recruitment.

Because of the existing impacts of sediment, the No Action Alternative would move towards attainment of Riparian Management Objectives at a slower rate than the action alternatives for aquatic species and their habitat because no vegetation management would be done to improve riparian habitat conditions. Attainment of improved aquatic and riparian habitat and fish populations where streams are degraded may not improve over time without treatment.

Watersheds with previous harvest would continue to recover. Due to past harvest practices such as skid trails through RHCAs, fire suppression, and current conifer stocking, many of these conifer stands would not improve without treatment. In RHCAs, individual tree growth would not increase to promote the development of large trees and large woody debris (LWD) recruitment to the stream channel within the timeframe as in Alternatives 2, 3, or 4. Large wood develops pools, traps sediment, decreases water temperatures, and provides cover for fish.

The effects of past management practices such as logging and skidding in riparian areas, effects of the land use generated sediment, channel widening and aggradation, and channel stability loss, could persist for at least several decades. From Hagans' (et al. 1986) prediction in another study area, it could be more than a century for recovery from past management practices, even if no further disturbance occurred in the area.

In the event of a wildfire, there would be varied intensities of fire depending on the varied amounts of fuel loading. In RHCAs, large wood is below INFISH standards. The upper steeper draws (Class IV) would likely have a high-intensity fire. There would be a loss of future LWD recruitment until new seedlings are established that could take decades. In the lower parts of the drainages, there would be immediate large wood recruitment as the dead and dying trees in the moderate and low intensity burn fall into the streams. There would be an increase of sediment as a result of losing vegetation along the RHCAs and uplands, likely in a mosaic pattern. Shade would be reduced and water temperatures increased. Pools would form from the sediment being trapped in the fallen wood. In the unstable stream reaches, down cutting would continue where large wood is deficient.

The resulting open canopy would increase growth of woody riparian vegetation. As the cover over streams increased, temperatures would decrease and seedling would reestablish. In Alternative 1, post wildfire, large wood would be available in the RHCAs quicker than in Alternatives 2, 3, and 4 with vegetation and fuels treatments. It would take longer in Alternative 1 to recruit the next generation of large wood until seedlings reestablished and grew into large wood and fell into the streams.

Livestock grazing continues to impact streams by trampling and by consuming riparian (woody) streamside vegetation such as willows. Grazing woody vegetation along streams reduces shade, increases temperature, increases compaction due to trampling, reduces pools, and causes stream bank cutting.

Bank conditions where cattle have been concentrating are not stable. Without treatment to open the canopy in the uplands, sunlight would not reach the forest floor and would result in a subsequent decrease in forage in upland areas. Livestock would continue to concentrate in the RHCAs.

Degraded channel conditions in the headwaters of many streams and in spring areas in the watershed have resulted from livestock concentration. Changing livestock management is outside the scope of this document; however, it is reasonably foreseeable that there will be an improvement in riparian condition due to changes in the range utilization standards in the Grazing Implementation Monitoring Module (IIT, 2000). Studies in the intermountain region indicate that the height of grasses and forbs that are to be left in key riparian areas indicate a level of grazing that allows a corresponding recovery of palatable woody vegetation. Bank stability and channel geometry interact with vegetation but may respond differently, depending on the extent of continued mechanical disturbance in the channel and the current channel condition.

The existing condition of the streams would continue to inhibit the success of redband trout populations and fitness until restoration and as well as the current change in range utilization standards have been implemented. Without effective habitat restoration and management, redband trout and Columbia spotted frog populations habitat and fitness would not increase.

Due to past harvest practices, fire suppression, and current conifer stocking, many of these conifer stands would benefit from thinning (commercial and precommercial thinning) and activity fuels under burning. Without treatment, it could take more than a century to begin to move the vegetation towards historical (Hagans et al. 1986).

There are approximately 320 acres of private land within and adjacent to the project area. These parcels have had previous selective harvest but are predominate by scattered overstory ponderosa pine with medium to high densities of understory trees. Current uses appear to be for dispersed recreation and possibly cattle grazing. Activities for the future would not likely change and would maintain the baseline condition and would not contribute to the cumulative impacts to fisheries.

Determination for aquatic species*:* There would be "No Impact" to redband trout and Columbia spotted frog species or habitat as there are no treatments proposed in this alternative. There would be no change from the baseline of activities.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Alternatives 2, 3, and 4 do not differ substantially in effects to fisheries and aquatics except in the magnitude of treatments. Alternative 2 treats more acres with commercial treatments, noncommercial thinning, and prescribed fire than Alternatives 3 or 4. Alternative 4 treats the same acreage as Alternative 2 except there would be no commercial treatment and slightly less fuels treatments. All alternatives contain specifications for treatment to protect riparian dependent resources and the effects are similar between the alternatives relative to threatened and endangered, sensitive, and management indicator species. Specifics of treatment impacts by RHCA category, watersheds, and subwatersheds may be found in the Resource Report and Biological Evaluation for Aquatic Species and is incorporated by reference**.** Table 3.30 displays the acreage of treatments within RHCAs by alternative.

Table 3.30 Comparison of Acreage Treated by Alternative

	Commercial Harvest Treatment within RHCA	Noncommercial Treatments within RHCAs	Fuels Reduction Treatments within RHCAs	Totals
Alternative 1	0	0	0	0
Alternative 2	11	1,294	572	1,877
Alternative 3	11	933	432	1,376
Alternative 4	0	1,300	501	1,741

Precommercial thinning and natural fuels burning would occur within RHCAs. These activities are designed to maintain or improve existing shade conditions, to promote development of large-size trees, and to enhance long-term recruitment of large woody debris within riparian areas. These activities would contribute to meeting Riparian Management Objectives (RMOs). See Appendix C for a listing or RMOs.

Only three units (8, 21, and 445) in Alternatives 2 and 3 commercially treat vegetation within RHCAs for a total estimated treatment of 11 acres. The unit acres total 45 acres; however, approximately 25 percent of each unit would be treated, not the entirety of each unit. Treatment is designed to maintain or improve existing shade conditions by thinning conifers to promote deciduous trees and shrubs, to promote development of large-size trees by reducing competition, and to enhance long-term recruitment of large wood within riparian areas. These activities would contribute to meeting RMOs in INFISH for large wood recruitment and shade. No ground-based heavy equipment would be utilized to remove commercial trees within the RHCA unless on existing roads; wood would be removed with the use of a mobile yarder or a tractor mounted winch from the existing roads. Noncommercial thinning in RHCAs varies with 1,294 acres occurring in Alternative 2, 933 acres occurring in Alternative 3, and 1,300 acres in Alternative 4.

In noncommercial thinning units, the trees are too small to be sold as conventional mill products; these trees would be left on site after cutting and would be available for firewood, posts and poles, or other uses. Noncommercial thinning projects including both precommercial thinning of dense understory trees and juniper thinning to restore upland grass and shrub communities. Prescribed fire or grapple piling would be used to reduce fuels created by thinning. Selected treatment units contain riparian habitat that would be lightly thinned to develop and maintain a high forest canopy for shade or to promote development of broadleaf shrub and tree cover.

Thinning is expected to increase individual tree growth and promote the development of large trees and LWD recruitment to the stream channel. Fish habitat would improve due to increased cover and pool formation with LWD input (Bjorn and Reiser 1991). Increased LWD will also slow hydraulic gradients, reducing potential erosion during high flow events, help to develop narrower and deeper channels, catch and retain sediment and organic matter, and would allow fish colonization of previously unused habitat.

Natural fuels and activity fuels underburning would avoid burning large wood in RHCAs. There would be no hand firelines within 20 feet of Class II and III RHCAs and within 10 feet of Class IV RHCAs. Fire may be purposely ignited within RHCAs to protect structures, create fuel breaks, and to thin seedlings with fire. Fire may also creep into RHCAs, but has been designed to retain large wood and riparian vegetation. Prescribed fire has been designed in each alternative to minimize the potential effects of fire in RHCAs. Treatment in RHCAs would rejuvenate riparian plant species composition. This would accelerate the improvement of riparian plant species more closely to the natural rate of recovery. These underburning activities would not have more of an effect on fish habitat or fish than a naturally-occurring, low-intensity fire. Naturally-occurring fire would move in and out of the riparian areas, removing vegetation in a mosaic pattern. Large down wood in RHCAs would be minimally impacted from the underburning activities. The proposed prescribed fire includes underburning some forest stands after thinning, and undberburning some unthinned stands to maintain the existing low fuel levels. Prescribed fire reduces surface fuels, which reduces the potential intensity and resistance to control of future wildfires. Prescribed fire would also be used to reduce seedling and sapling density; regenerate grass, forbs, and shrubs; and reduce the encroachment of western juniper into pine stands.

Burning would be conducted for approximately a 10-year period and scattered throughout the West Maury Project area to meet the disturbance regime. There would be a slight increase in the potential for sedimentation 1 year after the burn should a rain event occur before vegetation reestablishes. Filtering vegetation would then become established to reduce sedimentation to streams. Acreages of prescribed fire treatments would be similar in Alternative 2 (572 acres), Alternative 3 (432 acres), and Alternative 4 (501 acres).

Fire objectives in INFISH would be met in each alternative. Fire is designed to enhance RMOs (Appendix C) by treating fuels to reduce the risk of high-intensity wildfire and minimize disturbance of riparian ground cover and vegetation. Strategies recognize the role of fire in ecosystem function and identifies those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem function or inland native fish. These actions such as fire retardant, incident bases, camps, helibases, staging areas, and helispots are not planned to be used to carry out prescribed fire objectives and operations.

With treatment by fuels and precommercial thinning within RCHAs, there would be an increase in large wood recruitment for future decades as trees increased in size, died, and fell into the RHCA. Since shade would not be reduced riparian woody vegetation would not increase as quickly as in the case of a wildfire where the canopy in RHCAs becomes open with sunlight reaching the vegetation. This would be the case for Alternatives 2, 3, and 4.

Hand piling of fuels would occur without equipment or resource damage within RHCAs in Alternatives 2, 3 and 4. Grapple piling would not occur within RHCAs.

A roads analysis (West Maurys Roads Analysis) was completed prior to analysis of the proposed alternatives to determine the influence of each road on riparian areas and to identify roads no longer needed for access. Road construction and use may impact water quality and timing by increasing sediment delivery, reducing infiltration, and increasing the rate of water delivery to streams. Most sediment production outside stream channels in the project area results directly or indirectly from roads. Roads within RHCAs disturb overland and groundwater flow, can reduce shading, displace deciduous vegetation and reduce potential for large woody debris recruitment. Road crossing of streams can impede natural flow (USDA 2003). The existing open road density is 2.35 miles per square mile. The density is below the Forest Plan standard and guideline of 3.0 miles per square mile. For Alternatives 2 and 4, 10.2 miles of roads would be decommissioned and 8.8 miles would be decommissioned in Alternative 3. Road decommissioning and inactivation within the RHCAs would likely reduce bank erosion at stream crossings and sediment from road surfaces within the watershed and allow for stream channels to maintain function.

All newly constructed specified roads would be closed after use is completed. Alternative 2 would construct 6.6 miles of roads and Alternative 3 would construct 3.3 miles of new roads. All newly constructed temporary roads (5.2 miles in Alternative 2 and 4.3 miles in Alternative 3) would be decommissioned by the timber purchaser after use is completed. Alternative 2 would reconstruct 37.5 miles of road and Alternative 3 would reconstruct 34.1 miles. There would be no road construction or reconstruction associated with Alternative 4. Road realignment results in the new location of an existing road or portion of a road. The purpose for realignment is for resource protection to remove the existing road from a riparian area. Alternative 2 and 3 would realign a portion of 3.2 miles of road out of the riparian zone.

The key components of fish habitat include: pools, temperature, large woody debris, width/depth ratio, and sedimentation. The proposed treatments are designed to enhance recruitment of large woody debris. Streams would increase in numbers of pools formed by downed wood and improve the width/depth ratio by making the streams narrow and deeper. An indirect effect of the proposed treatments and recruitment of large wood for streams include development of deeper and narrower streams, reduced temperatures, and trapped sediment within the wood structure. There is no further discussion on the fish habitat key components by individual stream reaches as the treatments are similar and designed to improve recruitment of large wood in Alternatives 2, 3, and 4. Further information on individual stream reaches can be found in the Resource Report and Biological Evaluation for Aquatic Species and is incorporated by reference.

Pools: The proposed treatments are designed to enhance recruitment of large woody debris. Streams would increase in numbers of pools formed by downed wood. As the numbers of pools increase, the width/depth ratio would be improved as the streams become narrower and deeper. Pools increase the volume of water in the channel without markedly increasing the surface area; thus, providing a buffer against wide swings in water temperatures. None of the alternatives would adversely affect pools.

Temperature: The proposed treatments would reduce temperature over time by forming pools from large woody debris recruitment and the resultant deeper and narrower stream channels. Pools increase the volume of water in the channel without markedly increasing the surface area; thus, providing a buffer against wide swings in water temperatures. Riparian vegetation would also be improved over time. As riparian vegetation increases, the amount of stream shading would also increase and reduce water temperatures. None of the alternatives would increase stream temperatures.

Large woody debris: The proposed treatments are designed to enhance recruitment of large woody debris. Large woody material in streams and the adjacent floodplain provides stream bank stability, decreases flow velocities, increases storage time (decreases downstream flood risk), and stores sediment. Proposed underburning is designed to burn in a mosaic pattern and to preserve existing large woody material in riparian areas. The three action alternatives would not adversely affect large woody debris.

Width-to-depth ratio: Width-to-depth ratios would improve from the proposed treatments. Recruitment of large woody debris in streams would increase numbers and quality of pools by making the streams narrower and deeper. This would reduce width-to-depth ratios and increase the ability of a stream to reach the floodplain and reduce shear stress on stream banks (reducing cut banks). The appropriate width-to-

depth ratios result in improved fish habitat and water quality. The three action alternatives would not adversely affect width-to-depth ratios.

Sedimentation: Both depth and width can respond rapidly to changes in sediment load and/or discharge. Whether a stream erodes downwards or outwards is influenced by both local shear stresses and whether the stream bed or banks are the most easily eroded. Prescribed fire has been designed in each alternative to minimize the potential effects of fire in RHCAs. Treatments in RHCAs are designed to rejuvenate riparian plant species composition. This would accelerate the improvement of riparian plants more closely to the natural rate of recovery. These fuel projects would not have more of an effect on fish or fish habitat than a naturally-occurring, low-intensity fire. Water quality would not be adversely affected by sedimentation.

Cumulative Effects of Alternatives 2, 3, and 4

Actions proposed with the Action Alternatives would no contribute additionally and would actually result in improved conditions within RHCAs and therefore in fisheries habitat. Therefore, because conditions resulting from activities in the action alternatives actually improve conditions, the degree of the effects would be less in the action alternatives and relative to the amount of treatments within RHCAs.

Long-term riparian objectives would be enhanced by performing vegetation management (both commercial harvest and precommercial thinning) within RHCAs. Activities in RHCAs are designed to maintain or improve shade conditions, to promote development of large-size trees, and to enhance long-term recruitment of large wood within riparian areas. These activities would contribute to meeting Riparian Management Objectives in INFISH.

Livestock grazing would continue to impact streams by trampling and by consuming riparian (woody) streamside vegetation such as willows. Grazing woody vegetation along streams reduces shade, increases temperature, increases compaction due to trampling, reduces pools and causes stream bank cutting.

After implementation of fuels, thinning and grapple and hand piling treatments, livestock would be attracted to the newly sprouting vegetation that would occur in the uplands and within RHCAs. Because the proposed treatments in the uplands reduce canopy closure in forested stands, there would be a subsequent increase in forage production and palatability in the short-term (2-3 years) in the upland areas.

Bank conditions where cattle have been concentrating are not stable. By treating uplands and reducing canopy closure in forested stands, sunlight reaching the forest floor would result in a subsequent increase in forage in upland areas. In the burned areas, the newly sprouted vegetation would increase in forage palatability and in nutrients for the first 3 years that would make it easier to attract cattle away from riparian areas to uplands. This would alleviate grazing pressure and trampling in RHCAs. The previously burned vegetation would then return to normal level of nutrients as it became part of the landscape and providing increased riparian plant growth and bank stability.

Degraded channel conditions in the headwaters of many streams and in spring areas in the watershed have resulted from livestock concentration. Changing livestock management is outside the scope of this document; however, it is reasonably foreseeable that there will be an improvement in riparian condition due to changes in the range utilization standards in the Grazing Implementation Monitoring Module (IIT, 2000). Studies in the intermountain region indicate that the height of grasses and forbs that are to be left in key riparian areas indicate a level of grazing that allows a corresponding recovery of palatable woody vegetation. Bank stability and channel geometry interact with vegetation but may respond differently, depending on the extent of continued mechanical disturbance in the channel and the current channel condition.

The vegetation and fuels treatments would increase recruitment of large wood as the large trees become old and die and woody riparian vegetation that would increase the potential for downed wood to create pools. These treatments would not have a direct effect on other stream components.

The proposed treatments in Alternatives 2, 3 and 4 are designed to not retard the attainment of the RMOs and would not slow the rate of recovery below the near natural rate of recovery.

In addition to decreases in stream temperature, increased vegetation would lead to changes in fish and amphibian cover and their prey base. Fish and amphibian cover within the lower portions of all the major drainages would change from one dominated by substrate to one dominated by LWD and vegetation. Trout production should increase as the quantity and quality of cover improves (Wesche 1974, Binns and Eisermann 1979). This would allow use of portions of the stream not used currently because of lack of cover. A healthy stand of deciduous vegetation would provide structure for increased diversity and populations of terrestrial and aquatic insects which are important food items for redband trout (Chapman and Demory 1963) and amphibians. In addition, the leaf drop of deciduous trees will provide increased quantities of organic material and nutrients which will be available for aquatic insects and invertebrates (Cummins 1974). The increase in riparian vegetation and large woody material is expected to help stabilize stream banks, reduce erosion and lead to the development of undercut banks. It will also trap sediment from upstream sources (Platts 1991).

Due to past harvest practices, fire suppression, and current conifer stocking, many of these conifer stands would benefit from thinning (commercial and precommercial thinning) and activity fuels under burning. Without treatment, it could take more than a century to begin to move the vegetation towards historical (Hagans et al. 1986). Conifer thinning is expected to increase individual tree growth and promote the development of large trees and LWD recruitment to the stream channel. Fish and amphibian habitat would improve slightly due to increased cover and pool formation with LWD input (summary by Bjorn and Reiser 1991). Increased LWD will also slow hydraulic gradients, reducing potential erosion during high flow events, help to develop narrower and deeper channels, catch and retain sediment and organic matter, and may allow fish colonization of previously unused habitat.

Determination for aquatic species: Alternatives 2, 3, and 4 may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species for redband trout and Columbia spotted frog species or habitat. The action alternatives were designed to enhance or improve dimension, pattern, and profile to streams. There would be no adverse physiological changes or adverse biological changes as a result of any of the action alternatives as defined by INFISH. RHCAs are protected by the standards and guidelines in INFISH and additional Mitigations, Design Criteria, and Resource Protection Measures developed by the interdisciplinary team and described in Chapter 2 of this EIS.

The proposed projects do not violate standards and guidelines (listed in the Fisheries Report, Appendix G) for timber (TM), Fire/Fuels Management (FM), and Roads Management (RF) from INFISH (1995). The proposed projects are designed to avoid adverse effects on inland native fish.

INFISH (1995) defines adverse effects as: "Adverse effects include short- or long-term, direct or indirect management-related impacts of an individual or cumulative nature, such as mortality, reduced growth, or other adverse physiological changes; harassment of fish; physical disturbance of redds; reduced reproductive success; delayed or premature migration; or other adverse behavioral changes. Adverse effects to designated critical habitat include effects to any of the essential features of critical habitat that would diminish the value of the habitat for the survival of native inland fish." Webster's (1998) dictionary defines harassment as: "To annoy or torment repeatedly and persistently; to wear out: exhaust."

Short-term sedimentation from project implementation would not be measurable and would not harass fish. Fish may be displaced for a short period of time during the activity but would have refuge in other areas of the stream away from project activities. Fish would not be annoyed or tormented repeatedly and persistently by the proposed activities. INFISH would not be violated.

Tables 3.37 and 3.38 identify roads that would be used for haul and that need culvert replacements. Fish do not occupy the streams in the areas where culverts would be replaced. Any culvert replacements would be designed to accommodate peak flows.

Botany (Sensitive Species)

The West Maurys Botany Report including the Biological Evaluation for Sensitive Plants, Noxious Weed Management, and Plants of Cultural Value is incorporated by reference. The following is a summary of the pertinent information documented in this report including current conditions, survey information results and effects analyses. Further detail on the summary information can be found in the report. Scientific names of all species mentioned can be found in the report.

Proposed, Endangered, or Threatened Plant Species
Affected Environment

There are no known proposed, endangered, or threatened plant species known or expected to occur on the Ochoco National Forest. Habitat is not present.

Effects of All Alternatives

Therefore, no effect to threatened or endangered species is expected to occur with any of the alternatives.

Sensitive Species
Affected Environment

Of the 26 sensitive plant species documented or suspected to occur on the Ochoco National Forest and the Crooked River National Grassland, 14 do not have potential habitat within the West Maurys project area. These species are: Estes wormwood, South Fork John Day milkvetch, Peck's milkvetch, Deschutes milkvetch, long-bearded mariposa lily, dwarf suncup, narrow-leaved sedge, yellow lady's slipper orchid, Ochoco lomatium, disappearing monkeyflower, Peck's penstemon, Columbia cress, arrow-leaf thelypody and Howell's thelypody. There would be no effect to any of these species from any of the Alternatives.

The 12 sensitive species that have potential habitat, or are known to occur in the analysis area, have been grouped where they occupy similar habitats, and anticipated effects of alternatives are similar. The habitat groups are riparian, moist forest, and non-forest scabland. The following species are those that have either been documented in or near the West Maury analysis area, or have a higher potential for occurrence in the area. The groupings are as follows:

1. species associated with riparian habitats (including wet meadows, seeps and springs): Peck's lily; six *Botrychium* species including ascending moonwort, Crenulate moonwort, Mingan's moonwort, mountain moonwort, twin-spike moonwort, Pinnate moonwort and two sedges; porcupine sedge and interior sedge.
2. species associated with moist forests: Back's sedge.
3. species associated with non-forest scabland habitats : Henderson's needlegrass, Wallowa needlegrass.

Surveys were conducted for sensitive plants in the West Maury area in 1990-1991. Most of these surveys were completed as intuitive control and in areas with the highest potential for Peck's lily and needlegrass species. In 2003, additional intuitive control surveys were completed on a variety of habitats, with emphasis on sites with the potential for Back's sedge and interior sedge. Survey records are available at the Lookout Mountain Ranger District. Only Peck's lily populations were found.

Group 1: Species associated with riparian habitats

Peck's lily habitat - Populations are primarily along meadows and low-gradient drainages in the lower elevations. Compared with other portions of the Ochoco NF, the West Maurys project area contains relatively few areas of potential habitat. The Draft Species Management Guide (Kagan 1996) regards all three Maury Mountains populations as "select" populations, with two of these populations occurring within the West Maury analysis area (Shotgun and upper Bear Creek drainages). The goal is to manage selected populations in order to maintain or increase the overall population. Previously unrecorded sites were discovered in 2003, primarily in areas acquired during a land exchange. They added to the size of one population.

Botrychium habitat – Habitat for the six *Botrychium spp*. is primarily sedge/forb communities associated with seeps, drainages, and the edges of wet meadows. Though several surveys have been completed, none of these species have been documented in the Maury Mountains. Known sites containing populations of

Botrychium spp. in other portions of the Ochoco National Forest are somewhat shaded to fully open at the edges of clearcuts. More individuals have been found at intact sites versus altered sites. At least one population is in a natural wet meadow. Habitat and populations appear to be stable (Ianni et al. 1996).

Porcupine and Interior sedge - These species are associated with very wet riparian habitats, usually in association with perennial water. Porcupine sedge is on the Oregon Natural Heritage Program (ONHP) List 2. Interior sedge is on ONHP List 3, meaning that more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout its range. On the Ochoco National Forest, porcupine sedge has been found only along Black Canyon Creek and other creeks on the Paulina Ranger District. It also occurs in the Bridge Creek watershed on public lands administered by the Bureau of Land Management. It appears to be a species that is more often associated with non-forested lower elevations. Interior sedge has been documented at higher elevations on the Ochoco NF. Neither species has been documented in the analysis area. Habitat for these species appears stable (Helliwell 2001, Yates 2001, and Halvorson 2003).

Direct and Indirect Effects of No Action
Group 1 - This alternative includes no disturbance, such as road construction, timber harvest, burning or other activities that could affect viability of these species. Habitat would be maintained. Therefore, no impact to Peck's lily, the six *Botrychium* spp., the sedges is expected. Monitoring indicates populations of these species are currently stable; therefore short-term effects (<10 years) are unlikely. Because Peck's lily can decline if competition is not set back due to fire or other disturbance, the continued policy of wildfire suppression and lack of management practices, such as tree thinning and prescribed burning, may lead to a long-term decline. Discussion of wildfire risk and potential for population expansion of noxious weeds is included in the cumulative effects section.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Group 1 - All of the action alternatives avoid mechanical disturbance of known populations and high probability habitat for Peck's lily, the six *Botrychium* spp., and the sedges. Except for existing roads and selected crossings, no ground-based equipment would be used in any Riparian Habitat Conservation Areas (RHCAs) or other areas identified as habitat for these species.

Seeding of native or native cultivar grasses and forbs would take place during rehabilitation of log landings and portions of inactivated roads, including those in riparian areas, to reduce potential for erosion and introduction and spread of noxious weeds. Additional seeded grasses and forbs could move into Peck's lily habitat. Observations indicate Peck's lily populations are stable. Populations of native and non-native grasses and non-noxious forbs appear to have shared this habitat with Peck's lily for decades. Therefore, seeding is not expected to affect existing populations. On highly disturbed sites such as roads, seeded grasses and forbs can colonize these sites and reduce risk of some noxious weeds, such as teasel (*Dipsacus sylvestris*), which appears to be a greater threat to Peck's lily. Habitat for the *Botrychium spp.* and the sedges is very moist. Seeding upland grasses and forbs of the species proposed is not likely to expand into this habitat and affect these species. Though some localized impacts due to non-native invasive plants, such as teasel, are apparent in Peck's lily habitat, they presently do not appear to threaten the viability of this or other sensitive species on the Ochoco NF.

The riparian habitat for these species is typically excluded from commercial timber harvest, except for approximately 11 acres in Alternatives 2 and 3. Moist habitat would be unlikely to burn during prescribed burning. However, connected actions including road maintenance, reconstruction and obliteration, noncommercial thinning, and fuels treatments that would occur within the RHCAs, may damage some individual Peck's lily populations or habitat for the *Botrychium* spp. or the sedges. However, these activities are expected to only affect the periphery of such habitat (e.g. thinning along a meadow edge), are not expected to burn with high intensity, or would affect areas already heavily disturbed (e.g. road obliteration), or otherwise primarily in marginal habitat or other areas unlikely to affect viability of populations. Therefore, the immediate, anticipated effects would be that some individuals or habitat may be impacted, but would not be likely to contribute to a trend towards federal listing or a loss of viability to sensitive plant species associated with riparian areas, wet meadows, or seeps and springs.

Where noncommercial conifer thinning and prescribed burning would occur along forest/meadow interface that contains habitat for Peck's lily, the expected long-term effects (>10 years) would be enhanced habitat resulting from the reduction of shade and the expansion of meadow habitat. This could result in expansion of populations. Road obliteration may result in less vehicle use in riparian areas, which could also further protect, and may enhance habitat.

Group 2: Species associated with moist forest

Back's sedge occupies riparian areas and moist meadows, but also has been documented in moist woods and thickets in Eastern Oregon. Recent information suggests occurrences of this species in Oregon have been misidentified, and are actually *Carex cordillerana*, a "new" species yet to be described. Until such change is adopted by the Oregon Natural Heritage Program (ONHP), Back's sedge will be used. Though this species has been found on a variety of moist sites, several populations occur in rocky areas, which are less susceptible to livestock grazing, indicating this species may be more likely to occur in areas with little or no grazing (Lytjen 2003). Back's sedge is on the ONHP List 2. In Central Oregon, this species was last documented in 1916 on private land at "Cabin Station Pasture," adjacent to the Ochoco National Forest along Ochoco Creek.

Though surveys have been completed on a variety of sites throughout the Ochoco NF, including the Maury Mountains in 2003, this species has not been recently documented on the Forest or in Central Oregon. These and earlier surveys indicate this species is likely not present in the Maury Mountains. Back's sedge may have been extirpated from Central Oregon. Closest known populations presently known are approximately 100 miles east of the West Maurys project area. The Umatilla, Malheur, and Wallowa-Whitman National Forests maintain populations of this species, with populations apparently stable (Wood 2003). It is also known to occur on lands managed by the Burns District of the Bureau of Land Management.

Direct and Indirect Effects of No Action

Group 2 - This alternative includes no road construction, road decommissioning, timber harvest, seeding, burning or other activities that could affect viability of this species. Habitat would be maintained. Therefore**,** no impact is expected that would likely contribute to a trend towards federal listing or a loss of viability for Back's sedge. Discussion of wildfire risk and potential for population expansion of noxious weeds is included in the cumulative effects section.

Direct and Indirect Effects of Alternatives 2, 3, and 4

Group 2 - Most of the suitable habitat for this species is associated with upland portions within Riparian Habitat Conservation Areas (RHCAs). Except for existing roads or crossings, no ground based equipment would be used in RHCAs. Therefore, this activity is not expected to affect viability of this species.

As described earlier, seeding of upland grasses and forbs would occur on portions of decommissioned or inactivated roads, including those in this habitat, to stabilize soils and reduce potential for noxious weed introduction or spread. If available, native seed produced from local collections would be used. Otherwise, native cultivars would be used. A variety of native cultivars are present in many areas of the Ochoco National Forest, and do not appear to be aggressive in displacing existing native vegetation. Seeding these native cultivars is therefore not expected to affect Back's sedge. Even less risk would be expected with the seeding of locally collected native grasses and forbs.

Though surveys indicate this species is not likely to occur in the Maury Mountains, and may no longer occur in Central Oregon, potential habitat does exist. The moist sites associated with this species are primarily in RHCAs. Vegetation and fuels management treatments in RHCAs would be completed without the use of ground disturbing equipment. The activities would occur in drier, upland plant communities, which would not be primary habitat for Back's sedge. Activities such as road maintenance and road decommissioning may impact some habitat, but are expected to result in long-term enhancement of riparian habitat by reducing impacts from vehicles and sedimentation. Therefore, some habitat may be impacted by implementation of these alternatives, but is not expected to lead to a trend towards federal listing or affect viability of Back's sedge.

Group 3: Species associated with non-forest scabland habitat

Henderson's and interior needlegrass - These perennial grasses are regional endemic species. They are associated with residual, clay soils known as lithosols. This habitat is commonly referred to as non-forest balds, or "scablands." Both species are on the ONHP List 1. These species are uncommon but widely scattered on the Ochoco National Forest. These species occur sporadically in central and northeastern Oregon on rocky, scabland ridges, often in association with rigid sagebrush (*Artemisia rigida*), Sandberg bluegrass (*Poa secunda*), onespike oatgass (*Danthonia unispicata*), and buckwheat (*Eriogonum*) species. Dry, heavy clay to gravelly, droughty, shallow soil is common, with aspect mostly south to southwest, with gentle to moderate slopes. Known sites are at elevations of 3,400 to 5,400 feet. Closest documented populations are on land managed by the BLM within the North Fork Crooked River watershed. None have been documented within the project area, though few areas of suitable habitat have been surveyed.

Studies indicate that where scabland soils occur on slopes exceeding 15 percent, measurable erosion has occurred over the last 100 years. As a result of these changes, productivity and plant community composition has also likely changed due to the loss of surface soil, grazing, and invasion by exotic species. Monitoring indicates the majority of this change occurred several decades ago. Though this species occurs on these altered sites, it is difficult to estimate effects of these changes on sensitive *Achnatherum* populations.

Where scablands occur on flatter slopes, less erosion has occurred, indicating little change in productivity and plant communities (David 2001).

Monitoring of this species has not been extensive. However, scabland habitat associated with this species presently appears to be stable, and, except for road construction and some damage by OHV traffic, has changed little over the last few decades. Because scabland habitat does not recover from disturbance, protection is emphasized under direction of the Ochoco National Forest and Crooked River National Grassland Land and Resource Management Plan. Long term effects of exotic grasses on this species is unknown, but if associated soils remain undisturbed, effects of exotics are less apparent. On the Ochoco NF, the majority of this habitat appears to be stable, and is expected to remain suitable for these species.

Direct and Indirect Effects of No Action

Group 3 – This alternative includes no road construction, road de-commissioning, timber harvest, seeding, burning or other activities that could affect viability of this species. Habitat would be maintained. Therefore, no impact is expected that would likely contribute to a trend towards federal listing or a loss of viability for the needlegrasses. Discussion of wildfire risk and potential for population expansion of noxious weeds is included in the cumulative effects section.

Direct and Indirect Effects of Alternatives 2, 3, and 4

Group 3 – All action alternatives avoid ground-disturbing activities on scablands that provide the primary habitat for *Achnatherum hendersonii* and *A. wallowaensis.* Observations indicate that scabland habitats are affected little, if at all, by prescribed burning activities. This is due to very low fuel levels inherent to this habitat. Therefore, all alternatives are expected to result in no impact to these species.

Cumulative Effects of All Alternatives (including No Action), All Species Groups

Though habitat quality has declined since pre-settlement on the Ochoco National Forest, observations and monitoring over the last decade indicate habitats for sensitive species are generally stable, despite continuing influences from livestock grazing, noxious weeds, recreation use, stream channel stabilization, road construction and other continuing activities in the project area (Ianni et al 1996, Halvorson 2003). Sensitive species associated with scablands, or non-forest balds, have changed little in the last few decades, and are expected to remain in their current condition. In some areas, riparian improvement projects, such as planting, headcut (stream channel) repair, and development of riparian pastures, appear to have enhanced or expanded habitat for sensitive species associated with riparian areas. Where conifer thinning (and follow-up burning) has occurred, forest stands have moved towards conditions more closely approximating pre-settlement. This is expected to benefit sensitive plant species that favor open conditions. An example is thinning and prescribed burning along a forest/meadow interface, where fire suppression has resulted in

conifer expansion into meadow habitat. Meadow habitat associated with Peck's lily would increase, reversing the trend of "shrinking meadows."

The Sherwood Prescribed burn would not affect sensitive plant habitat. The prescribed burn would be conducted under moist conditions and would result in low intensity burn that would not affect habitat.

Prescribed burning would occur with the West Maury project, and is probable but not currently planned to occur in or adjacent to the project area beyond implementation of the West Maurys Fuels and Vegetation project (except for that already discussed with the Sherwood prescribed burn). Because of low fuel levels on scablands, these sites can only burn during extreme conditions, such as during high winds on hot summer days. Observations indicate these sites are also generally less susceptible to noxious weeds. Therefore, sensitive species associated with scablands are expected to be unaffected by other prescribed burning projects or noxious weeds.

On upland forest sites, prescribed burning can result in increased exposed soils, which can increase susceptibility to noxious weed introduction and spread. This risk increases when prescribed fire exceeds normal intensities, such as occurs during unanticipated weather changes during burning activity. Burning is also likely to improve forage production and palatability, and can also result in increased livestock use on burned areas. If these areas burn too hot, or if livestock grazing occurs before sufficient recovery of vegetation and the soil organic layer, grazing can impact these areas by compacting and displacing soil, and increase risk of erosion, riparian degradation and serve as vectors for introduction and spread of noxious weeds (DeClerk 1997, DiTomaso 1997, Miller et al. 1999, Asher et al. 2001, and Zimmerman et al. 2002). This could affect sensitive plants and habitat. However, large-scale burning can also help distribute livestock, and its impacts, over a wider area. Grazing has occurred on what is now the Ochoco National Forest for a century, and prescribed fire with subsequent grazing has occurred for the last 20 years. Sensitive plant populations presently appear stable following these activities.

Prescribed burning within riparian habitat conservation areas (RHCAs) would occur where specific areas are expected to benefit from burning. While some areas likely to burn are within the RHCA boundary, they are generally outside the actual riparian zone that is influenced by higher moisture levels. Relatively little moist site riparian vegetation, and associated riparian-associated sensitive plant habitat, is expected to burn. Therefore, as discussed above, burning and successive grazing would not be expected to affect sensitive plants or habitat associated with riparian zones. If implemented within normal burning prescriptions, cumulative effects of burning is not expected to affect long-term viability of sensitive plant species, and for some species, such as Peck's lily, continuation of the prescribed burning program may enhance long-term habitat.

Non-native invasive plant species currently do not appear to have a measurable effect on the viability of sensitive plant populations. Noxious weeds are expected to continue to be introduced by vehicles and livestock, but control measures are also occurring under the 1998 Integrated Weed Management Plan, and are expected to continue. Though Canada thistle is expected to expand, its effects to sensitive plants are presently not foreseen. Continued introduction of biological control agents may ultimately result in a decline of this noxious weed.

Assuming noxious weed control continues, weeds are less likely to affect sensitive plant habitats associated with riparian and forest habitats. Therefore, no cumulative effects are expected on sensitive plant species associated with scablands. The Forest Service Northwest Regional Office is currently completing environmental analysis for treatment of noxious weeds. This is expected to result in additional treatment areas on the Ochoco National Forest for integrated noxious weed management. Implementation of additional weed management is expected to have little short-term effect on sensitive plant species, and may have long-term beneficial effects.

With the current vegetation and fuels conditions in the West Maury analysis area, wildfire is foreseeable. Wildfire could affect native plant communities and associated sensitive plants directly (Owen 2003), or indirectly by increasing susceptibility to noxious weeds (Asher et al. 2001).

For the sensitive plant species associated with riparian areas, *Calochortus longebarbatus* var. *peckii*, the six *Botrychium spp., Carex hystericina* and *C. interior*, are not expected to be affected. These species occur in areas that are generally moist year-round, or in the case of *Calochortus longebarbatus* var. *peckii,* are dormant during wildfire season and also in areas with generally light fuel loads, and therefore are not expected to burn with high intensity. *Calochortus spp.* are generally recognized as dependent on disturbances such as wildfire (Kagan 1996, and Kaye et al. 1990 and 1994).

Species associated with scabland, *Achnatherum hendersonii* and *A. wallowaensis* occur on areas with relatively low fuel density. However, these habitats are known to burn during wildfire events (Johnson 1998). Therefore, these species are likely to be adapted to, and remain viable with periodic wildfire.

Carex backii has been documented in association with upland conifers, indicating it is adapted to periodic fire. Therefore, wildfire is not expected to affect viability of this species.

In general, thinning and fuels reduction treatments that move conditions towards the historical range would reduce potential adverse effects due to wildfire. Potential effects due to wildfire would vary with alternatives, with anticipated degree of wildfire effects inversely related to acres treated.

Determining more specific potential effects of wildfire for alternatives is not possible, due to so many unknown variables, such as fuels conditions during a wildfire event, weather, suppression forces available, and other factors. However, risk of future wildfire, and its potential effects to sensitive plants, would vary by alternative, corresponding to the degree of thinning and fuels management activities. Alternative 1 maintains the highest risk, and could decrease with thinning and burning that would occur outside the West Maury projects. Other alternatives would result in a more substantial reduction in wildfire risk, with Alternative 2 resulting in the lowest risk of future wildfire. Alternative 3 would be more aggressive in vegetation management, and would have a lower risk of wildfire than Alternative 4.

In view of the past and continuing activities, assessment of future activities, expansion of noxious weeds, and assessment of general wildfire effects on sensitive plant species, cumulative effects are expected to not change the findings determined in the direct and indirect effects.

Determination For Botanical Species: In summation, for all alternatives, there would be no impact to the viability of any sensitive plant species and implementation of any action alternative would not result in a species trending towards the need for federal listing. Some individuals or their habitat might be impacted. See the EIS Appendix A and the Botany Report for individual species effects determinations.

Management Indicator Species (MIS)
Wildlife Species

The LRMP identified MIS to help determine the effects of management activities on fish and wildlife habitat. Brook and rainbow trout were selected as an indicator of riparian and aquatic habitat. Pileated woodpecker was selected an indicator for species that require mature forest and old-growth habitat and impacts to habitat from proposed activities have already been described under Issue 1E and will not be repeated. Primary cavity excavators and the common flicker were selected to represent species that utilize snags and old-growth juniper habitat, respectively.

Primary Cavity Excavators

The northern flicker is listed as an MIS in the FEIS for the LRMP. This species was identified as an indicator for old-growth juniper. However, the flicker is a habitat generalist and can be found nesting in a wide variety of habitat types so long as snags or hollow trees of the appropriate dimensions are present. It is thought that the habitat generalists among the primary cavity excavators can be assured habitat by providing suitable habitat for the range of species that select for specific habitat types or more limiting habitat conditions. The existing condition for primary excavators is addressed by focusing on two species of habitat specialists, the white-headed and pileated woodpeckers. The pileated woodpecker prefers closed canopy, late to old-growth fir-dominated habitat. The best pileated feeding habitat is within stands dominated by large (>20”dbh) true fir. The white-headed woodpecker prefers ponderosa pine habitat that

has a more open overstory with large pine for foraging and snags for nesting habitat. Its habitat associates are generally called the pine birds, including the pygmy and white-breasted nuthatches and the flammulated owl. This habitat is used by all of the local primary excavators with the exception of the pileated woodpecker, which prefers a fir component for foraging substrate and roost structure. Open forest conditions are preferred by Lewis' woodpecker, Williamson's sapsucker, pygmy and white-breasted nuthatch.

Affected Environment

Current conditions in the Maury Mountains are limited by site potential on south and west facing slopes (juniper and pine sites). On grand fir and Douglas-fir sites (which have better potential to provide pileated woodpecker habitat than pine sites) current conditions are also limited for pileated wood peckers, as closed-canopy stands with large tree size (E5a, M5a, L5a) are below the historical range of variability in dry grand-fir and Douglas-fir PAGs, as shown in Tables 17 through 20 of the Maury Mountains Watershed Analysis. The existing condition is currently deficient in pileated woodpecker habitat as already described in Issue 1E. Current conditions in the Maury Mountains are limiting for white-headed woodpecker, and associated species, since open-canopy stands with large tree size (E5b, M5b, L5b) are below the historical range of variability in dry grand fir, Douglas-fir and (L5b) ponderosa pine PAGs, as shown in Tables 17 through 20 of the Maury Mountains Watershed Analysis. The existing condition is currently deficient in white-headed woodpecker habitat within the watershed, as compared to the historic range of variability. No snags would be cut or removed in any alternative except those identified as safety risks. Effects of the alternatives on white-headed woodpeckers is described in detail below.

Direct, Indirect, and Cumulative Effects of No Action

This alternative would not treat forest stands and thus the current trends in snag and large wood abundance would continue to occur. Mortality due to stand densities being above sustainable levels would result in recruitment of snag and down log habitat. Concurrently, the build up of fuels and canopy conditions that favor crown fires and high fire intensity may ultimately facilitate a stand replacing disturbance event. Such events yield an abundance of snags in the short term, but may result in large areas devoid of snags in 50 to 100 years afterwards. Large snag recruitment would begin again after the new stand matures enough to provide such structure. This may take 150 years or more.

This alternative would maintain the existing acres of fir-dominated understories and the trend toward fir dominated habitats. The No Action Alternative would favor the species that utilize dense, fir-dominated habitats, in the short term. There would be a continued decline in suitability of existing white-headed woodpecker habitat since the species prefers open, pine dominated stands. However, because large size class trees are the limiting factor on this landscape, white-headed woodpecker habitat would increase over time as mid-size trees become larger. This alternative would not move towards the historical range of variability for the white-headed woodpecker and its associates, as rapidly as the action alternatives which promote the development of large size ponderosa pine. White-headed woodpecker habitat is below HRV. Projections indicate that HRV for white-headed woodpecker would be attained in about 25 years if stands continue to develop without large-scale stand replacing disturbance. The risk of such events would be higher under this alternative. This alternative would not accelerate development of habitat for white-headed woodpeckers.

Actions Consistent With Alternatives 2, 3, and 4

No snags would be harvested with any of the Action Alternatives except for safety reasons or road construction needs. Snag and down wood levels as described in the Viable Ecosystem (VE) Guide would be applied to proposed harvest activities. Snag levels have been developed for each seral structural stage. A summary of snag and down wood levels based on plant association groups and the historic range of variability for seral/structural stages provides an approximation of the numbers of snags to be maintained within each PAG. VE guidelines are applied on a landscape basis. Table 3.31 displays snag levels averaged by plant association group and Table 3.32 displays down wood levels by plant association.

Table 3.31 Viable Ecosystems Guidelines for Snags (average number of snags per acre)

Plant Association Group	Snags<20 inches DBH		Snags>20 inches DBH	
	HRV-low	HRV-high	HRV-low	HRV-high
Dry grand fir	3.3	7.3	1.0	3.4
Douglas-fir	1.5	3.4	.3	1.9
Moist ponderosa pine	1.1	2.4	.2	1.5
Dry ponderosa pine	0	.2	0	.6

Table 3.32 Viable Ecosystems Guidelines for Down Wood Levels (average lineal feet per acre)

Plant Association Group	HRV Low	HRV High
Dry grand fir	81	257
Douglas-fir	71	233
Moist ponderosa pine	55	167
Dry ponderosa pine	6	55

Direct and Indirect Effects of Alternative 2

This alternative would help restore white-headed woodpecker habitat on most of the commercial harvest area. Where noncommercial thinning occurs in two-storied stands with a component of large live ponderosa pine and suitable snags for nesting, this treatment would also serve to help restore white-headed woodpecker habitat. This alternative is expected to restore white-headed woodpecker habitat on 339 acres post harvest. This alternative would have the greatest potential for creating habitat for the white-headed woodpecker and its habitat associates. However, white-headed woodpecker habitat would remain below HRV post treatment. Projections indicate that HRV for white-headed woodpecker would be attained in about 25 years if stands continue to develop without large-scale stand replacing disturbance. Snags and down wood may be consumed by prescribed fire. This should be partially offset by the creation of down wood due to fire-killed trees. The effect of fire on snag retention would likely result in a higher number of hard snags, with a concurrent reduction in soft and hollow snag habitat. Because of anticipated low fire intensity, it is also likely that while large existing snags may be consumed by fire, the snags created by fire would tend to be in smaller size classes due to the vulnerability to fire mortality of smaller, thin barked trees. This alternative would accelerate development of habitat for white-headed woodpeckers.

Direct and Indirect Effects of Alternative 3

This alternative would help restore white-headed woodpecker habitat on most of the commercial harvest area. Where noncommercial thinning occurs in two-storied stands with a component of large live ponderosa pine and suitable snags for nesting, this treatment would also serve to help restore white-headed woodpecker habitat. This alternative is expected to restore white-headed woodpecker habitat on 249 acres. Prescriptions designed to meet goshawk or pileated woodpecker objectives under this alternative would have some effect on the trends of pine and fir habitats, but less than stands treated with prescriptions designed to meet silvicultural objectives. This alternative would have the moderate potential for creating habitat for the white-headed woodpecker and its habitat associates compared to Alternative 1 and 2. However, white-headed woodpecker habitat would remain below HRV post-treatment. Projections indicate that HRV for white-headed woodpecker would be attained in about 25 years if stands continue to develop without large scale stand replacing disturbance. Snags and down wood may be consumed by prescribed fire. This should be partially offset by the creation of down wood due to fire-killed trees. The effect of fire on snag retention would likely result in a higher number of hard snags, with a concurrent reduction in soft and hollow snag habitat. Because of anticipated low fire intensity, it is also likely that while large existing snags may be consumed by fire, the snags created by fire would tend to be in smaller size classes due to the vulnerability to fire mortality of smaller, thin barked trees.

Direct and Indirect Effects of Alternative 4

This alternative would help promote development of white-headed woodpecker habitat on most of the thinning area. Where noncommercial thinning occurs in two-storied stands with a component of large live ponderosa pine and suitable snags for nesting, this treatment would also serve to help restore white-headed woodpecker habitat. This alternative is expected to move stands toward restoration of white-headed woodpecker habitat on 339 acres, but would not be as effective in creating open forest conditions as the

commercial treatments prescribed in Alternatives 2 and 3. However, this alternative retains a larger number of co-dominant fir trees that also contribute to size class. Therefore the acreages displayed in Table 3.33 are slightly higher for this alternative based on quantity of stands meeting nesting habitat criteria for this species. They do not necessarily reflect the quality of habitat for this species which is dependent on open stands of ponderosa pine. This alternative would have moderate potential for creating habitat for the white-headed woodpecker and its habitat associates. White-headed woodpecker habitat would remain below HRV post treatment. Projections indicate that HRV for white-headed woodpecker would be attained in about 25 years if stands continue to develop without large scale stand replacing disturbance. Snags and down wood may be consumed by prescribed fire. This should be partially offset by the creation of down wood due to fire-killed trees. The effect of fire on snag retention would likely result in a higher number of hard snags, with a concurrent reduction in soft and hollow snag habitat. Because of anticipated low fire intensity, it is also likely that while large existing snags may be consumed by fire, the snags created by fire would tend to be in smaller size classes due to the vulnerability to fire mortality of smaller, thin barked trees. This alternative would accelerate development of habitat for white-headed woodpeckers.

Table 3.33 White-headed Woodpecker Nesting Habitat (acres)

Alternative	HRV low	HRV high	Acres Post Treatment	Acres in 10 yrs	Acres in 30 yrs
Alternative 1	19,367	38,765	14,114	16,945	20,535
Alternative 2	19,367	38,765	14,453	17,205	20,663
Alternative 3	19,367	38,765	14,363	17,107	20,568
Alternative 4	19,367	38,765	14,984	18,555	23,212

Cumulative Effects of Alternatives 2, 3, and 4

Since none of the action alternatives remove snags, existing levels would be retained with exceptions for safety hazards, road construction, and loss from prescribed burning. As a result of past harvest activities and stands adjacent to roads (subject to firewood gathering), stands previously managed have reduced snag densities. Regeneration harvests normally result in little snag retention. Selective harvest prescriptions focused on removing less thrifty trees and probably resulted in reduced natural rates of mortality in stands. There are no reasonably foreseeable future activities, such as livestock grazing, which would have any effect on snag levels. Based on harvest history in the project area, the existing road network and assumptions further detailed in the Wildlife Report, the level of snag retention within the project areas is estimated to be at 77 percent of the potential population capability for primary cavity excavators, compared to data tables in Thomas 1979.

Decayed Wood Advisor (DecAID) - DecAID (PSW-GTR-181) is an advisory tool to help land managers evaluate effects of forest conditions and existing or proposed management activities on organisms that use snags, down wood, and other wood decay elements. DecAID is not a model, it is a synthesis of wildlife research and forest inventory data, and provides information regarding abundance of snags and down wood on forested landscapes and their use by wildlife. DecAID can provide a basis for determining the number and distribution of snags and logs. It is possible to estimate the abundance and size distribution of woody material based on habitat types and structural conditions. Then the abundance of dead wood habitat can be related to the occurrence of various wildlife species that require dead wood habitat for some part of their life cycle. A more detailed description of how DecAID was utilized is found in the Wildlife Report and is incorporated by reference, including tolerance levels for individual species by plant association group and size / structure conditions.

Cumulative species curves provide data on how wildlife species use snags greater than 10 inches for nesting, roosting, resting, and/or foraging. Wildlife use of snag sizes and densities are based on various studies conducted within the relevant habitat types, but not necessarily in the project area or on Ochoco National Forest. DecAID shows levels based upon "percentage of tolerance". This tolerance can be viewed as representing levels of assurance or confidence of providing for a particular species. Information is given at the 30, 50, and 80 percent tolerance levels. Some sites are inherently limited in their ability to provide high tolerance levels. For example southwest aspects in dry ponderosa pine/Douglas-fir forests

may not be capable of growing the number of trees needed to reach the 80 percent tolerance levels, whereas sites on north or northeast facing slopes could.

The comparison of estimated historic to current snag density and size class distributions reveal that in most cases the amount of area devoid of snags (in both size classes, 10+ inch and 20+ inch in diameter) is less than might be expected under natural conditions. This is likely the result of aggressive fire suppression limiting the extent of high-intensity fires and reburns, which tend to result in areas devoid of snags at some point in time (after the fire, snags fall down or are consumed in a reburn). The amount of area with low density of snags (in both size classes) tends to run higher than might be expected under natural conditions in ponderosa pine and Douglas-fir habitat types. This likely results from a combination of factors including past vegetation management, firewood cutting, fire suppression, and the activity of insect and disease agents. The amount of area with low density of snags (in both size classes) is also higher in eastside mixed conifer stands dominated by small/medium sized trees. This represents the current trend of mortality to trees in overstocked stands that have resulted from fire suppression and species conversion associated with historic timber management practices. Eastside mixed conifer dominated by large structure trees are lacking on the current landscape, so all categories of snag size and density are below what would be expected under historic conditions for this habitat type. This is largely the result of past timber management. High density categories of snags (in both size classes) run lower in the current environment than would be expected under natural conditions in eastside mixed conifer stands. This likely results from a combination of factors including past vegetation management and firewood cutting. High density categories of snags (in both size classes) are comparable to what might be expected under natural conditions in ponderosa pine and Douglas fir stands. These habitat types had limited distribution of areas with very high snag density under natural conditions due to site capability and fire frequency.

This project does not propose to harvest existing snags in any action alternative, so the amount of snags present within the project area should not be substantially altered by implementation of this project. The project would remove trees up to 20.9 inches d.b.h., so there could be an effect on the abundance of trees available for recruitment of future snags. However, the action alternatives do not propose harvest of existing snags, so the amount of snags present within the project area should not be substantially altered by implementation of silvicultural treatments under any alternative in the short term. The abundance, size and condition class distribution of snags may be affected by prescribed burning as described above under alternative effects. However, it is not anticipated that existing snag abundance would be substantially altered by implementation of any action alternative. Thus, the percent of population potential and percent tolerance for species evaluated under DecAID should not be further affected by the alternatives.

Requirements for abundance and distribution of habitat for cavity nesting species is described in the Wildlife and Fish Forest-wide Standards and Guidelines section of the LRMP. The LRMP (p. 2-243) specifies a forest-wide objective across all allocations of 47 percent. The LRMP (p. 4-262) provides standards by management area as well. Objectives for management areas within the Maury Mountain Watershed range from 0 to 100 percent. Using a weighted average of the acres within each management allocation for the West Maury Project Area and the snag habitat levels specified in the LRMP, a project level objective of approximately 49 percent can be obtained. The current snag level within the project area is at 77 percent. This meets the objective for the forest-wide scale, as well as the minimum level that would be projected based on objectives for management allocations within the project area.

The Regional Forester's Plan Amendment 2 (Eastside Screens) revised the LRMP and requires snags to be retained at the 100 percent population level (at least 2.25 snags per acre in ponderosa pine and mixed conifer PAGs) within harvest units. This project does not propose to salvage dead trees and would not affect ability of forested stands in the project area to meet the Amendment 2 requirement of not less 100 percent of maximum potential population in the future.

The Viable Ecosystem Management Guide provides information on snag retention by PAG and seral/structural stage. No harvest unit would have snags marked for removal. This project would not alter the current snag levels at a landscape scale and would not affect the ability of forested stands within the project area to meet the standards in the future.

Snag distribution requirements would be met to the extent that snags are present in the existing condition or are present after fuels treatment. Harvest treatments should not alter the available snag habitat level, as snags are not to be removed other than as required for safety. Fuels treatments may alter snag availability as described above. Post treatment monitoring would be conducted to verify that snag requirements are met, or to identify areas with deficiencies in which to plan for snag creation and recruitment (Chapter 2). This monitoring should be done on at least 10% of the treatment units. Since all trees greater than or equal to 21 inches would be left, and trees less than 21 inches would be thinned, opportunities to provide snags in deficient areas, and sources for recruitment of future snags would be retained.

Past timber management has reduced the abundance of overstory trees, snags, and large down logs on private timberlands in the project area. These actions have limited the suitability of these private timberlands for occupancy by woodpeckers and other primary cavity excavators.

Western Flicker

The northern flicker is a management indicator for old-growth juniper habitat. The HRV for old-growth juniper habitat in the project area ranges from 30-72 acres. Currently, there is 1 acre of old-growth juniper habitat. None of the alternatives would modify the existing amount of old-growth juniper habitat. All juniper trees greater than 12 inches in diameter would be retained. Effects to this species have not been discussed because none of the alternatives propose to substantially alter habitat, only beneficial impacts would be realized by juniper thinning. None of the alternatives would have an affect on large juniper tree habitat that is suitable for nest excavation.

Fisheries

Fish species identified by the Ochoco National Forest LRMP as management indicator species are listed in the FEIS for the plan. These fish species are rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*). In the past, these fish have been stocked by the Oregon Department of Fish and Wildlife. They are no longer stocked in the streams in the West Maury project area but naturally reproduce in many streams (Class II). For purposes of this analysis, effects to redband trout have already been described in the Threatened, Endangered, Sensitive Species section of this Chapter and will act as a surrogate for MIS fish species effects analysis. No further evaluation will be discussed in this section.

Other Wildlife Species (not MIS or Threatened, Endangered, Proposed or Sensitive Species)

Other Raptors

Affected Environment

There are 16 raptor nests (other than goshawks) which have been identified in the project area. They include 9 red-tailed hawk, 2 Cooper's hawk, 1 great horned owl, 1 osprey, 1 golden eagle and 2 bald eagle nests. Refer to the Threatened, Endangered, Proposed or Sensitive Species section for a discussion on northern bald eagles. No prairie falcon nests are known to occur within this project area. There would be no impacts to prairie falcons. Seasonal restrictions have been identified for treatment units near raptor nests. See Mitigations, Design Criteria, and Resource Protection Measures.

Direct and Indirect Effects of No Action

Alternative 1 would not treat forest stands and thus the current trends in forest development would continue to occur. This alternative would maintain the existing acres of fir-dominated understories and the trend toward fir dominated habitats. This would tend to favor the forest dwelling accipiters (Coopers hawk) and the small forest dwelling owls (pygmy owls, saw whet owls). These dense, fir-dominated understory conditions would result in a continued loss of herbaceous and shrubby vegetation in the understory. As a result, shrub and ground nesting bird populations (prey) would remain depressed, and the ability of open forest avian predators to effectively hunt ground dwelling small mammals would continue to be limited. There would be a continued decline in habitat for species which prefer grassland/shrub steppe, open forest and edge habitats (ferruginous hawks, harriers, red-tailed hawks, kestrels, flammulated owls, barn owls and great horned owls). Tree mortality due to stand densities being above sustainable levels would result in

recruitment of snag and down log habitat over time. This would likely trigger an increase in the woodpecker population in the short term, which are also prey for avian species. Concurrently, the build up of fuels and canopy conditions that favor crown fires and high fire intensity may ultimately facilitate a stand replacing disturbance event. Such events would provide foraging opportunities for species that prefer to hunt open country, but would result in limited nesting habitat for species that nest in green forests or live trees. This alternative would maintain the suitability of all existing habitat for raptors in the short-term and would not result in disturbance or displacement of raptors from existing occupied territories.

Direct and Indirect Effects of Alternative 2
Canopy closure would be reduced to less than 60 percent in treated stands. Retained trees would expand their crowns in diameter and depth in response to the release from competition that results from the thinning. Thinning of mid-story trees would promote the development of large structure trees, large snags and down logs. Reducing competition from below is also likely to improve the longevity of existing large trees in the overstory. Thus, treatments may reduce suitability, in the short term, for the forest dwelling accipiters and the small, forest-dwelling owls. However, over time, the treatments may maintain overstory canopy by improving health and vigor of retained trees in the stands. The development of herbaceous and shrubby vegetation in the understory that results from reducing conifer density, should also improve habitat for many species of shrub and ground nesting birds, and the ability of open forest avian predators to effectively hunt ground dwelling small mammals would also be improved. Large raptors that nest on large trees or snags in relatively open forests, such as osprey, red-tailed hawks and golden eagles would benefit in the long-term from treatments that promote the development of large trees and snags. This type of treatment would occur on the most acres under this alternative. This alternative would maintain the suitability of habitat for raptors that select for open forest environments within treated stands and for other species in untreated stands. This alternative has the potential to disturb nesting raptors in occupied territories.

Direct and Indirect Effects of Alternative 3
Impacts and improvements described under alternative 2 would also occur under alternative 3 in treated stands. However, less area would be treated. Within goshawk post-fledging areas (PFA) and pileated woodpecker feeding habitat the intensity of treatment would be reduced as described in Issue 1C (goshawk) and 1E (pileated habitat). Thus, the reduction in habitat suitability for dense forest dwelling species and improvement in habitat conditions for open forest dwelling species under this Alternative would be between that in Alternatives 1 and 2. This alternative would maintain the suitability of habitat for raptors that select for open forest environments within treated stands (but on less acres than in Alternative 2) and for other species in untreated stands. This alternative has potential to disturb nesting raptors in occupied territories.

Direct and Indirect Effects of Alternative 4
Impacts and improvements described under alternative 2 would also occur under alternative 4 without commercial harvest. However, the intensity of treatment would be substantially less than either Alternative 2 or 3 because of the lack of commercial harvest in this alternative. Thus, the reduction in suitability for dense forest dwelling species, and improvement in habitat conditions for open forest dwelling species under this alternative would between that in Alternatives 1 and 2. This alternative would improve the suitability of habitat for raptors that select for open forest environments within treated stands (but not as well as the other action alternatives) and for other species in untreated stands. This alternative has potential to disturb nesting raptors in occupied territories.

Cumulative Effects of Alternatives 1, 2, 3, and 4
Past regeneration and commercial thinning harvest treatments have reduced overall dense canopy species habitat in the project area. See the Wildlife Report for more specific details on acreage figures by treatment type. In the future, it's likely, but not currently planned, that management would continue to move forested stands toward historic conditions. This would increase the abundance of open, park-like ponderosa pine stands on dry sites. There would likely be a continuation to manage forests to increase the abundance of large tree structure in single story structural classes on more mesic sites. This management trend is likely to continue until the multi-strata LOS and single-strata LOS is within the HRV. This process would reduce the amount of habitat available for species that prefer dense forest canopy, while increasing the amount of

habitat available for species that select more open stands. Thinning of stands with relatively small trees should promote the development of large tree habitat in the future. The recruitment of large trees and large snags would contribute potential habitat for species that nest high in tall trees, such as red-tailed hawks, or that require large snags to accommodate appropriately sized cavity nests, such as kestrels and many owls.

Adjacent to Forest Service managed lands within the project area there are 6,009 acres of privately owned timberland within the analysis area (within subwatersheds that overlap the project area boundary). On these lands, past timber management has reduced the abundance of overstory trees and snags. These actions may have limited the suitability of these timberlands for occupancy by some species of raptors. Some species are likely to nest in timbered areas on National Forest land and forage over privately owned habitat (e.g., red-tailed hawks). However, some species prefer to nest in open habitats and may nest and forage within the privately owned habitat in the analysis area (e.g., ferruginous hawks).

There are no other reasonably foreseeable future activities, including livestock grazing, which would affect raptor habitat.

Neotropical Birds

Affected Environment

Executive Order 13186 titled "Responsibilities of Federal Agencies to Protect Migratory Birds" directs the environmental analysis of Federal actions to evaluate the effects of actions on migratory birds with an emphasis on species of concern. The neotropical migratory birds are described in the Partners In Flight - Northern Rocky Mountains Bird Conservation Plan. This conservation plan identifies priority habitats and focal species by subprovince. The Ochoco National Forest is within the Blue Mountains subprovince. Table 3.34 lists the habitats and species listed for the Blue Mountains subprovince.

Table 3.34 Migratory Bird Species of Concern

Priority Habitats	Focal Species for the Blue Mountains Subprovince
Dry Forest	White-headed woodpecker, flammulated owl, chipping sparrow, Lewis' woodpecker
Mesic Mixed Conifer	Townsend's warbler, Vaux's swift, varied thrush, MacGuillivary's warbler, olive-sided flycatcher
Riparian Woodland	Lewis' woodpecker, red-eyed vireo, veery
Riparian Shrub	Willow flycatcher
Subalpine Forest	Hermit thrush
Montane Meadows	Upland sandpiper
Steppe Shrublands	Vesper sparrow
Aspen	Red-naped sapsucker
Alpine	Gray-crowned rosy finch

Nine of the seventeen species listed were modeled using the data derived from the Viable Ecosystems process. White-headed woodpecker was analyzed and is described in the Primary Cavity Excavators section previously in this Chapter. Of the remaining eight species analyzed, four are currently above the minimum amount of habitat abundance and four are below. The existing amount of priority habitat has been compared to the desired range of habitat identified as the Historic Range of Variability (HRV). This allows a comparison between what exists today as opposed to the balance of conditions that may have existed historically. Generally, there is a relative shortage of habitat for those species associated with large tree structure and open forest conditions. These trends are primarily the result of past management practices and fire suppression activities.

Species whose habitat is currently below historic abundance are: chipping sparrow, Lewis' woodpecker, olive-sided flycatcher and Townsend's warbler. Species whose habitat is currently within historic abundance are: flammulated owl, varied thrush, MacGilliavary's warbler, and hermit thrush. Species that require specialized habitats such as riparian vegetation, meadows, shrublands, aspen or alpine cannot be modeled this way. None of the alternatives include reducing shrub or meadow habitat. The action alternatives do include restoration activities in stands where aspen occurs and prescribed burning would

result in restoration of upland shrub and grassland habitats. The upland sandpiper is discussed in the threatened, endangered and sensitive species section of this EIS. This species is a Region 6 Regional Forester's Sensitive Species and its habitat is not affected by the project proposals.

The Vesper sparrow inhabits steppe shrublands found at lower elevations and are not present within forested habitats or in the project area. The Gray-crowned rosy finch inhabits alpine habitats that do not occur within this project area. Therefore, the proposed activities would have no effect to these species or their habitats.

Additional specific information on species habitat projections can be found in the Wildlife Report. The following table displays the existing acres of species' habitat to the historic range of variation of species' habitat within the project area.

Table 3.35 Comparison of Existing Habitat to HRV, in acres

Species	HRV minimum Acres	HRV maximum Acres	Existing Acres	Status
Flammulated Owl	23,520	40,799	27,170	Within Range
Chipping sparrow	16,970	34,541	12,446	Below minimum
Lewis' woodpecker	12,840	22,786	6,010	Below minimum
Varied Thrush	1,518	4,532	2,364	Within range
MacGilliavary's warbler	0	0	0	Within range
Olive-sided flycatcher	14,246	27,179	6,983	Below minimum
Townsend's warbler	578	1154	438	Below minimum
Hermit Thrush	1,499	2,589	1,684	Within range

Direct, Indirect, and Cumulative Effects of No Action

No activities outside of the on-going operation and maintenance that occur on the forest would occur. By delaying density management in forested stands, this alternative would continue to perpetuate the abundance of wildlife species associated with dense forests having true-fir and Douglas-fir understories. Under this alternative, there would be a continued decline in habitat abundance for all species that select open forest and early seral conditions as denser, mid to late seral conditions continue to develop. In the long-term, Alternative 1 would result in the least amount of habitat for species that select for open forest or early seral conditions. In the long-term, this alternative would result in the most habitat of all the alternatives for these species associated with denser, mid to late seral conditions. Habitat projections for the individual species are identified in the Wildlife Report and have not been repeated here, but are incorporated by reference. In the long term, approximately 30 years, habitat for all species remains similar to current conditions, except for habitat for Townsend's warbler which moves to within historic conditions. Therefore those species' habitat that was within HRV remains so and those species' habitat that was below, remains below.

The red-eyed vireo, veery and willow flycatcher are associated with riparian woodland and shrub plant communities. These habitats exist within the project area, but are small in size and fragmented. These species may be present and utilizing the habitats as available. The No Action Alternative would retain the current trends in displacement of riparian vegetation due to encroachment by young conifers in portions of this habitat type. The red-napped sapsucker is a bird that uses aspen dominated vegetation and riparian woodlands almost similar to the vireo, veery and willow flycatcher. The No Action Alternative does not propose aspen restoration activities involving thinning of conifers which are competing with aspen. This alternative maintains habitat for species that select for dense forest conditions and continues the decline in habitat conditions for species that use open forest conditions until one or more disturbance events (insects or fire) create open conditions in the future. Past management actions have been incorporated in the discussion of existing conditions. There are no current or reasonably foreseeable future activities that would affect habitat for neotropical bird species within the project area. Livestock grazing would continue and current impacts to riparian woodland and shrub plant communities would continue and these impacts

are incorporated into the existing condition discussions for these plant communities, including the acreage estimates of habitat and the projections.

Direct and Indirect Effects of Alternative 2
This alternative results in increases in habitat for species that select for open forest and early seral conditions due to stand density reduction and the favoring of early seral species. The habitat relative to HRV (within or below) remain as described above (Table 3.35), except that habitat for Hermit thrush becomes below HRV post-treatment. In the long-term, Alternative 2 results in the greatest amount of habitat for all open forest species as well as those that select for large tree size. Proposed treatments would cause a short-term reduction in the amount of habitat for species that select for denser forests or later seral conditions. In the long-term (measured at 30 years post-treatment), habitat for all species compares to HRV as described above (if within stays within, if below stays below), except that habitat for Townsend's warbler becomes, and hermit thrush returns to, within historic abundance levels.

This alternative would alter the current trend in displacement of riparian vegetation due to encroachment by young conifers in the portions of this habitat type where prescribed fire or silvicultural treatments are employed. This would result in a beneficial effect to species associated with riparian woodland and shrub plant communities (red-eyed vireo, veery and willow flycatcher). This alternative also proposes aspen restoration activities in stands where aspen occurs involving thinning of conifers which are competing with aspen clones. This would occur in clones within 37 harvest units. This would result in a beneficial effect to species associated with aspen dominated vegetation. These treatments are consistent with the goals and objectives for these habitats as listed in the Partners In Flight, Landbird Conservation Strategy for the Northern Rocky Mountains. Specific design criteria for maintenance of riparian shrub habitat are included Chapter 2. This alternative reduces habitat for species that select for dense forest conditions and reverses the decline in habitat conditions for species that utilize open forest conditions.

Direct and Indirect Effects of Alternative 3
This alternative results in increases in habitat for species that select for open forest and early seral conditions due to stand density reduction and the favoring of early seral species. The habitat relative to HRV (within or below) remain as described above (Table 3.35) post treatment. In the long-term, this alternative results in more of habitat for all open forest species as well as those that select for large tree size, but not as much as in Alternative 2. Proposed treatments would cause a short-term reduction in the amount of habitat for species that select for denser forests or later seral conditions. In the long-term (measured at 30 years post-treatment), habitat for all species compares to HRV as described above (if within stays within, if below stays below), except that habitat for Townsend's warbler becomes within historic abundance levels.

This alternative would alter the current trend in displacement of riparian vegetation due to encroachment by young conifers in the portions of this habitat type where prescribed fire or silvicultural treatments are employed. This would result in a beneficial effect to species associated with riparian woodland and shrub plant communities (red-eyed vireo, veery and willow flycatcher). This alternative also proposes aspen restoration activities involving thinning of conifers which are competing with aspen clones. This would occur in 29 harvest units. This would result in a beneficial effect to species associated with aspen dominated vegetation. These treatments are consistent with the goals and objectives for these habitats as listed in the Partners In Flight, Landbird Conservation Strategy for the Northern Rocky Mountains. Specific design criteria for maintenance of riparian shrub habitat are included Chapter 2. This alternative reduces habitat for species that select for dense forest conditions and reverses the decline in habitat conditions for species that use open forest conditions, but not to the extent of Alternative 2 but more than Alternative 4.

Direct and Indirect Effects of Alternative 4
This alternative results in slight increases in habitat for species that select for open forest and early seral conditions due to stand density reduction and the favoring of early seral species. The habitat relative to HRV (within or below) remain as described above (Table 3.35). In the long-term, alternative 4 results in the least amount of habitat for all open forest species of the action alternatives. Proposed treatments would cause a short-term reduction in the amount of habitat for species that select for denser forests or later seral

conditions compared to no action, but retains more closed forest habitat than the other action alternatives. In the long-term (measured at 30 years post-treatment), habitat for all species compares to HRV as described above (if within stays within, if below stays below), except that habitat for Townsend's warbler becomes within historic abundance levels.

This alternative would alter the current trend in displacement of riparian vegetation due to encroachment by young conifers in the portions of this habitat type where prescribed fire or silvicultural treatments are employed. This would result in a beneficial effect to species associated with riparian woodland and shrub plant communities (red-eyed vireo, veery and willow flycatcher). This alternative also proposes aspen restoration activities involving thinning of conifers which are competing with aspen clones. This would occur in clones within 37 harvest units. This would result in a beneficial effect to species associated with aspen dominated vegetation. These treatments are consistent with the goals and objectives for these habitats as listed in the Partners In Flight, Landbird Conservation Strategy for the Northern Rocky Mountains. Specific design criteria for maintenance of riparian shrub habitat are included Chapter 2. This alternative reduces habitat for species that select for dense forest conditions and reverses the decline in habitat conditions for species that use open forest conditions compared to no action, but to a much lesser extent than Alternatives 2 or 3.

Effects Common to Alternatives 2, 3, and 4

There are no measures specific to neotropical birds. However, measures prescribed to restrict activities within nesting seasons for goshawk and other raptors and during elk calving season would also afford reduced disturbance to nesting birds where their home ranges overlap with restricted areas. In addition, due to logistical limitations on harvest, thinning and burning activities, some of the work would be scheduled outside of the nesting season. However, a portion of the project work would occur during the nesting season and some individuals would likely be impacted by management activities. Since most migratory birds occupy relatively small nesting season home ranges and are present in relatively large numbers, it is expected that suitable habitat outside of treatment units would provide alternate cover for birds that are displaced during activities. The area outside of treatment units would also provide source populations for re-colonization of areas in which individuals have been lost. Birds that are disturbed early in the nesting season may move out of the treatment area during operations and may re-nest later, or outside of the area of activity. In some cases, habitat outside of the unit may be limiting or fully occupied, in which case the displaced birds may become non-reproductive during the year of operation. These would be short-term impacts to individual birds or pairs of birds. This is a trade-off under the action alternatives for the long-term benefits of providing increased amounts of habitat for the focal species (and the communities they represent) that are currently below the minimum historic levels within this watershed, and for the restoration of habitat for species that utilize herbaceous and shrubby vegetation.

Cumulative Effects of Alternatives 2, 3, and 4

Since the early 1990's the Ochoco National Forest's emphasis has shifted from removal of large pine to re-establishment of large pine and larch, and other single-strata LOS stands. Through the foreseeable future, the Ochoco National Forest will continue to manage forested stands to increase the abundance of open, single-storied ponderosa pine stands on dry sites. This is the type of forest structure thought to be the historic condition on the majority of ponderosa pine sites. There would also be a continuation to manage forests to increase the abundance of large tree structure in both multi- and single-strata structural classes on more mesic sites. This management trend would likely continue until multi-strata LOS and single-strata LOS is within the HRV. This process would reduce the amount of habitat available for species that prefer dense forest canopy, while increasing the amount of habitat available for species that select more open stands and larger trees. Thinning of stands with relatively small trees should promote the development of large tree habitat in the future. The recruitment of large trees and large snags would contribute potential habitat for species that nest high in tall trees, or that require large branches or large snags to accommodate nests. Ultimately, all species habitat would move toward an abundance and distribution that is thought to be within the HRV based on site conditions within the project area.

Continued livestock grazing would affect riparian woodland and shrub communities, but the proposed treatments in these areas would promote these species by reducing competition from conifer species. This would result in more riparian woodland and shrub community development and result in more habitat in the future.

Other forest management activities, such as grazing, mining, and recreational use can influence the quality of habitat and use of areas by migratory birds. For example, herbivory can alter the structure and composition of herbaceous and shrubby vegetation, which can influence changes in forage base and nesting cover for some species of birds. For species that forage in open grassy areas, such as blue birds, the effect can be positive. For species that nest in willow thickets, such as willow flycatchers, the effects can be negative. For other species that nest and forage in the overstory, such as white-headed woodpeckers there is no effect from herbivory on the forest floor.

Hydrology / Watershed Conditions

Conditions relative to percent EHA and water yield have already been discussed under Key Issue 2 earlier in this chapter. The following are related to sedimentation/turbidity, chemical effects, temperature, and riparian/wetlands. The following information is summarized from the Water Quality Report.

Sediment

Affected Environment

It is estimated that most of the sediment in the streams in the West Maury Project area is coming from in-channel erosion such as bank erosion, head cuts, and channel scour. Channel destabilization can result from changes in peak flows, sediment load, and livestock impacts, but down cutting in the Crooked River and Bear Creek appear to be a major cause for the instability in the West Maury project area. Potential increases from in-channel sources resulting from harvest and natural disturbance induced increases in runoff are addressed by the EHA model.

State water quality standards direct that turbidity levels should not exceed background levels by more than 10 percent. The LRMP indicates that this would be accomplished by maintaining stream bank stability and implementing Best Management Practices (BMPs). BMPs would be monitored to verify that management objectives are being accomplished. Treatments within Riparian Habitat Conservation Areas were designed to meet Riparian Management Objectives (RMOs). See Appendix C for a listing of RMOs and Appendix D for a listing of BMPs.

The Relative Erosion Rate procedure evaluates sediment delivery. The procedure does not calculate the actual sediment load but calculates a Relative Erosion Rate (RER) that is used to compare alternatives. It evaluates direct changes to sediment load resulting from current management practices and average rates that reflect previous practices and recovery rates. Only management activities within 600 feet of mapped streams are evaluated. Soil erosivity is based on the Forest Soil Resource Inventory (SRI); slopes are derived from the GIS Digital Elevation Model (DEM); delivery potential is calculated from a technique derived from PSWHA I (Leven, 1978); and potential sediment yield and recovery are calculated using the "Guide for Producing Sediment Yield from Forested Watersheds" (Forest Service, R1/R4, 1981), and WATSED (Forest Service, R1, 1992). Based on the low average annual precipitation in the project area, low volume per acre, and not operating in the rainy season, haul delivered sediment should be low (less than 10 percent of the road delivered sediment). Because of the uncertainty of the destination mill, the accuracy of the model, and the low sediment delivery, haul delivered sediment was not calculated. No machine fireline is proposed with any action alternative, and the amount of delivered sediment from hand fireline would be very small. Therefore, sediment delivery from hand fireline construction was not calculated with this RER analysis.

The RER depicts potential sediment delivery based on the amount and type of ground disturbance, slope/erosion class (based on soil erosivity and slope), and distance to stream channels. The RER model is an effective tool for comparing alternatives. The actual sediment delivery may be higher or lower than predicted depending on the amount of vegetative recovery before storm events and storm intensity.

Elevated sediment delivery may occur even if no additional activities are accomplished if a large runoff event occurs such as the high intensity rainstorm that caused the Newsome Creek flood in the late spring of 1991.

Turbidity is the degree to which suspended material in the water impedes light penetration. Turbidity is expressed in Nephrometric Turbidity Units (NTUs). There is normally a close correlation between turbidity and suspended sediment in a given stream, but this correlation can change as organic material increases over the summer or if the percent of sediment from different sources in the drainage changes. Turbidity does not measure the amount of sediment being transported as bedload. At turbidity levels above 25 NTU salmonids' sight feeding may be reduced. Sediment associated with the turbidity level may have measurable effects on aquatic life. Further information on assumptions and calculations for sediment and turbidity can be found in the Water Quality Report including information specific to selected watersheds and subwatersheds.

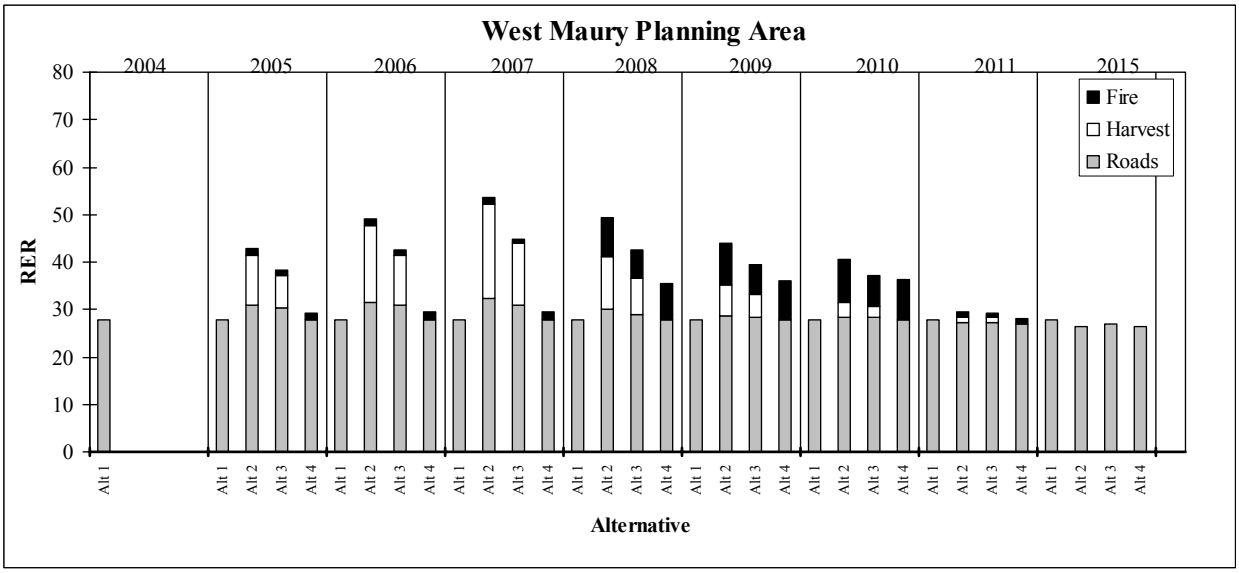
The amount of sediment transported by streams is derived from surface erosion delivered to the channel, scour of the streambed, scour of the channel banks, and mass soil movement. The amount of sediment delivered from surface erosion and mass soil movement outside the stream channel is dependent on soil erosivity, the amount and type of ground disturbance, slope, and distance to the stream. A map showing the slope erosion hazard for the project area is on file at the Lookout Mountain Ranger District (Prineville Ranger Station). About two-thirds of the sediment delivered to the stream from surface erosion comes from within 200 feet of the channel and more than 90 percent comes from within 400 feet. Within the first 200 feet, draw bottom roads and stream crossings are two of the primary contributors of sedimentation. In addition draw bottom roads prevent stream shading vegetative cover, contribute to losses of in-channel and future Large Woody Material (LWM) recruitment, and disrupt streamside water tables.

High sediment levels adversely affect the aquatic habitats of fish, insects, and other aquatic animals, reduces the esthetic quality for recreation users, and may lead to channel type changes.

The increase in RER calculated for the action alternatives would be roughly proportional to the area treated and the miles of road and temporary road constructed or reconstructed. Noncommercial thinning was not included in the tables because it would not produce measurable increases in sediment. Haul delivered sediment, which is not included in the RER, would be proportional to the number of trips taken and number of miles traveled in the project area, which should be roughly proportional to the volume harvested.

The RER portrays average sediment load changes attributable to forest management practices and natural disturbance factors. Sediment delivered on any given year will vary depending on weather patterns, storm tracks, and snowmelt. Figure 3.7 compares the potential sediment delivery between the alternatives derived from the RER model.

Figure 3.7 West Maurys Project Area Relative Erosion Rate



Direct and Indirect Effects of No Action

Sediment and turbidity levels would not change. Natural fuels levels would continue to increase and fire intensities will be higher than under historic conditions should a wildfire get started. Roads in the stream influence zone would not be inactivated (closed) or decommissioned.

No increase in the cumulative sediment yield in the project area would occur as a result of this alternative. The primary source of sediment above background results from the road system. Road densities within 400 feet of streams would remain the same. Fuel loadings in the majority of the project area are currently in mixed and high-intensity fire regimes. Over time, without disturbance, fuel loading in stands would continue to progress toward high intensity, which has a higher risk of stand replacement fire. In the long term, there is a potential for effects associated with fuel loading that would carry high-intensity wildfire. If a large-scale, high-intensity fire were to occur, there would be a high probability of increased sediment delivery resulting in adverse effects to aquatic habitats. It is difficult to predict the time, the scale, or the intensity at which such an event might occur.

In-Channel - It is estimated that most of the sediment in the streams in the project area is coming from in channel erosion such as bank erosion, head cuts, and channel scour. The Bottom Line Survey identified headcuts on the following streams: Gibson Creek (14), Newsome Creek (18), Florida Creek (5), Sherwood Creek (6), Pine Creek (12), Shotgun Creek (6), Little Ferguson Creek (2), Klootchman Creek (3), Deer Creek (1), Friday Creek (3), and Faught Creek (1). In-channel effects have been considered in the EHA model under Key Issue 2.

Uplands - Sediment from ground disturbance associated with trails, Off Road Vehicle (ORV) use, dispersed recreation, and recreational firewood gathering may cause localized problems but is small on a watershed scale and was not included in the analysis. Sediment from routine road maintenance was included in the model. Over time, most of the upland management generated sediment delivered to streams by surface erosion on Forest Service administered lands in the project area would be coming from roads. Open road densities within 400 feet of stream channels, the source area of an estimated 90 percent of surface sediment delivered sediment, are shown in Table 3.36. There would be no road closures with this alternative.

Table 3.36 Open Road Densities within 400 Feet of Streams

Subwatershed (in project area)	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
Upr Prineville R (Sanford Cr)	5.4 mi/mi²	3.9 mi/mi²	3.9 mi/mi²	3.9 mi/mi²
	0.62 miles	0.45miles	0.45 miles	0.45miles
Newsome Cr	3.1 mi/mi²	3.1 mi/mi²	3.1 mi/mi²	3.1 mi/mi²
	17.65 miles	17.34 miles	17.39 miles	17.34 miles
Conant Cr	7.5 mi/mi²	7.5 mi/mi²	7.5 mi/mi²	7.5 mi/mi²
	0.45 miles	0.45 miles	0.45 miles	0.45 miles
Pine Cr	3.2 mi/mi²	3.2 mi/mi²	3.2 mi/mi²	3.2 mi/mi²
	7.14 miles	7.14 miles	7.14 miles	7.14 miles
Drake Cr	2.7 mi/mi²	2.7 mi/mi²	2.7 mi/mi²	2.7 mi/mi²
	1.79 miles	1.79 miles	1.79 miles	1.79 miles
Ltl Bear Cr	2.7 mi/mi²	1.1 mi/mi²	1.1 mi/mi²	1.1 mi/mi²
	1.70 miles	0.72 miles	0.72 miles	0.72 miles
Upr Bear Cr	1.8 mi/mi²	1.8 mi/mi²	1.8 mi/mi²	1.8 mi/mi²
	1.59 miles	1.59 miles	1.59 miles	1.59 miles
Headwtrs Bear	4.9 mi/mi²	4.6 mi/mi²	4.7 mi/mi²	4.6 mi/mi²
	21.99 miles	20.33 miles	21.03 miles	20.33 miles
Indian Cr	5.0 mi/mi²	5.0 mi/mi²	5.0 mi/mi²	5.0 mi/mi²
	0.15 miles	0.15 miles	0.15 miles	0.15 miles

Cumulative Effects of No Action

While livestock can affect upland sediment delivery, in the West Maury Project Area, their primary impact appears to be on riparian vegetation and channel condition. Degraded channel conditions in the headwaters of many streams and in spring areas in the project area have resulted from livestock concentration. Changing livestock management is outside the scope of this document; however, it is reasonably foreseeable that there would be an improvement in riparian condition due to changes in the range utilization standards in the Grazing Implementation Monitoring Module (IIT, 2000). Studies in the intermountain region indicate that the height of grasses and forbs that are to be left in key riparian areas indicate a level of grazing that allows a corresponding recovery of palatable woody vegetation. Bank stability and channel geometry interact with vegetation but may respond differently, depending on the extent of continued mechanical disturbance in the channel and the current channel condition. The Forest Service is currently developing a proposal to update the five Allotment Management Plans (AMPs) in the Maurys. The AMP updates will be analyzed over the next 1-2 years; any changes to livestock grazing as a result of that analysis will not be made until after a decision is made on the West Maury Fuels and Vegetation Management project. It is reasonably foreseeable that forthcoming changes that will result in improved channel condition will include activities such as moving water troughs out of riparian areas, fencing or enlarging exclosures at springs, and developing more water sources in the uplands.

Headcut repair and riparian planting is expected in Newsome, Gibson, East Fork Shotgun and Cow Creeks. These activities would result in reduced sediment delivery in the long-term as stream functioning would be improved. Individual headcuts contribute small to moderate amounts of sediment into streams in the project area. The proposed headcut repair activities have a high potential for short-term, localized sediment delivery. Site-specific measures will be implemented to minimize sediment production. These measures include the timing of activities (during low flow periods so water flow will not move soil) and diverting water around the in-stream activity. Headcut repair activities should result in a decrease in sediment production within 1 year of completion. Riparian planting activities would help to stabilize stream banks and reduce in-channel erosion as vegetation becomes established. Riparian planting would take at least 4-5 years to begin stabilizing stream channels.

Direct and Indirect Effects of Alternative 2
The RER analysis indicates that about 60 percent of the potential new sediment originates from timber harvest. Approximately 825 acres of ground based selective harvest and 569 acres of skyline cable selective harvest are proposed within 400 feet of streams under this alternative. Megahan (1980) found that ground based selective harvest produced about 30 percent less sediment than clearcutting and the proposed cable systems should produce about half of that caused by tractor logging. About 28 percent of the new potential sediment would originate from fuels treatments. About 4,426 acres of fuels treatment would be proposed within 400 feet of streams. Only about 11 percent of new potential sediment is projected to come from roads. This alternative constructs approximately 0.38 miles of new system road and 0.47 miles of new temporary road within 400 feet of a stream. The new system road 1680-152 would require installation of a stream crossing on the west fork of Shotgun Creek, a Class III stream. Reopening with limited reconstruction would be required within 400 feet on 4.38 miles of system road and 1.34 miles of temporary road. Stream crossings on the following reopened roads may need to be replaced depending on the condition of existing culvert size and current acceptable functioning. If the size of the culvert is too small and the culvert is not functioning, then the culvert would be replaced.

Table 3.37 Alternative 2 Reopened Roads with Potential Stream Crossings

Forest Road Number	Stream Class II	Stream Class III	Stream Class IV
1700105	-	-	1
1610050 TEMP	-	-	1
1600024	-	-	5
1640170	-	-	1
1700305	-	1	-

There are 3.1 miles of existing open roads and 2 miles of existing closed roads within 400 feet of streams that are proposed for decommissioning.

Harvest, road construction and reconstruction, and fuels treatment in this alternative would increase sediment. Most of the sediment in the streams would come from in-channel erosion such as bank erosion, head cuts, and channel scour. Channel stability would not change. In addition to upland sediment delivery from the existing road system, sediment delivered from the harvest of 15 percent of the area, fuels treatments on 47 percent of the area, and construction and reconstruction of roads within 400 feet of streams would increase the cumulative sediment yield in the project area. Proposed road decommissioning of 2.0 miles of closed road and 3.1 miles of open road would reduce road densities within 400 feet of streams and would reduce long term sediment delivery.

Because of unstable channels in many of the drainages, background sediment is high in the project area. Based on the background sediment levels and the estimated levels resulting from proposed activities, this alternative would meet state turbidity standards. Activity fuels in the harvest units with noncommercial thinning and the adjacent RHCAs with noncommercial thinning would not be burned until several years after the noncommercial thinning would be accomplished. This would result in additional fuels breakdown and a lower intensity burn.

Alternative 2 has the highest Relative Erosion Rate due the highest levels of commercial harvest and other vegetative treatments and the highest mileage of road management.

Direct and Indirect Effects of Alternative 3
The RER analysis indicates that about 57 percent of the potential new sediment originates from timber harvest. Approximately 687 acres of ground based selective harvest and 233 acres of skyline cable selective harvest are proposed within 400 feet of streams under this alternative. Megahan (1980) found that ground based selective harvest produced about 30 percent less sediment than clearcutting and the proposed cable systems should produce about half of that caused by tractor logging. About 31 percent of the new potential sediment originates from fuels treatments. Approximately 3,048 acres of fuels treatment would be proposed within 400 feet of streams. Only about 12 percent of new potential sediment is projected to come from roads. This alternative would construct 0.15 miles of new system road and 0.47 miles of new

temporary road within 400 feet of streams. The new system road 1680152 would require installation of a stream crossing on the west fork of Shotgun Creek, a Class III stream. Reopening with limited reconstruction would be required within 400 feet on 3.6 miles of system road and 0.86 miles of temporary road. Stream crossings on the following reopened roads may need to be replaced depending on the condition of existing culvert size and current acceptable functioning. If the size of the culvert is too small and the culvert is not functioning, then the culvert would be replaced.

Table 3.38 Alternative 3 Reopened Roads with Potential Stream Crossings

Forest Road Number	Stream Class II	Stream Class III	Stream Class IV
1700105	-	-	1
1600024	-	-	5
1640170	-	-	1

There are 2.4 miles of existing open roads and 1.8 miles of existing closed roads within 400 feet of streams that are proposed for decommissioning.

Harvest, road construction and reconstruction, and fuels treatment in this alternative would increase sediment. Most of the sediment in the streams would come from in-channel erosion such as bank erosion, head cuts, and channel scour. Channel stability would not change. In addition to upland sediment delivery from the existing road system, sediment delivered from the harvest of 10 percent of the area, fuels treatments on 31 percent of the area, and construction and reconstruction of roads within 400 feet of streams would increase the cumulative sediment yield in the project area. Proposed road decommissioning of 1.8 miles of closed road and 2.4 miles of open road would reduce road densities within 400 feet of streams and should reduce long term sediment delivery.

Because of unstable channels in many of the drainages, background sediment is high in the project area. Based on the background sediment levels, this alternative should meet state turbidity standards. Activity fuels in the harvest units with noncommercial thinning and the adjacent RHCAs with noncommercial thinning would not be burned until several years after the noncommercial thinning was accomplished. This would result in additional fuels breakdown and a lower intensity burn.

The RER would be approximately 70 percent of that from Alternative 2 with approximately 10 percent of the potential decrease attributable to roading, 68 percent to harvest, and 22 percent to fuels treatments.

Direct and Indirect Effects of Alternative 4

No timber harvest is proposed under this alternative. In Alternative 4, all of the new potential sediment originates from fuels treatments. About 4,287 acres in fuels treatment is proposed within 400 feet of streams. There would be not any road construction or reconstruction. A few closed roads may need to be opened for access to grapple pile units but they would not be reconstructed. Drainage structures would be refreshed and the affected roads would be re-closed when the fuels treatment is completed. New road delivered sediment resulting from this alternative should be very small and was not evaluated in this alternative. The only stream crossing, on a closed road, identified for Alternative 4 is required to access Unit 327 on the following reopened road:

Table 3.39 Alternative 4 Reopened Roads with Potential Stream Crossings

Forest Road Number	Stream Class II	Stream Class III	Stream Class IV
1600024	-	-	1

There are 3.1 miles of existing open roads and 2.0 miles of existing closed roads within 400 feet of streams that would be proposed for decommissioning.

Fuels treatment in this alternative would increase sediment. Most of the sediment in the streams would come from in-channel erosion such as bank erosion, head cuts, and channel scour. In addition to upland sediment delivery from the existing road system, sediment delivered from fuels treatments on 45 percent of the area within 400 feet of streams would increase the cumulative sediment yield in the project area.

Proposed road decommissioning of 2.0 miles of closed road and 3.1 miles of open road would reduce road densities within 400 feet of streams and should reduce long term sediment delivery.

Because of unstable channels in many of the drainages, background sediment is high in the project area. Based on the background sediment levels, this alternative should meet state turbidity standards.

The RER potential for Alternative 4 is about 24 percent of that from Alternative 2.

Cumulative Effects of Alternatives 2, 3, and 4
Alternatives 2, 3 and 4 have a potential cumulative effect from increased livestock use in treated riparian areas and in prescribed fire areas due to removal of brush and down wood, increased grass and forb production, increased palatability of forage resulting from higher nutrient content and new growth, and forage remaining succulent later into the season in riparian areas. Increased trampling of banks could increase sediment delivery and grazing on streamside vegetation could reduce shade. Grazing the same season as the prescribed fire treatment has the highest risk of increasing sediment delivery to treated streams.

In-Channel - It is estimated that most of the sediment in the streams in the West Maury Project area is coming from in channel erosion such as bank erosion, head cuts, and channel scour. In channel effects have been considered in the EHA model under Key Issue 2.

Uplands - Sediment from ground disturbance associated with trails, Off Road Vehicle (ORV) use, dispersed recreation, and recreational firewood gathering may cause localized problems but is small on a watershed scale and was not included in the analysis. Sediment from routine road maintenance was included in the model. Over time, most of the upland management generated sediment delivered to streams by surface erosion on Forest Service administered lands in the project area would be coming from roads. Open road densities within 400 feet of stream channels, the source area of an estimated 90 percent of surface sediment delivered sediment, are shown in Table 3.36. Proposed road closure would reduce the cumulative sediment delivery in the long run but ground disturbance resulting from ripping and installing drainage structures would probably increase sediment the first year or two.

Grazing – Alternatives 2, 3 and 4 have a potential effect from increased livestock use in treated riparian areas and in the prescribed fire areas due to removal of brush and down wood, increased grasses and forbs, increased palatability of forage resulting from higher nutrient content and new growth, and forage remaining succulent later into the season in riparian areas. Increased trampling of banks could increase sediment delivery and grazing on streamside vegetation could reduce shade. Grazing the same season as the prescribed fire treatment has the highest risk of increased sediment delivery to treated streams.

While livestock can affect upland sediment delivery, in the West Maury project area, their primary impact appears to be on riparian vegetation and channel condition. Degraded channel conditions in the headwaters of many streams and in spring areas in the watershed have resulted from livestock concentration. Changing livestock management is outside the scope of this document; however, it is reasonably foreseeable that there will be an improvement in riparian condition due to changes in the range utilization standards in the Grazing Implementation Monitoring Module (IIT, 2000). Studies in the intermountain region indicate that the height of grasses and forbs that are to be left in key riparian areas indicate a level of grazing that allows a corresponding recovery of palatable woody vegetation. Bank stability and channel geometry interact with vegetation but may respond differently, depending on the extent of continued mechanical disturbance in the channel and the current channel condition. The Forest Service is currently developing a proposal to update the five Allotment Management Plans (AMPs) in the Maurys. The AMP updates will be analyzed over the next 1-2 years; any changes to livestock grazing as a result of that analysis will not be made until after a decision is made on the West Maury Fuels and Vegetation Management project. It is reasonably foreseeable that forthcoming changes that will result in improved channel condition will include activities such as moving water troughs out of riparian areas, fencing or enlarging exclosures at springs, and developing more water sources in the uplands.

As indicated earlier, the actual sediment delivered may be higher or lower than predicted depending on whether drainage structures have been installed and the amount of vegetative recovery before a storm event and the intensity of the storm. Mitigations (Chapter 2) would also modify the amount of sediment delivered. Even if no additional ground disturbing activities took place in the project area, elevated sediment delivery could happen if a large runoff event occurred.

Chemical Effects

Affected Environment

Water chemistry samples were collected in the summers of 1997 and 1998 for the DEQ Regional Environmental Monitoring and Assessment Program (REMAP). Streams sampled in or close to the National Forest boundary ranged from fair to good on the water quality index with all meeting the state dissolved oxygen and pH standards. A summary and interpretation of the results plus tables of individual results may be found in the "Upper Deschutes River Basin R-Map: 1997-1998 Water Chemistry Summary" Technical Report BIO99-04.

Direct and Indirect Effects of No Action

No increase in nutrient delivery to streams would occur as result of this alternative.

Direct and Indirect Effects of Alternatives 2, 3 and 4

Nutrient flushes resulting from rapid mineralization and mobilization of nutrients as a result of fire may affect water quality (Baker 1988 and Tiedeman et al. 1978). Calcium, magnesium, and potassium when converted to bicarbonate salts and nitrogen in several forms are susceptible to movement into streams by either leaching into the ground water or overland flow. However, most of the increased available nutrients are taken up by plants or bound to the soil, roots, or debris. The loss of plant cover increases the potential for erosion of these elements. Increased nutrients that reach the streams tend to get bound up in primary production and associated aquatic communities. DeByle and Packer (1972) found that sediment was the primary source for loss of phosphorous, calcium, magnesium, and potassium, whereas sodium losses were mostly in solution. The flush is most pronounced in the first couple of heavy rains after the fire but may persist for several years depending on fire intensity.

Prescribed burning to treat fuels accumulation in the project area will result in the mineralization and mobilization of nutrients. Prescribed fire would only have a minimal impact on the watershed because the surface vegetation, litter, and forest floor would only partially burn. Most of the increased available nutrients will be taken up by plants or bound to the soil, roots, or debris. Van Wyk (1982) found that nutrient release as a result of prescribed burning did not persist beyond the first winter after burning with the nutrient output returning to pre-burn levels within 3 to 10 months. Most of the increase occurred in the first 2 storms after the burn.

In Alternative 2, approximately 17,889 acres of prescribed fuels treatments would increase nutrients in streams within burned drainages. The area actually burned would range from less than 10 percent in hand piled units to between 40 and 70 percent in prescribed burning units. Nutrient levels would return to pre-burn levels within 1 year of treatment.

In Alternative 3, approximately 13,370 acres of prescribed fuels treatments would increase nutrients in streams within burned drainages. The area actually burned would range from less than 10 percent in hand piled units to between 40 and 70 percent in prescribed burning units. Nutrient levels would return to pre-burn levels within 1 year of treatment.

In Alternative 4, approximately 16,407 acres of prescribed fuels treatments would increase nutrients in streams within burned drainages. The area actually burned would range from less than 10 percent in hand piled units to between 40 and 70 percent in prescribed burning units. Nutrient levels would return to pre-burn levels within 1 year of treatment.

Cumulative Effects for All Alternatives

Forests in the inland west are dependent on a combination of biological and fire decomposition processes to regulate nutrient availability and cycling (Harvey et al. 1994). Increased nutrients from fire that reach

streams would tend to get bound up in primary production and associated aquatic communities. Because of fire suppression and the loss of aspen, alder, and other deciduous trees and shrubs in riparian zones, nutrient levels are probably lower than they were historically in streams in the project area. Britton (1991) found that a late summer prescribed burn appeared to have little effect on the invertebrate fauna and that maintaining shade was the major concern.

Nutrient levels in streams in the project area would not change with Alternative 1 (No Action). Over time, fuel loadings within the project area would tend to increase towards conditions conducive to high-intensity fire conditions. If a large-scale, high-intensity fire were to occur, increased nutrient delivery to streams would be expected proportional to the percentage of effective ground cover lost and the distance to streams. The flush would be most pronounced the first couple of heavy rains after the fire but might persist for several years after the fire. It is difficult to predict the time, or the scale and intensity at which such an event might occur.

The Sherwood prescribed burn (1,300 acres) to be done in 2004 would alter the nutrients in streams and would take place prior to implementing actions in the West Maurys project area, chemical levels would return to pretreatment levels within 1 year and would not have any cumulative effects with actions proposed with the action alternatives.

Temperature and State Listed Water Quality Limited Streams (303(d))

Affected Environment

There are no bull trout in the project area or in the Maury Mountains. The Maury Mountains Watershed Analysis disclosed that redband trout are the only salmonid species currently present the Maury Mountains planning area. The Oregon Department of Environmental Quality did not identify any bull trout habitat in the Maury Mountains (Oregon Watery Quality Standards, Fish Use Maps, Figure 130A). The temperatures in the INFISH Interim RMOs (Table 1A) are based on bull trout presence or potential. Based on the Interim RMOs, project design criteria includes measures so that the 7-day moving average daily maximum water temperature is not increased in any adult holding habitat or spawning or rearing habitats in the project area. The state water quality standards more accurately reflect attainable conditions and the target species (redband trout) found in the project area. The new State standards (340-041-0028, approved by EPA March 2004) identify that the 7-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use may not exceed 18.0°C (64.4°F). The state of Oregon assumes that waters meeting this standard will provide water temperatures suitable for redband trout spawning. Even though streams in the project area are not required to meet the state steelhead spawning standards, and while not limited to those on Table JS3, it appears streams that are meeting the 18°C threshold should be meeting the spawning threshold (13°C (55.4°F) between January 1 and May 15). Water temperatures over the 18.0°C threshold are not to be increased further except in accordance with Water Quality Standards direction.

The following creeks are on the 2002 State 303(d) list of Water Quality Limited Water Bodies for summer water temperature: Bear Creek, Cow Creek, and Klootchman Creek. While Bear Creek is also listed for water temperatures between October 1 and June 30, it no longer applies under the new state standards. Stream temperature data gathered from 1994 through 2003 in the project area can be found in Table 3.40. Additionally, Figure JS21 and JS22 in the Water Quality Report depict the daily 7-day average maximum water temperature for Newsome Creek and Klootchman Creek, representative north and south slope project area drainages, for 1994 through 2003 and are incorporated by reference. Large fluctuations on Klootchman Creek from year to year appear to be attributable to fluctuations in flow, lack of shade in a meadow system, and solar input to a south aspect stream.

Monitoring indicates that the floating 7-day maximum average water temperatures in most Bear Creek tributaries range from the low to mid 70's. Water temperatures in these ranges are higher than the preferred range for salmonids and retard growth. Bear Creek at the National Forest boundary is recording maximum summer water temperatures in the mid to upper 70's. This is probably due to Antelope Reservoir storage and releases. Maximum 7-day floating average water temperatures in Bear Creek tributaries range from the high 60's to mid 70's in Klootchman and Deer Creek. The 1994 7-day maximum average water temperature for Klootchman Creek at the National Forest boundary (Klootch #1) appears to have resulted

from the water level falling below the data recorder level. The streams in the Upper Crooked River Watershed on the north slope of the Maurys, are below the state water temperature standard threshold.

Table 3.40 West Maury Area 7-Day Average Max Water Temperatures 1994-2003 (temperatures over threshold are highlighted)

Station		1994	1995	1996	1997	1998	1999	2000	2001	2003
Bear Creek Watershed										
Bear #1	7 Day	-	**71.6**	**78.3**	**76.1**	**79.4**	-	-	-	-
	Days>64.4	-	80	70	92	66	-	-	-	-
Bear #2	7 Day	-	-	-	-	**79.1**	**77.0**	-	-	-
	Days>64.4	-	-	-	-	83	93	-	-	-
Deer	7 Day	-	**70.4**	**78.6**	**73.8**	**75.2**	**68.6**	**71.9**	**76.8**	**78.2**
	Days>64.4	-	40	80	88	78	37	39	66	90
Klootch #1	7 Day	**83.4**	**70.8**	**72.3**	**71.6**	**72.9**	**67.8**	63.2	**75.3**	**78.1**
	Days>64.4	46	50	63	53	61	33	0	80	93
Klootch #2	7 Day	62.6	-	-	-	**70.1**	**67.2**	-	-	-
	Days>64.4	0	-	-	-	45	21	-	-	-
Upper Crooked Watershed-										
Florida	7 Day	61.9	-	-	-	61.0	**66.9**	-	-	-
	Days>64.4	0	-	-	-	0	7	-	-	-
Gibson	7 Day	-	-	-	-	-	-	-	-	52.0
	Days>64.4	-	-	-	-	-	-	-	-	0
Newsome	7 Day	62.3	58.8	-	59.4	58.6	57.6	60.7	57.1	55.8
	Days>64.4	0	0	-	0	0	0	0	0	0
Sherwood	7 Day	58.9	55.4	58.1	-	54.9	55.9	55.7	57.1	55.8
	Days>64.4	0	0	0	-	0	0	0	0	0
Pine #1	7 Day	**73.8**	-	64.0	-	64.1	61.6	63.0	**64.8***	-
	Days>64.4	46	-	0	-	0	0	0	3	-
Pine #2	7 Day	-	-	-	-	-	-	-	-	61.5
	Days>64.4	-	-	-	-	-	-	-	-	0

* Creek dry when retrieved therefore temperature is not reflective of water temperature

Direction under the Water Quality Standards

No measurable increase in water temperature on listed streams, except in accordance with Water Quality Standards direction, may result from management practices in the Bear Creek Watershed because Bear Creek, Cow Creek, and Klootchman Creek are on the State 303d list of Water Quality Limited Water Bodies for summer water temperature. Monitoring shows Deer Creek is also over threshold. Streams on the north slope of the project area, which are under the state standard threshold (a floating 7-day maximum average of 18°C (64.4°F)), may not be warmed by more than 0.3°C (0.5°F) above the ambient condition unless greater increases would not reasonably be expected to adversely affect fish or other aquatic life.

Direct and Indirect Effects of No Action

No reduction in shading would result from this alternative. There would be no increase in water temperatures.

Cumulative Effects of No Action

There would be no change in water temperatures in the project area in the event of no disturbances. Because stand densities and fuel loadings would not be reduced, in the event of a wildfire, should riparian habitat conservation areas be burned severely, it is likely that canopy cover would decrease with a commensurate increase in stream temperatures.

Direct and Indirect Effects of Alternatives 2, 3, and 4

Reductions in solar input resulting from shading are a primary factor effecting stream temperature. Shade functions (Beschta et al. 1987) generally occur within 100-200 feet of the channel. Noncommercial thinning and associated aspen enhancement are proposed in RHCAs under Alternatives 2, 3, and 4. The only commercial harvest proposed in RHCAs would be in units 8 and 21 on lower Pine Creek and in Unit 445 on Bear Creek above Antelope Creek in Alternatives 2 and 3. There are no commercial treatments in Alternative 4. The height of trees, at various slopes and distances that provide shade during the period when peak temperatures occur, were calculated. Only trees less than the height indicated by the calculations would be thinned from units along perennial streams unless the removal would be needed to enhance conditions for hardwoods within RHCAs. Shade is not a consideration along intermittent streams because intermittent streams are dry during the summer months when peak water temperatures occur. However, shade would be maintained along intermittent streams because none of the action alternatives include commercial harvests in Class IV RHCAs and they include implementation of other Riparian Management Objectives.

Commercial harvest in Units 8, 21, and 445 in Alternatives 2 and 3 and noncommercial thinning in RHCAs would not result in temperature increases on perennial streams. Removing conifers from aspen stands may reduce some shade but would not result in a measurable increase in water temperatures as deciduous vegetation would be expected to increase with reduced competition. Possible short-term reductions in shade resulting from conifer thinning in aspen stands or to improve alder or willow production and prescribed fire would occur but would not produce any measurable increases in temperature.

Prescribed burning would be accomplished when moisture conditions favor a low-intensity burn. There is a risk of prescribed fire reducing shade; however, short-term increases in temperature (up to 6 months) are allowed even on streams over threshold during activities that restore riparian vegetation (Oregon Water Quality Standards 340-041-0004(5)(a)). To reduce this risk, fire ignition would generally occur outside RHCAs and the fire would be allowed to back into the RHCAs. However, due to variations in the landscape and to meet mosaic and fire intensity objectives, fire may be ignited within RHCAs under heavy fuels conditions, to protect old growth trees, to protect threatened, endangered, and sensitive plants and meet other botany concerns, to break up fuel continuity, move fire across a road running parallel to a stream, or meet other Riparian Management Objectives. It is the intent that fire be reintroduced into RHCAs but less extensively than in the uplands. Burning within meadow systems adjacent to creeks within treatment units, to retard conifer encroachment, would be coordinated with the District Botanist, Fisheries Biologist, and/or Hydrologist.

Alternative 2: There would be 1,012 acres of noncommercial thinning and approximately 11 acres of harvest in Units 8, 21, and 445 in Category 1 and 2 RHCAs in this alternative. This would not reduce shading of fish bearing streams or non-fish bearing perennial streams. Thinning of conifers from aspen stands would be proposed in this alternative. Commercial logs thinned from these stands would be removed in these units if they can be winched to a road without causing resource damage. There is a risk of conifer thinning in aspen stands and prescribed fire reducing shade for a short term; however, this would meet state standards because deciduous plants would increase with reduced competition and shade would result. Approximately 39 percent of the RHCAs on fish bearing streams and 29 percent on perennial non-fish bearing streams would be in prescribed fire units. It is estimated that between 20 and 50 percent of the area in the RHCA would actually have fire in it with most of this being further away from the stream. Thinning to improve deciduous riparian vegetation would be more intensive on north aspect streams where water temperatures are below threshold. There would not be any measurable increase in water temperatures on perennial streams. There is a potential to increase water temperature in intermittent non-fish bearing streams (Class IV) when they are flowing, but this would not result in a violation of state water quality standards because these streams go dry before peak water temperatures occur in the project area.

Alternative 3: There would be 754 acres of noncommercial thinning and approximately 11 acres of harvest in Units 8, 21, and 445 in Category 1 and 2 RHCAs in this alternative. This would not reduce shading of fish bearing streams or non-fish bearing perennial streams. Thinning of conifers from aspen stands would be proposed under this alternative. Commercial logs thinned from these stands would be removed in these

units if they can be winched to a road without causing resource damage. There is a risk of conifer thinning in aspen stands and prescribed fire reducing shade for a short term however this should meet state standards because deciduous plants would increase with reduced competition and increased shade would result. Approximately 30 percent of the RHCAs on fish bearing streams and 25 percent on perennial non-fish bearing streams would be in prescribed fire units. It is estimated that between 20 and 50 percent of the area in the RHCA would actually have fire in it with most of this being further away from the stream. Thinning to improve deciduous riparian vegetation would be more intensive on north aspect streams where water temperatures are below threshold. There would not be any measurable increase in water temperatures on perennial streams. There is a potential to increase water temperature in intermittent non-fish bearing streams (Class IV) when they are flowing, but this would not result in a violation of state water quality standards because these streams go dry before peak water temperatures occur in the watershed.

Alternative 4: There would be 1,012 acres of noncommercial thinning in Category 1 & 2 RHCAs in this alternative. This should not reduce shading of fish bearing streams or non-fish bearing perennial streams. Thinning of conifers from aspen stands would be proposed under this alternative. There is a risk of conifer thinning in aspen stands and prescribed fire reducing shade for a short term however water temperatures would still meet state standards. Approximately 34 percent of the RHCAs on fish bearing streams and 27 percent on perennial non-fish bearing streams would be in prescribed fire units. It is estimated that between 20 and 50 percent of the area in the RHCA would actually have fire in it with most of this being further away from the stream. Thinning to improve deciduous riparian vegetation would probably be more intensive on north aspect streams where water temperatures are below threshold. There would not be any measurable increase in water temperatures on perennial streams. There is a potential to increase water temperature in intermittent non-fish bearing streams (Class IV) when they are flowing, but this should not result in a violation of state water quality standards because these streams go dry before peak water temperatures occur in the watershed.

No measurable direct temperature change would occur in any of the Class II-III streams in the project area under any of the alternatives.

Cumulative Effects of Alternatives 1, 2, 3, and 4

Past logging, roading, and grazing have reduced shading in the project area. No reduction of shading would result from timber harvest and most noncommercial thinning based on the mitigation measures identified in Chapter 2.

Reasonably foreseeable riparian planting and headcut repair would occur on the following creeks in the project area:

Newsome Creek – Approximately 1.0 mile of planting with 15 headcut repair structures
Gibson Creek – Approximately 1.25 miles of planting with 12 headcut repair structures
Sanford Creek – Approximately 0.5 mile of planting
East Fork Shotgun Creek – Approximately . 0.25 mile of planting with numerous headcut structures
Cow Creek - 4 headcut repair structures

The riparian planting will help stabilize stream banks but is not expected to provide much shading for at least 10 years. Past deciduous riparian plantings outside of exclosures on the south slope of the project area are being heavily browsed by livestock and wildlife.

There are no other future vegetation management activities planned in the project area that would affect stream temperature. Cattle grazing would continue at current levels and would not cumulatively add to the reduction in shading since no additional increase in temperature would be expected from the proposed activities.

Alternative 1: There will be no change in water temperatures in the project area. In the event of a large-scale, high-intensity wildfire, increased solar input to streams would result from reduced shade but would be offset somewhat by increased flows. Increases in temperature would be proportional to the amount of canopy lost, the distance to the stream and the aspect. The effect would be most pronounced in confined valleys with dense understory. While producing other adverse affects, losing shade on other than perennial

streams would not have much effect on summer maximum stream temperatures. It is difficult to predict the time, or the scale and intensity at which such an event might occur.

Alternatives 2, 3, and 4: There would not be any measurable increase in water temperatures in any fish-bearing or non-fish-bearing perennial streams in the project area. There is a potential to increase water temperature in intermittent non-fish bearing streams (Class IV) when they are flowing, but this should not result in a violation of state water quality standards because these streams go dry before peak water temperatures occur in the project area. Other ongoing and reasonably foreseeable activities would have no cumulative effects on water temperature, because they would not result in any measurable decrease in shade.

All alternatives, even considering cumulative effects, would not produce measurable increases in the maximum water temperature and would meet state and INFISH water quality temperature standards.

Riparian / Wetlands

Affected Environment

A riparian area is an area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland. It includes wetlands and those portions of the floodplain and valley bottom that support riparian vegetation. Wetlands are areas that are saturated frequently enough to support vegetation that requires saturated soil conditions for growth or reproduction. Wetlands generally include swamps, marshes, springs, seeps, bogs, wet meadows, mudflats, ponds, and other similar areas. Legally, federal agencies define wetlands as possessing hydrophytic vegetation, hydric soils, and wetland hydrology. All three characteristics must be met for an area to be identified as a wetland. Generally, to be considered hydric soil, there must be saturation at temperatures above freezing for at least 7 days. Lowering water tables resulting from channel down cutting have reduced the area capable of supporting riparian vegetation in the project area.

Aspen and cottonwood stands are being crowded out by conifer encroachment and regeneration suppressed by cattle and wildlife. Alder, willow, and other deciduous riparian vegetation have decreased in the project area due to conifer encroachment, shading by upland vegetation, and grazing by cattle and wildlife.

The primary impact from livestock in the West Maurys project area appears to be on riparian vegetation and channel condition. Degraded channel conditions in the headwaters of many streams and in spring areas in the watershed have resulted from livestock concentration. Changing livestock management is outside the scope of this document; however, it is reasonably foreseeable that there will be an improvement in riparian condition due to changes in the range utilization standards in the Grazing Implementation Monitoring Module (IIT, 2000). Bank stability and channel geometry interact with vegetation but may respond differently, depending on the extent of continued mechanical disturbance in the channel and the current channel condition.

RHCAs and springs on the National Forest GIS layer are shown on Map 13 RHCA and Springs in the EIS. A review of the GIS layer, Forest water rights, and field review of streams and springs within proposed harvest units was accomplished. In the West Maurys project area, RHCAs on fish-bearing streams extend 300 feet from the edge of the stream's active channel. RHCAs on perennial streams extend 150 feet from the edge of the stream's active channel. On ponds, reservoirs, and wetlands greater than 1 acre, the RHCAs extend 150 feet from the edge of the wetland or max pool elevation. RHCAs extend 50 feet from the edge of intermittent streams, wetlands less than 1 acre, and landslides. Stream bank stability associated with root strength, vegetation, and floodplain condition, is achieved within a distance of 0.5 to 1 site-potential tree height. Litter fall, large woody debris (LWD) recruitment, nutrient retention, and nutrient input functions (Gregory et al. 1987) generally occur within 100-200 feet of the channel.

Direct, Indirect, and Cumulative Effects of No Action

There would be no change in riparian condition in the short term but with a continued upward trend with existing activities such as stream headcut repair and improvements in grazing management. Road densities within RHCAs would not change.

Over time, without disturbance, fuel loading would continue to move towards a high risk of high-intensity fire. Fuel loadings would continue increasing and vegetation conditions would continue moving away from historic composition and distribution. In the long term, there could be a potential for indirect effects associated with increased fuel loading that would carry a high-intensity fire. If a large-scale, high-intensity fire were to occur, there would be a high risk of increased sediment production and delivery, loss of shade and increased water temperatures, increased and flashier flows, loss of large woody debris, and channel degradation.

Livestock grazing would continue as described in the Affected Environment.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Silviculture, and fuels treatments would only be accomplished in RHCAs to enhance Riparian Management Objectives (see Appendix C). There would be negligible direct effects to stream bank stability, LWD recruitment, nutrient input, or nutrient retention in Class I-III streams resulting from commercial harvest in Alternatives 2 or 3 or noncommercial thinning in all action alternatives. No commercial harvest is proposed in Category 4 RHCAs (Class IV streams) under any alternative. The only commercial harvest in Alternatives 2 and 3 proposed in Category 1 & 2 RHCAs (Class I-III streams) is what can be reached with a mobile yarder from the 17 road in Units 8 and 21 along Pine Creek and fir thinned from the aspen stand in Unit 445 which would be winched to the 1700-182 road. Accelerated growth of trees in the Riparian Habitat Conservation Areas (RHCAs) resulting from thinning under all action alternatives has the potential to provide larger trees sooner for LWD recruitment. Growth rates in Alternative 4 would be reduced compared to Alternatives 2 and 3 because trees greater than 9 inches d.b.h. would not be thinned. These trees would still be suppressed under competitive conditions for resources for growth. Ground-based logging equipment in Alternatives 2 and 3 would not operate off roads within RHCAs; this would be done to meet RMOs. All alternatives meet BMPs and LRMP standards and guidelines.

In Alternative 2 riparian treatments would be accomplished to improve cottonwood and aspen conditions. Approximately 11 acres would have commercial harvest, 1,294 acres of RHCA would have noncommercial thinning (includes 140 acres or juniper thinning), to move the RHCAs toward the historic range of variability, to maintain existing large diameter trees or aspen stands, to accelerate the growth of smaller trees for future riparian needs, reduce the risk of stand replacement fire, and allow future reintroduction of fire. In Alternative 3, there would be 11 acres of commercial harvest, 933 acres of noncommercial thinning (includes 119 acres of juniper thinning). Alternative 4, would have 1,300 acres of noncommercial thinning (includes 140 acres of juniper thinning). Alternative 2 and 4 would decommission 2.15 miles of open road and 1.29 miles of closed road within RHCAs. Alternative 3 would decommission 1.45 miles of open road and 1.09 miles of closed road within RHCAs.

Burning would be accomplished when moisture conditions favor a low intensity burn. Prescribed burning ignition would generally occur outside RHCAs and the fire would be allowed to back into the RHCA. However, due to variations in the landscape and to meet mosaic and intensity objectives, fire may be ignited within RHCAs under heavy fuels conditions, to protect old growth trees, to protect TE&S plants and meet other botany concerns, to break up fuel continuity, move fire across a road running parallel to a stream, or meet other Riparian Management Objectives. It is the intent that fire be reintroduced into RHCAs, but less extensively than in the uplands. Burning within meadow systems adjacent to creeks, to retard conifer encroachment, would be coordinated with the District Botanist, Fisheries Biologist, and/or Hydrologist. This alternative would decommission 2.15 miles of open road and 1.29 miles of inactivated (closed) road in RHCAs.

Burning within meadow systems adjacent to creeks, to retard conifer encroachment, would be coordinated with the District Botanist, Fisheries Biologist, and/or Hydrologist. This alternative would decommission 2.15 miles of open road and 1.29 miles of inactivated (closed) road in RHCAs.

Alternative 2: Alternative 2 moves 34 percent of RHCAs toward desired condition using timber harvest, noncommercial thinning, and juniper thinning. Approximately 39 percent of the RHCAs in the project area are in fuels treatment units. Prescribed fire would primarily be allowed to back into these units and the percent of the area burned would be less than in the uplands. The number of miles of open road in RHCAs

would be reduced by 7 percent. Proposed treatments, other than road closures, are primarily aimed at improving vegetation within RHCAs.

Alternative 3: Alternative 3 moves 25 percent of RHCAs toward desired condition using timber harvest, noncommercial thinning and juniper thinning. Approximately 29 percent of the RHCAs in the project area are in fuels treatment units. Prescribed fire would primarily be allowed to back into the RHCAs and the percent of the area burned would be less than in the uplands. The number of miles of open road in RHCAs would be reduced by 5 percent. Proposed treatments, other than road closures, are primarily aimed at improving vegetation within RHCAs.

Alternative 4: Alternative 4 moves 34 percent of RHCAs toward desired condition using noncommercial thinning and juniper thinning. Approximately 34 percent of the RHCAs in the project area are in fuels treatment units. Prescribed fire would primarily be allowed to back into these units and the percent of the area burned would be less than in the uplands. The number of miles of open road in RHCAs would be reduced by 7 percent. Proposed treatments, other than road closures, are primarily aimed at improving vegetation within RHCAs.

Cumulative Effects of Alternatives 2, 3, and 4
Alternatives 2, 3, and 4 have a potential cumulative effect from increased livestock use in treated riparian areas and in the prescribed burn area due to removal of brush and down wood, increased grasses and forbs, increased palatability of forage resulting from higher nutrient content and new growth, and forage remaining succulent later into the season in riparian areas. Increased trampling of banks could increase sediment delivery and grazing on streamside vegetation could reduce shade. However, prescribed burning in the uplands could provide more palatable sources of forage in upland areas.

Fire has been excluded from many riparian areas due to past grazing practices and fire suppression. This has resulted in fuel loadings above natural conditions; increased LWD densities; later successional plant communities; increased densities of seedlings, saplings, and small trees; and decreases in aspen, cottonwood, willow, alder, and other deciduous riparian vegetation. Silvicultural and fuels treatments in the uplands under Alternatives 2, 3, and 4 would reduce the risk of a large fire in the project area with treatments in the RHCAs reducing impact intensities within stream-side zones and wetlands, should a fire occur.

Connected and reasonably foreseeable riparian planting and headcut repair will occur on the following creeks in the project area:

Newsome Creek – Approximately 1.0 mile of planting with 15 headcut repair structures.
Gibson Creek – Approximately 1.25 miles of planting with 12 headcut repair structures.
Sanford Creek – Approximately 0.5 mile of planting.
East Fork Shotgun Creek – Approx. 0.25 mile of planting with numerous headcut structures.
Cow Creek - 4 headcut repair structures.

The riparian planting will help stabilize stream banks but will not be very effective for at least 4 to 5 years and measurable increases in shade are not expected for at least 10 years in areas currently devoid of vegetation. Past deciduous riparian plantings outside of exclosures on the south slope of the project area are being heavily browsed by livestock and wildlife.

Other ongoing and reasonably foreseeable activities would have no measurable effect on riparian condition.

Geology

The West Maurys project area is located on the western corner of the Blue Mountains physiographic province, which also includes the Wallowa, Elkhorn and Strawberry mountains. The shaping of the landforms in the watershed is a reflection of the past geologic history of the area. The tectonic movement, uplift of the Blue Mountain anticline, and mass wasting processes has combined to create the broad ridges and steep draws. Mass wasting, sheet and rill are some of the physical processes currently in action.

Further details of the geologic description of the area can be found in the Geology and Minerals Report and is incorporated by reference.

Landslide Prone Areas

Affected Environment

Addressing the potential for initiating slope movement through management activities, beyond the natural process and proposing mitigations through design elements and minimizing landslide terrain within the units is in compliance with the soil mass wasting standards and guidelines in the LRMP. The design elements and mitigation protecting seeps, springs and riparian areas (Chapter 2) are in compliance with INFISH.

Landslide debris (Qls) covers approximately 3 percent (1,293 acres) of the analysis area (Swanson 1969). The landslide and debris flow deposits are composed of chaotic masses of angular blocks, chiefly mixtures of basalt and tuffaceous sedimentary rocks (Swanson 1969). The unit includes debris flows and large talus piles. The landslide debris is mapped around the crest of the Maurys, on the eastside of the project area. The unconsolidated material is highly susceptible to mechanical and chemical weathering. The landslide scarps associated with the debris are located on the crest of the ridges.

Based on an air photo interpretation, the West Maurys project area has a series of dormant landslide scarps and debris lobes around the western end of the crest of the Maury Mountains (see the Geology report for specifics). The dormant landslides tend to occur on slopes greater than 40 percent and are generally associated with ridge tops. The dormant landslide forms originate on Picture Gorge Basalts or are midslope in the Clarno and John Day Formations. When the dormant landslides were more active, they contributed a portion of the existing sediment currently occupying the flood plains of the stream courses. The dormant landslide terrain is primarily located in Mid Crooked River, Bear Creek and Camp Creek watersheds.

The visible landslides and related debris cover a total estimated 1,894 acres, 5 percent of the project area. These areas, depending on slope and aspect, are in a moderate to high risk for reactivation by management activities such as road construction or harvest, or by the continued weather pattern of higher precipitation. The remaining analysis area is at low risk for mass wasting instability by management activities or by the continued weather pattern of higher precipitation.

Direct and Indirect Effects of Alternatives 2 and 3

For all the units in the action alternatives, the primary concern from a mass wasting standpoint is for those units on dormant landslide terrain and underlain by mapped landslide debris. The Clarno Formation and a minor amount of mapped landslide debris underlie the West Maury commercial units. Landslide terrain tends to develop unusual subsurface drainage patterns. The intensity and style of management activity on landslide terrain, in the vicinity of seeps and springs, could potentially change the drainage pattern, possibly increasing the risk for instability.

The proposed harvest thinning (HTH) prescription does not generally alter groundwater movement measurably, except in the vicinity of seeps and springs. Harvest Select (HSL) removes a larger volume of timber as the treatment thins from below. The final density is similar to the harvest thinning treatment. Neither treatment would reduce the amount of water taken up by the trees through evapotranspiration substantially. Reducing the amount of evapotranspiration would leave more groundwater in the slope, which has the potential to decrease slope stability.

The acres of dormant landslide terrain are fairly equally spread across the watershed. The affected area varies slightly based on the proposed managed acres for each alternative (see Table 3.41). Alternative 2 proposes management of slightly more acres located in dormant landslide terrain than Alternative 3.

The skyline logging system tends to be less likely to increase instability than a tractor logging system which tends to compact the soil, changing groundwater flow patterns, potentially altering slope stability (see Table 3.41). Alternative 3 proposes management of roughly the same acres with the tractor method as Alternative 2.

Table 3.41 Dormant Landslide Terrain By Alternative with Commercial Harvest

Logging System	Alternative 2	Alternative 3
Skyline (acres)	104	44
Tractor (acres)	610	602
Total Treated Acres within Dormant Landslide Terrain	**714**	**646**
Total Treated Acres	18,508	14,404
Percent of Treated Acres within Dormant Landslide Terrain	**4%**	**4%**

There are 1,895 acres of dormant landslide terrain within the planning unit boundary, of which Alternative 2 proposes to treat 38 percent (714 acres) and Alternative 3 proposes treatment of 34 percent (646 acres).

The dormant landslide terrain acres by unit are listed for each alternative in Table 3.42. The units identified would have seeps and springs buffered and any evidence of recent motion evaluated by the geologist. Although the Harvest Select prescription removes a larger volume of timber, the skyline or mobile yarder method used to harvest those units is less likely to compact the landslide debris. The units, generally located on the upper slopes, may have a slightly increased risk for indirectly destabilizing the lower slopes if there should be a sustained weather pattern of higher precipitation.

Table 3.42 Units by Alternative with Commercial Harvest in Dormant Landslide Terrain

Unit/Harvest Mthd	Total Acres	Dormant Landslide Terrain Alternative 2 (acres)	Dormant Landslide Terrain Alternative 3 (acres)
Skyline and Tractor			
133/S -- HSL	39	32	
139.1/S -- HSL	38	14	14
139.2/S -- HSL	31	28	
157/S -- HSL	41	31	31
Subtotal Skyline	**149**	**104**	**44**
53/T --HSL	63	1	1
148/T -- HSL	38	10	10
204/T -- HSL	59	59	59
299/T -- HSL	22	8	
376/T -- HSL	196	20	20
445/T -- HSL	82	51	51
Sub-total Tractor	**460**	**149**	**141**
Sub total - HSL	**609**	**253**	**185**
Tractor			
78/T -- HTH	13	3	3
87/T -- HTH	44	15	15
401/T -- HTH	148	148	148
429/T -- HTH	115	33	33
448/T -- HTH	181	180	180
476/T -- HTH	89	11	11
504/T -- HTH	71	71	71
Subtotal Tractor/HTH	661	**461**	**461**
Grand Total Acres	**1,270**	**714**	**646**

Several units, based on slope and presence of landslide indicators, are more sensitive than others. Units are common to both alternatives unless identified as not occurring in Alternative 3. The units on steeper slopes are Units 133, 139.1, 139.2 and 157. Alternative 3 does not harvest Units 133 or 139.2. Units 204, 445, 504, 448 and 401 are tractor harvest. During a field visit, red clays, generally associated with slip planes in the Clarno Formation, along with seeps and springs were observed in the units. These units are prescribed for commercial thinning and harvest select prescription.

With the implementation of mitigation measures identified in Chapter 2, such as if seeps or springs are found, a no heavy equipment buffer around the wet area to protect from additional compaction would be designated. Protection of springs and seeps by providing a buffer is important. The additional compaction of ground surrounding wet areas could alter the subsurface water flow, increasing the risk for reactivation of landslide debris, depending on the steepness of the slope.

Riparian corridors are protected with vegetation left on the stream banks as designed with treatments in RHCAs, the landslide debris should remain stable, reducing the risk for increasing sediment production. The riparian vegetation will maintain the stability of the landslide debris toeslopes. Protection of springs and seeps by providing a buffer is important. The additional compaction of ground surrounding wet areas could alter the subsurface water flow, increasing the risk for reactivation of landslide debris, depending on the steepness of the slope.

The percentage of proposed reconstruction of system and temporary roads on dormant landslide terrain for Alternatives 2 and 3 is equal. The relative risk for reactivation of landslide terrain is equal for Alternative 2 and 3, given the same number of miles crossing unstable terrain. There are 10.2 miles of road proposed for decommissioning under Alternatives 2 and 4. Three miles (9%) are within dormant landslide terrain. Under Alternative 3, there are 8.8 miles of road proposed for decommissioning, with 3 miles within dormant landslide terrain. After addressing hydrologic concerns such as drainage by providing for adequate hydrologic flows, these roads would be safely decommissioned.

Those units located on the upper slopes of dormant landslide scarps have a slightly increased potential for reactivating the landslide debris on the lower slopes when combined with a higher precipitation or a rain on snow event like the forest experienced in 1997, due to the potential increase flow of groundwater to the lower slopes. Alternatives 2 and 3 propose roughly the same amount of tractor harvest method acres (see Table 3.41). Alternative 2 includes an additional 100 acres of the skyline harvest. Although the percent of treated acres within dormant landslide terrain is equal, Alternative 3 treats fewer acres. Alternative 3 would have slightly less of an effect than Alternative 2.

Potential risk for an increase in sediment transport due to mass wasting is low to moderate for all the action alternatives. The alternatives are roughly equal in the percentage of acreage proposed for management within dormant landslide terrain, as shown in Table 3.42. The slight difference lies in the prescription, method of harvest and total acres to be harvested. Although Alternatives 2 and 3 treat roughly the same percentage of dormant landslide terrain, the actual acres at risk is less in Alternative 3. The acres reduced would be harvested by skyline under the prescription in Alternative 2, which would not compact the ground and is unlikely to alter the subsurface flow.

The proposed treatments of noncommercial thinning and prescribed natural fire would have no direct effects on increasing slope instability. Indirectly, the treatments would encourage increased growth of the vegetation, which would increase the evapotranspiration, thereby improving slope stability.

Direct and Indirect Effects of Alternative 4

The proposed treatments of noncommercial thinning and prescribed natural fire would have no direct effects on increasing slope instability. The juniper thinning treatment has 8 acres underlain by dormant landslide terrain, of the 2,688 acres. Of the proposed 16,407 acres of prescribed fire, 693 acres are underlain by dormant landslide terrain. Of the 9,039 noncommercial thinning acres, 833 acres are underlain by dormant landslide terrain. Indirectly, the treatments would encourage increased growth of the vegetation, which would increase the evapotranspiration, thereby improving slope stability. There would be no change in sediment transport from roads.

Cumulative Effects of Alternatives 1, 2, 3, and 4

There are no past, present or reasonably foreseeable future activities or projects that would increase the potential for activating landslide prone areas within the project area. One activity that is widespread in the project area is livestock grazing. Cattle grazing would not increase the surface compaction or reduce vegetation enough to increase the flow of groundwater to the lower slopes. Headcut repair would have a

beneficial impact by decreasing the amount and rate of peak flows and reducing sedimentation. Therefore there would be no additional impacts from other activities besides the action alternatives on landslide prone areas. With the implementation of the following precautions, potential direct, indirect or cumulative effects would be minimized. This is in compliance with INFISH for the interim riparian standard. Springs and landslide prone areas less than 1 acre would be protected by a slope distance of 50 feet. Unstable terrain and spring areas greater than 1 acre would be protected by a buffer of 150 feet. If there is any indication of recent landslide activity, the area would be evaluated by the geologist and the buffer may be increased. See Mitigations, Design Criteria, and Resource Protection Measures for Watershed Resources in Chapter 2.

Mineral Materials (gravel and rock pits)

Affected Environment

Through development of the road system for timber and recreation access within the Maury watershed, 31 mineral material sources have been opened over the past three decades and are the likely sources to be used for reconstruction/stream restoration activities. The material sources vary in size from 0.5 acre to 14 acres. The average size is 0.5 acre. They cover 39.5 acres (0.1 percent) of the National Forest System land. These sources vary in chemical composition from rhyolite to basalt. The rock quality varies from marginal pit run to crushing quality. The status of the sources range from active to partially rehabilitated. The Geology Report contains a comprehensive listing of the material sources.

Direct and Indirect Effects of No Action

Under the No Action Alternative, extraction of rock would continue for use in road maintenance and restoration activities but would be minimal in amounts.

Direct and Indirect Effects of Alternatives 2, 3, and 4

No new material sources would be developed, only existing sources would be utilized for road maintenance, construction and reconstruction. No sources would be depleted because the amount of rock needed would be minimal. No road construction or reconstruction would occur with Alternative 4.

Cumulative Effects of Alternatives 1, 2, 3, and 4

Minor amounts of rock may be needed for routine maintenance and spot rocking on roads in the project area. Additional small amounts of rock would be needed for stream restoration activities. No other reasonably foreseeable future actions would utilize the quantities of rock needed for implementation of the action alternatives.

Soils

Affected Environment

MAJOR LANDTYPES AND PHYSIOGRAPHY

The Western Maury Mountains contains a wide variety of soils and landtypes. Parent materials are largely Clarno Formation, approximately 95 percent, which is comprised of andesitic lava flows, domes, breccia, interlayered saprolite, bedded volcaniclastic and epiclastic mudstone, claystone, siltstone, sandstone, conglomerate, and mudflow (lahar) deposits (Walker 1990). Quaternary landslide debris underlies approximately 4 percent. The John Day Formation underlies most of the balance, 1 percent, of the watershed and consists primarily of rhyolite and dacite in nested domes, small intrusive bodies and related flows (Orr 1992) (see also the Geology section of this chapter).

Volcanic ash from Mt. Mazama blanketed the area about 6600 years ago and has been subsequently reworked by water and air. Newberry Crater ash has also been deposited over much of the area with much less depth. Ash soils (greater than 7 inches of ash) occur over 32 percent of the area or about 12,000 acres. The balance of the project area is largely residual soil which is clay-loam or clay texture. Much of the lower elevation area is low productivity ponderosa pine forestland, juniper woodland or non-forest scabland, sage, juniper, rock outcrop, or meadow.

Most of the watershed is tractor ground with 36 percent of the total area in the 0-15 percent slope class and 54 percent in the 16-35 percent class, 9 percent in the 35-50 percent class (cable ground) and 1 percent in the 51-70 percent class. Total = 90 percent tractor ground and 10 percent cable or helicopter ground.

These figures illustrate that relatively this project area (West Maurys) has steeper tractor ground than other areas such as the east Maurys. This is fairly typical of Clarno Formation terrain in the southwest Blue Mountain area.

The major landtypes are the B landtypes (55 percent), T landtypes (35 percent), and L landtypes (7.5 percent). Additional minor landtypes are the A (1.6 percent), C (less than 1 percent) and M (less than 1 percent) landtypes. An acreage summary by major landtype is provided in Table 3.43.

Table 3.43 West Maurys Project Area Major Landtypes

Landtype group	Approximate NFS Acres	Percent of NFS Lands	Parent Material
B Landtypes	20,710	55	Basalt
T Landtypes	13,257	35	Tuffs and basalt
L Landtypes	2809	7.5	Landslide Deposits
A Landtypes	608	1.6	Mixed Alluvium
C Landtypes	67		Colluvial Escarpments
M Landtypes	62		Mixed Alluvium
		100.0	

More detailed information regarding the descriptions of existing landtypes can be found in the Soils Report and is incorporated by reference. Landtypes are utilized to identify soils with high tillage potential, vegetation types and soils that are susceptible to displacement or detrimental compaction from activities.

Site productivity is maintained through protection of the soil from detrimental disturbance. The LRMP requires "in order to maintain site productivity, all project activities will be planned to reduce soil compaction and displacement to the lowest reasonable level. Strive to reduce compaction and displacement to get as close to 90 percent of the total activity area (including permanent, rocked, and non-surface roads) remaining in a non-compacted/non-displaced condition, as realistically possible, one year after any land management activity. The minimum will be 80 percent of the total activity area. Existing areas exceeding these standards will be scheduled for rehabilitation as soon as possible. An activity area is the total area for which a ground disturbing activity is planned, for example, a unit for a timber sale, slash disposal project, or grazing allotment. The area would also include transportation systems within and directly adjacent to the project."

Soil compaction is defined as the increase in bulk density of 15 to 20 percent over natural levels. Bulk density is measured by the weight of soil in a set volume. Compaction arises from a reduction in pore space between soil particles resulting from heavy equipment passing over the surface during periods when the soils are susceptible to compaction. Frozen soils during winter can provide enough strength to protect soils from compaction. Soil displacement is the movement or rearrangement of soil so that normal processes are affected and also is the stirring of soil horizon layers. Displaced soils are often not vegetated as a result of disturbance and are susceptible to raveling and erosion. Damage to soils from burning usually occurs when fuels that are burned are in direct contact with the soil and the duration and intensity of burning is high. This normally occurs with high concentrations of fuels found at landings. As a result, soils become hydrophobic, meaning surface water does not infiltrate the soil and instead flows over the surface until an area is intersected where infiltration can occur. Burning of hand or grapple piles does not normally result in hydrophobic soils because of the smaller pile size and reduced temperatures and duration of the burning.

In 1998, the Regional Forester clarified the direction for planning and implementing activities in areas where soil standards have been exceeded from prior activities. In areas where less than 20 percent detrimental compaction exist prior to activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 20 percent. In areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must at a minimum, not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality.

The following is a description of activities associated with the Action Alternatives. Effects to action alternatives vary with the magnitude of commercial harvest and type of logging system and grapple piling.

Direct and Indirect Effects of Commercial Harvest Yarding Systems

Table 3.44 Acres of Harvest by Logging System

Yarding System	Alternative 1 (acres)	Alternative 2 (acres)	Alternative 3 (acres)	Alternative 4 (acres)
Ground based - Tractor	0	5,499	4,319	0
Skyline	0	2,111	931	0
Light (Horse, Mobile yarder)	0	203	238	0
Total Harvest	0	7,763	5,488	0

Ground-based Tractor System
This harvest system has the highest amount of soil impacts associated with it and can result in exceeding the soil standards if not carefully designed and actively monitored. Classic, rubber-tired skidders and skidding crawler-type tractors are used on an average 100-foot skid trail spacing to skid logs to the landings, which are accessed by roads. The main skid trails comprise the majority of the detrimental disturbance, which is largely compaction and displacement. The same applies to landings with the addition of more soil puddling and charring from landing piles. Skid trails on an average of 100-foot spacing contribute roughly 10-15 percent disturbance in an average unit with landings and roads making up an additional 5 and 2 percent, respectively. Overall, potential for detrimental soil conditions is 17-22 percent per entry; this does not include any mitigation or other measures to reduce potential impacts, nor does it include existing levels of detrimental disturbance. Mitigation measures such as utilizing existing skid trails, landings and roads, the use of tillage to reduce compaction will reduce percent detrimental soil impacts.

Past harvest practices have often led to unacceptable amounts of soil damage. Evaluation of existing conditions on the proposed harvest units in this project reveals that up to 65 percent of the acres currently exceed the standard for unacceptable condition. Current individual unit design criteria are helping to keep the overall percentage of net detrimental impacts to a minimum. In addition, equipment such as the Timbco tracked feller buncher with an approximate 25-foot reach will result in less impact. These are some of the least impacting harvest machines for the proposed harvest treatments. Wider tracks on these machines would help even more. If passes are kept to no more than two on previously disturbed areas, then detrimental conditions will be less likely to result from this entry.

Table 3.45 Summary of Existing Detrimental Soil Disturbance in Proposed Harvest Units

Alternative	% Harvest Acres with 20% or Less Existing Soil Damage	% Harvest Acres with More Than 20% Existing Soil Damage
2	77	23
3	68	32
4	0	0

Estimates of existing detrimental soil conditions related to past harvest activities were derived from examining past management actions, conducting soil monitoring and extrapolating results to similar areas not monitored using aerial photo interpretation and local knowledge. Historical harvest records were also researched to determine the extent of harvest, yarding system, time since harvest and harvest prescriptions.

Recent monitoring results show that detrimental soil conditions can be kept within acceptable levels using ground-based harvest equipment (see Soils Report, Appendix B: Soil Monitoring Reports, Blackbear Timber Sale, Paulina Ranger District). This requires that design criteria be carefully followed and that tillage opportunities are carefully evaluated.

Grapple Piling
Grapple piling of residual slash resulting from harvest and noncommercial thinning activities is done to lessen the fuel loadings and break up fuel continuity. Grapple piling is accomplished with a machine with an articulating arm able to reach 25-30 feet from the machine. Machines operate on existing skid trails and do not result in additional compaction to harvest units. Usually a 50 percent reduction in horizontal fuel continuity is adequate. With 100 foot skid trail spacing and a 25-30 foot boom length on the arm, this objective can be accomplished without additional disturbance.

Tillage Treatments to Alleviate compaction
The main purpose of tillage is to decompact the soil such that there is an improvement in soil moisture and aeration. Tillage is recommenced in previously harvested areas to reduce existing compaction and anticipated compaction resulting from proposed activities, especially on skid trails, landings and temporary roads. An assessment of tillage potential is based on the land type, steepness of slopes, soil depth and types of soils. Further information on assessing the potential for tillage can be found in the Soils Report. Short-term effects include increases in localized erosion potential until effective vegetative cover is established. The short term negative effects would be lessened with the use of water bars and strategic slash treatment. Resistance to root growth is lessened also. Long term effects are largely beneficial due to improved infiltration, percolation, aeration and lessened bulk density. Table 3.47 displays a unit by unit description of the Alternatives relative to proposed treatments, system of harvest and fuels treatments, existing soil compaction levels and post soil compaction levels with and without tillage.

Skyline systems
Skyline systems would result in little to no increase in current compaction levels in harvest units. This is because no heavy machinery would be allowed on the steeper slopes and during yarding operations, logs would either be fully suspended or have one end suspended which results in little compaction. Soil impacts would be limited to displacement of surface organic material in individual yarding corridors. This harvest system is used largely on steeper slopes where there is sufficient deflection for the use of cable operations. They are usually set up with an uphill access road at the top of the unit or drainage with landings along the road. The potential for detrimental disturbance is much lower than ground-based harvest. Overall potential for detrimental disturbance is 6-12 percent per entry. Detrimental disturbance occurs primarily on landings, roads, and cable corridors.

Mobile Yarder Systems
Mobile yarders would be utilized to yard trees from the existing road without the need to enter the unit within RHCAs. This would occur in units 8 and 21 within the RHCAs. No detrimental soil effects would be expected from these activities under either Alternative 2 or 3. Mobile yarders don't have the reach that larger skyline machines have but are useful on shorter steep pitches often too steep for tractor operations. With the mobile yarders, complete suspension is often not attained but these yarders produce less ground disturbance than skidders.

Horse and / or Mule Systems
Horse logging would be utilized in Unit 594 where resource protection is needed within or adjacent to recreation area. Using this method, yarding can occur within higher density stands and less ground disturbance and compaction would occur. On locally monitored animal logged units, mule disturbance was very minimal. A small drag trough was created by the mule skidding but was minimal compared to the impacts of the original tractor trail. Off trail disturbance was slight with an estimated 5 to 7 percent of the ground in an observable disturbed state. Detrimental displacement and compaction were low. (David, J; 2002; Mule/Horse Logging Impacts on Mule TS #3)

Soil Compaction and Displacement
Direct and Indirect Effects of No Action
This alternative proposes no management actions which would affect the soil resource in the short-term. Existing natural processes would continue. No soil restoration tillage would be performed. Recovery of existing soil (compaction) would occur through natural processes. These processes include frost heaving in

the top 4 to 6 inches of soil. These natural processes can take 10 to 50 years or more to fully restore damaged ash soils, while clayey residual soils may recover in 1-2 years due to shrinking and swelling actions.

Fuels reductions would not occur thereby increasing the risk of high intensity wildfire with increased oxidation and mineralization of nutrients such as nitrogen and potassium. This increased fire intensity and severity can reduce site productivity. (Harvey et al. 1991) This alternative would comply with the regional soil standards in the short-term but may exceed regional standards and guidelines in the long term if stands are not thinned and large tonnage is produced, burned by wildfire and then reburned. (Shank, Doug; 2004; Fire Related Soil Impacts: Monitoring of the Eyerley, B & B, Booth West, Cabot Creek and Brush Creek Reburns; Deschutes National Forest)

Direct and Indirect Effects of Alternative 2
This alternative proposes the most harvest overall, as well as the most ground-based harvest. This alternative has the greatest potential to increase the amount of detrimental soil compaction, displacement, and charring. Approximately 23% of the acres proposed for harvest currently exceed the 20 percent detrimental soil conditions standard. The remaining 77% of acres proposed for harvest currently have less than 20% of the area in a detrimental condition. This alternative has unit specific mitigations and practices identified which will ensure that all activity units meet the soil standards (see Table 3.47 and Chapter 2, Mitigations, Design Criteria, and Resource Protection Measures). This alternative also creates approximately 12 additional acres of detrimental soil impact due to construction of new and temporary roads. Implementation of this alternative would result in approximately 47 acres of tillage to alleviate detrimental soil compaction. Some detrimental soil charring would occur under the grapple piles but will be of a low percentage (estimated to be 5 to 6 piles per acre at 100 square feet/pile which yields 1.1 to 1.3 percent impacts which are mostly on existing trails and landings). Broadcast burning of natural fuels would produce some detrimental charring but is estimated to only be a fraction of a percent. There would be no net increase of detrimental soil conditions. Implementation of this alternative would comply with the regional soil standards.

Direct and Indirect Effects of Alternative 3
This alternative proposes the second most harvest overall, as well as the second most ground-based harvest. This alternative has the lesser potential (of the two action alternatives) to increase the amount of detrimental soil compaction, displacement, and charring. Approximately 32% of the acres proposed for harvest currently exceed the 20 percent detrimental soil conditions standard. The remaining 68% of acres proposed for harvest currently have less than 20% of the area in a detrimental condition. This alternative has unit specific mitigations and practices identified which will ensure that all activity units meet the soil standards (see Table 3.47 and Chapter 2, Mitigations, Design Criteria, and Resource Protection Measures). This alternative also creates approximately 8 additional acres of detrimental soil impact due to construction of new and temporary roads. Implementation of this alternative would result in approximately 47 acres of tillage to alleviate detrimental soil compaction. Some detrimental soil charring would occur under the grapple piles but will be of a low percentage (estimated to be 5 to 6 piles per acre at 100 square feet/pile which yields 1.1 to 1.3 percent impacts which are mostly on existing trails and landings). Broadcast burning of natural fuels would produce some detrimental charring but is estimated to only be a fraction of a percent. There would be no net increase of detrimental soil conditions. Implementation of this alternative would comply with the regional soil standards.

Direct and Indirect Effects of Alternative 4
This alternative is the third most potentially ground disturbing alternative but only includes grapple piling of noncommercial thinning slash and no commercial harvest. This activity would be largely constrained to existing skid trails, roads and landings. No new detrimental compaction is anticipated with this alternative because grapple pilers would be limited to existing skid trails, roads and landings and to one to two passes over ground previously undisturbed. The proposed grapple piling acreage is 2,638 acres for this alternative which is similar to Alternatives 2 and 3. Some detrimental soil charring would occur under the grapple piles but will be of a low percentage (estimated to be 5 to 6 piles per acre at 100 square feet/pile which yields 1.1 to 1.3 percent impacts which are mostly on existing trails and landings). Broadcast burning of natural fuels would produce some detrimental charring but is estimated to only be a fraction of a percent.

There would be no net increase of detrimental soil conditions. The failure to thin the young pole and sawtimber component (from 9 to 21 inches in diameter) would increase per acre standing fuel loadings which would increase fire intensity and severity in the future especially in reburn conditions. Implementation of this alternative would comply with the regional soil standards.

Direct and Indirect Effects of Other Treatments for Alternatives 2, 3, and 4
Other treatments proposed in the Action Alternatives such as noncommercial thinning, hand piling and prescribed burning do not result in detrimental soil impacts. No heavy equipment would be utilized to accomplish these activities. Prescribed burning would result in some removal of surface fuels, herbaceous vegetation and duff layers but there would not be 100 percent coverage in any burned unit. Prescribed burning is designed and done under spring-like conditions where moisture levels prevent total consumption of organic material. No detrimental soil effects would be expected from these activities under any alternative.

Long-term Soil Productivity, Coarse Woody Debris and Organic Matter
The Action Alternatives would maintain long-term site productivity. The primary impacts to soils would occur where soil is compacted, anticipated to occur only on designated skid trails, temporary roads and landings. Maintenance of the soil organic layer would be achieved in all of the action alternatives with commercial harvest (Alternatives 2 and 3) through the use of skyline logging systems and, for tractor harvest designating skid trails for machine use, or by tractor logging under winter conditions. Soil organics, including coarse woody material, would be at levels which maintain site productivity through all activities including, harvest, precommercial thinning and prescribed fire. Levels of coarse woody material resulting from the proposed activities is displayed below in Table 3.46. Coarse woody material is defined as woody residue larger than 3 inches in diameter. Down log levels are intended to be representative of historic conditions, including disturbance regimes. Use of these levels is best applied at the landscape (watershed) scale, however application can be made at any scale where the plant association group and seral/structural stage composition is known. Utilizing prescribed fire, and the resultant charring of coarse woody debris, does not interfere substantially with the decomposition or function for the soil resource (Graham et al.). Further description and analysis of coarse woody debris can be found in the Soils Report.

Table 3.46 Proposed Down Wood Historic Range of Variability by Plant Association Group

Plant Association Group	Down Log > 12" in diameter HRV – total lineal feet per acre
Moist Grand Fir	188-410
Dry Grand Fir	81-257
Douglas-fir	71-233
Moist Ponderosa Pine	55-167
Dry Ponderosa Pine	6-55

Forest Mycorrhizal associations: Ectomycorrhizae are an important fungal component of temperate forests. These mostly symbiotic fungi species infect host species of pines and firs. The trees provide nutrients to the fungus and the fungus provides nutrients and minerals to the tree. The fine mycelial strands increase the surface area of nutrient collection and provide an important soil link for forest trees. Harvest treatments such as commercial thinning (the majority of the treatment proposed) have very little effect on these fungal associations as long as there are live host tree species throughout the stand. No detrimental effects would be expected from these activities under any alternative.

Table 3.47 Existing and Expected Soil Compaction Levels by Unit For Alternative 2 and 3

Unit	Acres	Proposed Action			Alternative 3			Existing Soil Disturbance%	Post Treatment estimate	Tillage Potential	Tillage Acres	Post Tillage Estimate	Mitigations
		Harvest	Grapple Pile	Logging System	Harvest	Grapple Pile	Logging System						
8	23	HSL		M	HSL		M	5	8	L		8	
10	65	HSL	GP	T	HSL	GP	T	5	8	L		8	
11	3	HSL	GP	T	HSL	GP	T	20	20	M		20	Stay on existing trails, no net increase over 20%.
12	41	HSL	GP	T	HSL	GP	T	9	19	L		19	
18	7	HSL	GP	T	HSL	GP	T	8	18	M		18	
19	43	HSL		S				3	8	L		8	
20	138	HSL	GP	T	HSL	GP	T	25	25	L		25	Stay on existing trails. No net increase.
21	64	HSL		M	HSL		M	10	20	L		20	
29	76	HSL		S				1	7	L		7	
33	44	HSL		S				2	8	L		8	
44	32	HSL		T				2	12	M		12	
50	55	HSL	GP	T				2	12	M		12	
53	63	HSL		T	HSL		T	12	20	L		20	
62	27	HTH		S	HTH		S	5	10	L		10	
63.1	69	HTH		T	HTH		T	15	20	L		20	Stay on existing trails, no net increase over 20%.
72.1	28	HSL		S	HSL		S	10	15	L		15	
75	30	HSL	GP	T				8	18	M		18	
78	13	HTH		T	HTH			18	20	L		20	Stay on existing trails, no net increase over 20%.
79	42	HSL		S	HSL		S	11	15	L		15	
80	106	HSL	GP	T			T	6	16	H		16	
81	57	HSL		T	HSL		T	18	25	M	3	20	Stay on existing trails, no net increase over 20%.
82	30	HSL		S	HSL		S	2	12	M		12	
87	44	HTH		T				8	18	L-M		18	
103	149	HSL		S				0	5	L		5	
112	94	HSL		T	HSL		T	15	20	M		20	Stay on existing trails, no net increase over 20%.
115	85	HSL		T	HSL		T	2	12	L-M		12	
118	93		GP	T		GP	T	15	20	L-M		20	Stay on existing trails, no net increase over 20%.
125	92	HTH	GP	T	HTH	GP	T	18	20	L		20	Stay on existing trails, no net increase over 20%.
126	70	HSL		S			S	6	16	L		16	

Unit	Acres	Proposed Action			Alternative 3			Existing Soil Disturbance%	Post Treatment estimate	Tillage Potential	Tillage Acres	Post Tillage Estimate	Mitigations
		Harvest	Grapple Pile	Logging System	Harvest	Grapple Pile	Logging System						
133	39	HSL	GP	T			S	2	12	L-M		12	
134	39	HSL	GP	T			S	8	13	L		13	
136	103	HTH		T	HSL	GP	S	18	25	L-M	5	20	Stay on existing trails, no net increase over 20%.
139	70	HSL		S	HSL		S	2	7	L		7	
148	39	HSL		T	HSL		T	6	16	H		16	
149	27	HSL		T				12	18	L-M		18	
157	41	HSL		S	HSL		S	3	6	L		6	
162	39	HTH		S	HTH		S	3	6	L		6	
166	188	HTH	GP	T	HTH	GP	T	25	25	L-M	9	20	Stay on existing trails, no net increase over 20%.
173	29	HTH	GP	T	HTH	GP	T	15	20	L		20	Stay on existing trails, no net increase over 20%.
195	119	HSL		S	HSL		S	0	6	L		6	
198	175	HSL	GP	T	HSL	GP	T	25	25	L		25	Stay on existing trails. No net increase.
203	129	HSL	GP	T	HSL	GP	T	12	18	L		18	
204	59	HSL		T				25	25	H	3	20	Stay on existing trails. No net increase.
205	26	HSL		S				6	9	L		9	
226	51	HSL		S	HSL		S	16	23	H	2	20	Stay on existing trails, no net increase over 20%.
228	70	HSL		T	HSL		T	18	20	L		20	Stay on existing trails, no net increase over 20%.
240	58	HSL		T	HSL		T	18	25	M	3	20	Stay on existing trails, no net increase over 20%.
241	15	HSL		S	HSL		S	0	5	L		5	
242	70	HSL	GP	T	HSL	GP	T	16	23	M	2	20	Stay on existing trails, no net increase over 20%.
253	80	HSL	GP	T				15	20	L		20	Stay on existing trails, no net increase over 20%.
254	54	HSL		T	HSL		T	24	24	L		24	Stay on existing trails, no net increase.
258	11	HSL		S	HSL		S	0	6	L		6	
261	39	HSL		T	HSL		T	13	20	L		20	
282	31	HSL		S	HSL		S	2	8	L		8	
285	44	HSL		S				4	8	L		8	
287	9	HSL	GP	T	HSL	GP	T	5	15	M		15	
292	33	HSL		S	HSL		S	0	5	L		5	

Unit	Acres	Proposed Action			Alternative 3			Existing Soil Disturbance%	Post Treatment estimate	Tillage Potential	Tillage Acres	Post Tillage Estimate	Mitigations
		Harvest	Grapple Pile	Logging System	Harvest	Grapple Pile	Logging System						
294	14	HSL		S	HSL		S	3	6	L		6	
296	46	HSL	GP	T				6	16	M		16	
299	22	HSL	GP	T			T	7	17	H		17	
300	55	HSL	GP	T	HSL	GP	T	14	20	L		20	
303	34	HSL	GP	T				8	18	H		18	
309	79	HSL	HP		HSL	HP	T	10	19	H		19	
316	48	HSL	GP	T	HSL	GP	T	25	25	H	2	20	Stay on existing trails. No net increase.
317	77	HSL	GP	T			T	4	14	M		14	
318	55	HSL		S				2	6	L		6	
324	27	HSL		S	HSL		S	0	5	L		5	
327	5	HSL	GP	T				0	10	L		10	
334	29	HIM		S	HIM		S	3	6	L		6	
347	33	HSL		S	HSL		S	0	5	L		5	
350	22	HSL		S			S	2	8	L		8	
351	86	HTH	GP	T	HTH	GP	T	25	28	M	4	20	Stay on existing trails, no net increase over 20%.
364	28	HSL		S	HSL		S	2	6	L		6	
365	41	HSL	GP	T			T	6	16	L		16	
375	48	HSL		T	HSL		T	25	25	L		25	Stay on existing trails. No net increase.
376	196	HSL	GP	T	HSL	GP	T	20	25	L-M	10	20	Stay on existing trails, no net increase over 20%.
382	13	HSL		T			T	8	18	L-M		18	
384	79	HSL		T				9	19	L		19	Stay on existing trails. Keep total disturbance below 20%.
385	41	HSL		S	HSL		S	2	6	L		6	
386	31	HSL		T			T	6	16	L-M		16	
390	44	HSL	GP	T	HSL	GP	T	25	25	L		25	Stay on existing trails. No net increase.
393	187	HSL		S				0	6	L		6	
401	148	HTH		T	HTH		T	22	22	L		22	Stay on existing trails, no net increase.
405	48	HSL	GP	T			T	8	18	M		18	
410	83	HSL	GP	T	HSL	GP	T	9	19	H		19	
411	33	HSL		T				10	19	L		19	
416	66	HSL		T	HSL		S	12	20	L		20	
417	33	HSL		T	HSL		T	7	17	L		17	

Unit	Acres	Proposed Action			Alternative 3			Existing Soil Disturbance%	Post Treatment estimate	Tillage Potential	Tillage Acres	Post Tillage Estimate	Mitigations
		Harvest	Grapple Pile	Logging System	Harvest	Grapple Pile	Logging System						
426	28	HSL		T			S	0	10	L		10	
429	115	HTH	GP	T	HTH	GP	T	25	25	L		25	Stay on existing trails. No net increase.
439	54	HTH	GP	T	HTH	GP	T	10	20	L		20	
441	45	HTH	GP	T	HTH	GP	T	12	20	L		20	
445	71	HSL		T	HSL			15	20	L		20	Stay on existing trails, no net increase over 20%.
447	42	HSL		T	HSL		T	25	25	L		25	Stay on existing trails. No net increase.
448	181	HTH	GP	T	HTH	GP	T	15	20	L		20	Stay on existing trails, no net increase over 20%.
452	81	HSL	GP	T	HSL	GP	T	6	16	L		16	
459	11	HSL		T			T	18	20	L		20	Stay on existing trails, no net increase over 20%.
473	85	HSL		T				4	14	L		14	
476	89	HTH		T	HTH		T	16	20	L		20	Stay on existing trails, no net increase over 20%.
478	167	HSL		T	HSL		T	9	19	L		19	
483	19	HTH	GP	T				25	25	L		25	Stay on existing trails. No net increase.
484	56	HSL		S	HSL		S	2	4	L		4	
485	35	HTH		T	HTH		T	25	25	L		25	Stay on existing trails. No net increase.
495	74	HSL	GP	T	HSL	GP	T	25	25	L		25	Stay on existing trails, no net increase.
499	69	HSL		T	HSL		T	25	25	L		25	Stay on existing trails. No net increase.
501	141	HTH		T	HTH		T	25	25	L		25	Stay on existing trails. No net increase.
504	71	HTH	GP	T	HTH	GP	T	18	20	L		20	Stay on existing trails, no net increase over 20%.
506	90	HSL	GP	T	HSL	GP	T	20	25	M	4	20	Stay on existing trails, no net increase over 20%.
507	65		GP	T		GP	T	12	19	L		19	
524.1	23	HSL		T	HSL		T	2	15	L		15	
524.2	79	HSL		S	HSL		S	3	5	L		5	
529	185		GP	T				10	15	L		15	
532	54	HSL		S	HSL		S	4	7	L		7	
533	140	HSL	GP	T				15	20	L		20	Stay on existing trails, no net

Unit	Acres	Proposed Action			Alternative 3			Existing Soil Disturbance%	Post Treatment estimate	Tillage Potential	Tillage Acres	Post Tillage Estimate	Mitigations
		Harvest	Grapple Pile	Logging System	Harvest	Grapple Pile	Logging System						
													increase over 20%.
538	61	HSL	GP	T	HSL	GP	T	12	20	L		20	
559	30	HSL		T	HSL		T	8	18	L		18	
563	115	HSL	GP	T				12	20	L		20	
569	72	HSL		T			T	14	20	L		20	
570	81	HSL		T	HSL		T	8	18	L		18	
576	73	HTH		T	HTH		T	16	20	L		20	Stay on existing trails. Allow no more than 4% increase.
578	14	HSL		T				8	18	L		18	
580	80	HSL		T	HSL		T	10	19	L		19	
591	45	HSL		T				3	13	L		13	
594	150	HSL		L-H	HSL		L	6	16	L		16	
595	47	HSL		S				4	7	L		7	
598	118	HSL		T			T	4	14	L		14	
601	35	HSL		T			T	2	12	L		12	

HSL – Unevenaged Management
HTH – Commercial Thinning
HIM – Improvement Cut
GP – Grapple Pile
M – Mobile Yarder
S – Skyline system

T – Tractor yarding
L-H – Horse logging

Tillage Potential
L – Low (not good candidate for tillage because soil and physical features)
M – Moderate
H – High

Alternative 4 is not included in this table because detrimental compaction is not expected to increase because grapple pilers would be limited to existing skid trails, roads and landings and one to two passes on previously undisturbed areas. There conditions would not change from the existing condition.

Cumulative Effects of Alternatives 2, 3, and 4
Analysis of the entire project area indicates that approximately 7 percent (2,750 acres of existing detrimental disturbance divided by entire project area acreage (37,974)) of the project area currently has detrimental soil damage resulting from past harvest activities. The project area currently has 220 miles of roads which equates to approximately 400 acres of detrimental compaction and an additional 1 percent of detrimental compaction for a total project area assessment of 8 percent. Other possible activities causing compaction are fence construction and maintenance for cattle allotment management and water developments. There are approximately 89 miles of fence lines in the project area and permittees are permitted to access these fences for maintenance and construction with motorized vehicles where allowed. If you assume that the accessible area is approximately 10 feet wide, this would add an additional 208 acres of compaction. There are approximately 146 water developments in the project area. If you assume approximately 1 acre of ground is compacted from livestock use for each development, this would add an additional 146 acres of compaction. Compacted ground associated with fence lines and water developments would only increase the overall compaction in the project area by 0.7 percent. No measurable increase is expected with any of the action alternatives at the project area scale with the implementation of the mitigation measures such as reusing existing skid trails for harvesting and fuels treatments. Individual unit compaction levels are expected to increase slightly (see Table 3.47 for unit by unit estimates) but an estimated 47 acres of tillage is expected to reduce compaction resulting from heavy machinery, from both ground based harvest and grapple piling activities. In reviewing past, present and reasonably foreseeable future actions, no overall measurable increase in the amount of detrimental soil conditions is expected across the project area for any action alternative.

The Sherwood prescribed burn, to be implemented in the spring and fall of 2004, would result in little to no measurable effect on the soil resource due to the burn would be conducted under moist conditions resulting in low burn intensities. The ground cover vegetation would be expected to recover quickly after burning because of the low intensity of the burn, leading to little or no sediment production.

Heritage Resource Sites and Plants of Cultural Value

Affected Environment
Columbia Plateau and Great Basin cultural areas overlap in the high desert country of Central Oregon. The aboriginal inhabitants were well adapted to the unique desert, mountain, and plateau ecosystems. The Plateau Culture area includes the interior drainages of the Frasier and Columbian River, excluding the upper reaches of the Snake, John Day, and Deschutes Rivers (Lebow et al. 1990). The Great Basin Culture Area encompasses all the Great Basin plus peripheral parts of the southern tributaries of the Columbia River and much of the upper Colorado River. Distinctions between these groups are recognized by their language families, “Sahaptin” and “Shoshonean” and specific cultural traditions. Small family and extended family groups moved throughout their territories in relationship to the environment, seasonal changes, and availability of foods. Although the availability of resources fluctuated over the millennia, the archaeological records suggest the native inhabitants followed life ways very similar to those recorded ethnographically for the area. Archaeological sites are primarily recognized by stone tools and flakes resulting from making stone tools. The upland settings, like the Maury Mountains are believed to have been occupied in the spring, summer, and fall during seasonal rounds. Winter villages were commonly located in the lower elevation country with less snowfall.

Subsistence rounds, settlement patterns, and social ties were similar yet unique to the Northern Paiute and Columbia River groups. The Columbia River people place great importance on salmon, taken with weirs, dip nets, and spear. The Great Basin groups, specifically the Northern Paiute, relied more on a broader spectrum of resources for hunting, gathering, and collecting activities. In general, the Plateau groups developed more sedentary settlement patterns with winter villages common along the Columbia River. Great Basin groups traveled in smaller family groups during the warmer seasons and congregated into larger groups for semi-permanent winter camps. Ethnographic studies refer to winter villages along the main stem of the Deschutes River and its major tributaries including the Crooked River. By 9,000 years ago, Plateau people harvested fish, gathered plant foods, hunted large and small animals, and traded as they did more recently with Lewis and Clark’s arrival (Hunn 1990).

Central Oregon and the Ochoco Mountains are within the historic ancestral domain of several tribes including The Burns Paiute, The Confederated Tribes of the Warm Springs Reservation, The Klamath Tribe, and the Confederated Tribes of the Umatilla Reservation. The Ochoco National Forest is within the ceded lands of The Confederated Tribes of the Warm Springs Reservation. The earliest inhabitants of Central Oregon are known through the stories of origin and cultural tradition and the archaeological record over 12,000 years old. An intensification of hunting and gathering life ways developed during the warmer and drier intervals that followed. Archaeological evidence during the Archaic Period is characterized by an increased range of specialized tools and utensils, especially milling stones, geared to subsistence resources of each region (Claeyssens 1992). Site patterns in the Maury Mountains show a preference for south facing slopes along drainages and high elevation spring sites along the summit.

Heritage resource sites includes prehistoric, historic, and traditional cultural sites that may be affected, both negatively and positively, by the proposed activities. A complete description of the existing and known heritage resource sites can be found in the Heritage Report (Holtzapple, Heritage Existing Conditions, Effects Report, and West Maury Planning Area SHPO Report). The most common type of site in the Maury Mountains is lithic scatters. Lithic scatters would include flake debitage, flaked stone tools, and groundstone tools. The artifacts and cultural stratigraphy may be negatively affected by ground-disturbing activities from ground-based logging equipment, road construction, fuels treatments, or unplanned wild land fires. Machinery crushes artifacts and disturbs the spatial arrangement. Wildfire and prescribed fire, specifically the degree and temperature, can melt or disfigure artifacts and alter the hydration bands on obsidian. The fire intensity and duration of burning are highly variable and dependent on the nature of available fuels and weather conditions. Methods used for dating archaeological materials and environmental conditions rely on relatively stable environmental conditions and high temperatures can "reset" the chronological indicators. Research has shown obsidian is altered with temperatures ranging from 200 –300 degrees centigrade and greater (Loyd 2002). Historic sites often involve wooden structures like cabin remains, fences, and log troughs and would be adversely affected by fire, heavy equipment, and tree falling. Traditional cultural sites are areas used in the past or present for gathering plants for food, medicine, or other purposes. Ground disturbance from machinery and fire occurrence before plants are dormant could adversely affect these areas and plant populations. Prescribed fire may benefit plant populations when applied during the appropriate plant cycle. Access to these areas is a concern for neighboring Tribes and activities like closing roads could restrict access. Limiting or controlling access from vehicles and all terrain vehicles (ATVs) would reduce surface disturbance and potentially reduce vandalism to heritage sites resulting in a positive effect.

Reducing ladder fuels and/or changing the arrangement of existing fuels would lower the potential for unplanned fires and better provide for the protection of artifacts, features, and traditional cultural plant communities. Unplanned fires or wildland fires typically occur in the summer when fuels are drier and temperatures are hotter. Resource protection is responsive to wildfire conditions and often results in a loss of the resource.

The effects analysis is based on the potential for damage to artifacts, features, environmental settings and ground disturbance by machinery, fuel loadings and potential temperature and duration of fire treatment, and degree of risk for successfully implementing design criteria for the proposed alternatives.

Many plant species of cultural value occur within the forested lands. The plants discussed here focus on only a few of the culturally significant plants gathered by local tribes. Bitterroot (*Lewisia rediviva*) and several *Lomatium* species occupy non-forested habitats often called "scabland." Soils associated with scabland or lithosols are shallow with a high clay content. These habitats are sensitive to disturbance and native vegetation does not completely recover from disturbance activities like log landings, roads, and off road vehicle use. The LRMP identifies these fragile areas for protection except where disturbance is unavoidable. Very little, less than 1 percent, of scabland habitat would be disturbed by proposed activities in the action alternatives. Populations and the abundance of culturally significant root crops would be

expected to remain the same although individual plants may be affected by proposed actions. These root crops are present in open rocky areas with shallow soils. Such areas were included in the Sherwood Burn Project.

Camas (*Camassia quamash)* is generally found in moist areas and wet meadows. Yampa (*Perideridia gairdneri)* has a broader distribution and can be found in the understory vegetation in forested areas. Several of the *Lomatium* species also occupy a broader range of habitat including forested areas. Hanging black moss (*Bryoria fremontii)* primarily grows on the lower branches of conifers and decades of fire suppression has likely resulted in an increase of this species. Proposed activities would reduce the density of trees that provide habitat for the lichen but current levels would be maintained on untreated acres. Under all alternatives, the viability and availability of these culturally significant species would continue. Creeks and riparian vegetation are important to area Tribes for the combined values of water quality, fish habitat, and vegetation such as aspen, cottonwoods, willows, and currents.

Direct, Indirect, and Cumulative Effects of No Action
Existing management practices would continue under the No Action alternative but no new vegetative treatments would occur. Levels of natural fuels would continue to accumulate, dense understory trees would not be treated, and thinning of larger trees would not be scheduled. Untreated fuels under this alternative would increase the potential for unplanned, high-intensity wildfires and would have a negative affect on the physical materials and features of cultural resource sites. The risk of hotter and uncontrolled wildland fires would continue to increase and in turn lead to the loss of wooden features, soil scorching, damage to stone artifacts, and loss of site setting and the ability to collect further chronological data. There would be a direct negative effect to artifacts, features, and site settings from catastrophic fire and related fire suppression activities. Cultural plants and their abundance would be at risk of loss from unplanned fires, hotter burning temperatures, soil scorching, and associated fire suppression activities.

The Sherwood prescribed burn project focused on areas with timber or juniper within the project area. The root crops were not affected by the prescribed burning operations largely because patches of bare soil were common on these sites and fuel loadings were too low to carry fire. When fire did creep into these more open areas, burning temperatures were low, often carried by cheat grass and winds. Such short duration fire with low burning temperatures did not reduce the population of root crops. The timing of the Sherwood Burn occurred when the bitterroot was in bloom or post bloom stages. This type of short duration fire with low burning temperatures would not affect the stone tools or other qualities of the site. Fire was not allowed on sites with heavy fuel loadings where higher burning temperatures and longer duration fire would be expected.

Planned riparian restoration projects and wildlife habitat improvement projects would continue. These types of projects have addressed the protection and management of heritage values under separate project analysis and compliance. The Confederated Tribes of the Warm Springs Reservation and The Burns Paiute Tribes are supportive of riparian restoration projects particularly those that incorporate planting native species like willow, aspen, cottonwood, and chokecherry. Potential wildfire effects on plants of cultural value are varied, depending on the species and habitat. Willow (*Salix spp.)* could initially be reduced following fire, but in the long term may be enhanced by fire. Young straight stems are more desirable for basketry materials than older multi-branched stems.

Recreational activities including dispersed camping, off road vehicle use, and artifact collecting are most damaging to heritage sites. Dispersed camping areas commonly overlap with heritage site locations along creeks, meadows, and springs. Disturbance to sites results from human use, vehicle use, fire rings temporary outhouses, and vandalism. In general, increased recreational use correlates to increased vandalism and damage to heritage sites through removal of artifacts or disturbance to features. Site damage from off road use and all terrain vehicles has increased in the past 5 years. Recreation use would continue at the current rate under the no action alternative and disturbance to heritage sites would continue.

The headcut stabilization projects and treatment of noxious weed projects have addressed the protection and management of heritage values under separate project analysis and compliance. Resource protection was accomplished on a case specific basis.

Cattle tend to graze and damage surface artifacts near water sources, spring developments, salt grounds, and along fence lines. Artifacts may be broken where cattle trail and graze. Surface and subsurface disturbance occurs most where cattle trails are developed or near water developments or salting areas where cattle are concentrated. New construction associated with allotment management activities would address heritage concerns on a case-by-case basis.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Roading Activities
No heritage sites would be affected by the proposed road changes in Alternatives 2, 3, or 4. Less than 1 percent non-forested openings where culturally significant root crops may occur would be affected by temporary roads or log landings. In these areas the plant community and habitat would be retained. Neighboring Tribes have a concern for access to areas when roads are closed. The roads to be closed to vehicle traffic and decommissioned are generally less than 0.5 to 1 mile segments and are not the only access to an area. The benefit to streams and riparian habitat is generally viewed as a greater benefit than retaining multiple road access.

Direct and Indirect Effects of Alternative 2
The effects resulting from the proposed treatments in Alternative 2 would be managed by applying the design criteria incorporated into the West Maury EIS planning process. The treatment recommendations and criteria were developed to protect heritage values and avoid ground-disturbing actions on sites and reach a finding a No Effect with the SHPO. See Mitigations, Design Criteria, and Resource Protection Measures, Heritage Resources, Chapter 2. The viability of plants of cultural interest and their habitat (lithosols, riparian corridors, forested stands) would be maintained. Riparian habitat, meadows, and non-forested openings would be protected by a variety of design criteria (INFISH, LRMP Standards and Guidelines).

Commercial harvest activities are proposed on an estimated 7,700 acres. A sequence of treatments would occur on most of these proposed commercial harvested acres to complete stand treatment objectives. Implementation would likely occur through timber sale or stewardship contracts over a 5 to 10-year period. Treatments would begin with commercial harvest entries, noncommercial thinning, grapple piling where specified, and slash treatment or underburning. Site-specific heritage areas overlapping with or adjacent to proposed treatment units would require an intensive level of management to reach the desired results. There would be a greater risk for damage to heritage sites in areas where multiple treatments of commercial harvest, noncommercial thinning, grapple piling, and activities fuels treatments are scheduled over time. Design criteria and heritage management recommendations have been applied to 25 commercial harvest units involving an estimated 1,850 acres. Alternative 2 treats the most acres using commercial harvest, noncommercial thinning, and burning methods.

Noncommercial thinning would be scheduled on an estimated 5,700 acres. This includes 2,700 acres of small conifer removal and an estimated 3,000 acres of juniper removal, typically non-forested areas. An estimated 5,300 acres of the noncommercial thinning acres would be treated with fire within 2-3 years to remove activities generated slash. Design criteria would be applied to avoid or reduce adding thinning slash to sensitive heritage areas, and to prevent hot surface temperatures during burning to protect artifacts, features, and environmental settings. Grapple piling of fuels would not be allowed on designated sites to avoid disturbance by ground-based equipment and hotter surface temperatures from pile burning. Management of heritage sites would involve 20 units and approximately 1,250 acres under Alternative 2.

Natural fuels burning would be prescribed on approximately 6,300 acres to reduce fuel loadings, thin younger trees, and mimic historic fire cycles and intensity. Burning prescriptions vary but are designed to mimic more frequent fire cycles with lower burning temperatures. These events are planned to meet objectives with burning prescriptions based on fuel loadings, moisture content, and weather conditions. Natural fuels burning generally would not compromise the integrity of lithic scatter sites due to low

burning temperatures and short duration fire. Design criteria would be applied to 19 units involving 1,570 acres to ensure sensitive sites and features would be protected. Historic wooden features at risk have been identified and would be protected through avoidance and/or site-specific design criteria.

Juniper treatments, generally located in non-forested settings, have the greatest potential to overlap with populations of culturally significant root crops and archaeological sites. Design criteria would be applied to juniper removal to girdle the tree or fall fewer junipers and prevent hot surface temperatures and additional fuel accumulation where necessary.

Use of prescribed fire helps prevent unplanned wildland fire which typically burns hotter and faster than prescribed fire. Underburning activities with low burning temperatures (200 – 300 degrees centigrade) and short duration fire, or conditions common to spring burning conditions would not be expected to adversely affect stone artifacts or their spatial arrangement. Advanced planning and coordination with resource specialists during prescribed fire situations can avoid and reduce effects to sensitive resources compared to crisis management during hotter, unplanned wildfires and associated suppression activities.

Thinning and burning treatments on approximately 18,000 acres within the 38,000-acre project area in Alternative 2 would reduce the potential risk for future unplanned wildland fire and the resulting adverse affects to heritage resources from hotter burning temperatures, larger burned areas, and associated fire suppression activities.

Direct and Indirect Effects of Alternative 3

The effects resulting from the proposed treatments in Alternative 3 would be managed the same as discussed in Alternative 2. Design criteria included in the West Maury EIS planning process would be applied during implementation. These management guidelines have been written for the Maurys EIS treatments to avoid ground-disturbing actions on sites and reach a finding a No Effect with the Oregon State Historic Preservation Office.

Alternative 3 proposes commercial harvest treatment which generally includes non-commercial thinning and activity fuels treatments on approximately 5,400 acres with known heritage concerns. Design criteria would be applied on 20 units involving 1,650 treatment acres. These treatments would be spread over several years. Commercial harvest treatments involve ground based-equipment and repeated entries over time. These types of conditions increase the potential risk of damage to sites. When completed, stand treatments would reduce the risk of catastrophic fires and potential damage to sites.

Noncommercial thinning of conifers and junipers involves 14 units with heritage concerns and 1,040 of 5,100 acres in Alternative 3. Grapple piling would not be allowed on designated sites to avoid ground disturbance and piling of fuels and hot temperatures. In general thinning young trees, scattering slash, and burning would not affect stone artifacts. Avoidance of wooden features and structures is handled through planning efforts, identification, and field preparation efforts. Following thinning and harvest, the risk of futures fires would be reduced.

Alternative 3 proposes natural fire treatments on 4,850 acres with 17 units and 1,230 acres with heritage concerns. In general, low burning temperatures and short duration of natural fire treatments would not adversely affect stone artifacts or the environmental conditions. Wooden features or structures would be identified and avoided through planning and preparation efforts. Design criteria were developed to avoid sensitive areas for use of ATVs, fire line construction, and staging areas. Burning opportunities would likely be in the spring or fall when temperatures are cooler and moisture is higher.

Direct and Indirect Effects of Alternative 4

Alternative 4 proposes vegetative treatments using noncommercial harvest and natural fuels treatments. There would be no commercial harvest and no ground-based logging equipment. A greater number of acres would be treated with noncommercial thinning (11,700 acres) and natural fire (5,300 acres). Ground-based equipment would be used for grapple piling of thinning slash and would occur where existing fuels and thinning slash are dense, similar to the units identified in Alternatives 2 and 3. Less ground-disturbing equipment would decrease the potential risk for damage to heritage sites. Approximately 11,700 acres

would be proposed for noncommercial treatment and would include 35 units and 2,750 acres with heritage concerns. Some 5,320 acres are proposed for natural fuels treatments and would include 21 units and 1,980 acres with heritage concerns.

The proposed treatment units in Alternative 4 would involve more heritage resource management than Alternative 2 or 3; however, the noncommercial thinning and natural fuels treatments in general would have less potential to damage heritage resources. The noncommercial grapple pile units would require the most intensive management to protect and avoid heritage sites and artifacts. Alternative 4 has approximately 2,640 acres identified to grapple pile.

There would be no new road construction in Alternative 4. The same roads as in Alternative 2 would be closed to vehicle traffic or decommissioned.

Alternative 4 would reduce the risk of fire by removing young trees and burning activities generated slash on some 17,000 acres. In general, all the action alternatives would reduce fuels on a similar number of acres but the size and spatial arrangement would vary. Refer to the discussion in fuels effects for the comparison of risk from unplanned wildland fires between the action alternatives.

Cumulative Effects of Alternatives 2, 3, and 4

The effects from grazing, road maintenance, and recreation uses would be the similar to the No Action Alternative. Areas where cattle concentrate would have the greatest potential to affect the soil surface and damage surface artifacts. Alternative 2 would open forested stands on the most acres and increase the potential for grazing and surface disturbance. Opening stands through harvest, noncommercial thinning, or fuels treatments would increase the opportunity for livestock to graze and potentially meander through sensitive heritage sites. Slash from noncommercial treatments would offer some protection to sensitive areas in the short term by creating barriers for cattle grazing. Livestock tend to graze and damage surface artifacts near water sources, spring developments, salt grounds, and along fence lines. Artifacts may be broken where cattle trail and graze. Surface and subsurface disturbance occurs mores where cattle trails are developed or where cattle are concentrated. In general, spring and stock watering improvements would include deteriorating log troughs within new spring enclosure fences. This would retain the log trough feature and protect it from cattle.

The Sherwood Burn project was designed to avoid sensitive sites for prescribed burning activities. These included log watering troughs and lithic scatters where fuel conditions would potentially create high burning temperatures and potentially affect the lithic tools and flakes. Culturally significant root crops were observed on some of the non-forested high benches and ridges. These open areas had light fuel conditions and prescribed fire was not expected to carry; however, if fire did spread, the short duration fire with low burning temperatures would not reduce individual plants or the plant communities. Several headcut repair projects scheduled in the Maurys, like Pre-Emption and Rickman, were designed to avoid heritage sites. Truck traffic and dumping large rock for the project would also avoid all known sites.

The headcut stabilization projects in Bear Creek and treatment of noxious weed projects have addressed the protection and management of heritage values under separate project analysis and compliance. Resource protection was accomplished on a case specific basis.

Recreational activities including dispersed camping, off road vehicle use, and artifact collecting are most damaging to heritage sites. Dispersed camping areas commonly overlap with heritage site locations along creeks, meadows, and springs. Disturbance to sites results from human use, vehicle use, fire rings temporary outhouses, and vandalism. In general increasing recreational use correlates to increasing vandalism and damage to heritage sites through removal of artifacts and disturbance to features. Site damage from off road use and all terrain vehicles has increased in the past 5 years and would be expected to continue.

Ceded Lands, Tribal Trust Resources, and Tribal Interests

Affected Environment

The introduction of Euro-American culture brought abrupt changes to the hunting and gathering life ways for the Plateau and Great Basin groups. Congress affirmed Indian land title in Oregon in 1848 and between 1850 and 1877 implemented treaty policies. By 1850, traditional life ways were significantly interrupted. The 1855 Treaty with the Tribes of Middle Oregon established the Warm Springs Reservation. The treaty also reserved usual and accustomed rights and interests on lands ceded to the government. These reserved rights protect and retain tribal rights and privileges for hunting, fishing, gathering roots and berries, and pasturing stock as described in the Treaty. The boundary of lands ceded to the government in the 1855 Treaty extends from the Cascade Mountains through Central Oregon and up to the Columbia River inclusive of all lands within the Ochoco National Forest and Crooked River National Grassland. The Confederated Tribes of the Warm Springs Reservation have a Memorandum of Understanding with the neighboring forests to work in cooperation towards the development and implementation of policy, program recommendations, and actions affecting lands and natural resources. The agreement recognizes the need to be consistent with the Warm Springs Tribal Code Chapter 490, Ordinance 68 that sets forth the protection, preservation, and encouragement of tribal and Indian history, culture, tradition, and heritage. The Confederated Tribes of Warm Springs Reservation and our neighboring tribes have a strong and valued connection with the land and continue their cultural traditions and practices to preserve, protect, and promote tribal culture and heritage today. Additionally, the Maury Mountains are within ancestral and aboriginal lands of interest to The Burns Paiute, The Confederated Tribes of the Umatilla Indian Reservation, and The Klamath Tribes.

Contemporary Indian People continue their cultural traditions and practices today and the Ochoco National Forest and Maury Mountains are visited for hunting, gathering, and collecting traditional foods and resources.

The LRMP standards and guidelines provide direction for management activities and specifically addresses the following:

1. Religious Freedom: Meet all requirements of the American Indian Religious Freedom Act. This law makes it policy of the federal government to "protect and preserve for American Indians their inherent right to freedom to believe, express, and exercise [their] traditional rights." This protection includes but is not limited to access to sites, use and possession of sacred objects, and the enhancement of ceremonies and traditional rites. Related activities include the gathering and processing of plants for food, medicinal, or craft use, the construction of sweat lodges, or vision quest structures, and the like.

2. Treaty Rights: Honor the rights reserved by the Confederated Tribes of the Warm Springs Indians for lands ceded to the federal government through the Treaty of 1855. On ceded lands, the Tribes have the right to take fish in streams running through and bordering the Reservation and at all other usual and accustomed stations in common with citizens of the United States. The right of hunting, gathering roots, and berries, and pasturing stock on unclaimed lands in common with citizens was also secured within ceded lands.

Direct, Indirect and Cumulative Effects of No Action

There would be no change over the existing condition and tribal treaty rights would be preserved. Vehicular access would remain the same because no roads would be decommissioned. There are no past, present, or reasonably foreseeable future actions that would affect tribal treaty rights. Cattle grazing would continue under current management until a new decision was prepared that could adjust grazing levels and practices but would not alter treaty rights. Fuel loadings would continue to increase and if a wildfire occurred, with the current continuity of fuel loadings, the probability is high that high-intensity fire would result. Changes in the availability of plants of cultural values would probably be reduced until the area of high-intensity fire recovered.

Direct, Indirect, and Cumulative Effects of Alternatives 2, 3, and 4
All alternatives preserve tribal treaty rights. No restriction of treaty rights would occur with any of the alternatives. Decommissioning of 10.2 miles of road in Alternatives 2 and 4 and 8.8 miles in Alternative 3 would reduce the opportunities for vehicle access but would not restrict other forms of access such as foot or all terrain vehicles. Vegetative conditions would be approximating historic conditions (to a greater extent in Alternative 2, then Alternative 3 and to the least extent in Alternative 4), plants of cultural value that occur in more open forested conditions would be expected to increase. There are no past, present, or reasonably foreseeable future actions that would alter tribal treaty rights over the existing condition. Future actions include stream restoration projects like Pre-Emption and Rickman Pasture, Sherwood prescribed burn, and noxious weed management. These projects have been designed to protect heritage sites and cultural plants of value. None of these actions would result in changes in access or restrictions of tribal treaty rights or resources. Tribes would be consulted on revisions to allotment management plans on a case specific basis.

Recreation

Affected Environment
Recreation use in the project area includes wildlife viewing, driving for pleasure, camping, hiking, and horseback riding. Current direction emphasizes dispersed rather than developed recreation. Because much of the Ochoco National Forest is currently roaded, the dispersed roaded recreation opportunities exceed the demand. There is diverse recreation opportunities within this project area: Antelope Campground, Pine Creek Camp, and Hammer Creek Wildlife/Recreation Area. The project area also encompasses approximately 54 unnamed dispersed sites.

Hammer Creek Wildlife/Recreation Area
The main access to the area is provided by Forest Road 16, which follows the area's west boundary. Forest Road 1750 and the Hammer Creek Trail from the south can also reach the area. The Hammer Creek trail (which lies entirely within the management area) is a 6-mile loop route. The LRMP emphasis for the area is to provide and maintain habitat diversity for a variety of wildlife species where open road density is minimal; and provide a scenic, semi natural or natural-appearing setting for non-motorized recreational opportunities. Management activities are to remain visually subordinate to the characteristic landscape.

Direct, Indirect, and Cumulative Effects of No Action
Under the No Action Alternative, there would be a continuation of mortality of the large pine component due to high stocking density and active bark beetles. Fuel loadings, including small understory trees, would continue to increase. The amount of open, park-like stands would continue to decrease. In the long term, scenic quality would be degraded as open stands of large diameter trees become less abundant.

Sherwood prescribed burn, authorized under a separate decision in 2004 in the western half of this area, would impact users in 2004 with potential smoke for a few days while burning was occurring. Stream restoration activities would be evident in the short term because the initial activities would result in small areas of soil disturbance from log and boulder placement and riparian plantings. After a short period of time, approximately 1 month, the vegetation resulting from the plantings and nature regeneration would regrow in the newly disturbed areas. The disturbed soils would no longer be evident. Noxious weed control is limited to roadside treatments and one population within (but adjacent to Forest Road 16) the Hammer Creek Wildlife and Recreation Area. The impacts of these treatments would be limited because of the limited amount of acreage treated and the short duration of treatment (less than 1 week). Livestock grazing would be evident in areas of concentration near water developments and flat areas because of trampling of vegetation.

Direct and Indirect Effects of Alternative 2
Recreation users would be affected as activities occurred. Under this alternative, there would be 6,095 feet of trail impacted by proposed treatments. There would be 448 feet of trail impacted in Unit 253 (commercial harvest). There would be 1,559 feet of trail in Unit 193 (noncommercial thinning) and 4,088 feet of trail in Unit 101.1 plus 101.2 (noncommercial thinning and prescribed fire). Users could be temporarily displaced and would see more evidence of vegetation treatments. In the short term, the scenic

quality of the area would be affected, as visual evidence (stumps, slash, etc.) of the activities would be apparent. Users could also encounter dust, noise, logging traffic and smoke, if they are present when these activities occur. In the long term, scenic quality would be enhanced as more large pine develop and views of open, park-like stands become more frequent.

Direct and Indirect Effects of Alternative 3
This alternative has the least impact to users. There would be 1,559 feet of proposed noncommercial thinning along Hammer Creek Trail in Unit 193. Users would be temporarily displaced by thinning slash and smoke from prescribed fire activities. There would be no commercial harvest with this alternative, therefore noise and soil disturbance from heavy equipment would not occur. Stands would not benefit from reduced stand densities and mortality in the large diameter ponderosa pine would continue but at slightly reduced levels compared to Alternative 1.

Direct and Indirect Effects of Alternative 4
Recreation users would be affected as activities occurred. Under this alternative, there would be a total of 6,095 feet of trail impacted by proposed treatments. There would be 448 feet of trail impacted in Unit 253 (noncommercial thinning). There would be 1,559 feet of trail in Unit 193 (noncommercial thinning) and 4,088 feet of trail in Unit 101.1 plus 101.2 (noncommercial thinning and prescribed fire). Users would be temporarily displaced and would see evidence of vegetation treatments. In the short term, the scenic quality of the area would be affected, as visual evidence (stumps, slash, etc.) of the noncommercial activities would be apparent. Visual evidence of prescribed burning, such as needle scorching, blackened boles of trees and mortality in small diameter trees, would be apparent for approximately 1 season. Ground vegetation, such as grasses and forbs would be stimulated by burning and would regrow and cover the burned ground. There would be no commercial harvest with this alternative, therefore noise and soil disturbance from heavy equipment would not occur. With only noncommercial activities and prescribed fire occurring, stand densities would not be reduced and mortality in the large diameter ponderosa pine would continue but at slightly reduced levels compared to Alternative 1.

Cumulative Effects of Alternatives 2, 3, and 4
Sherwood prescribed burn, authorized under a separate decision in 2004 in the western half of this area, would impact users in 2004 with potential smoke for a few days while burning was occurring. Stream restoration activities would be evident in the short term because the initial activities would result in small areas of soil disturbance from log and boulder placement and riparian plantings. After a short period of time, approximately a month, the vegetation resulting from the plantings and nature regeneration would regrow in the newly disturbed areas. The disturbed soils would no longer be evident. Noxious weed control is limited to roadside treatments and one population within (but adjacent to Forest Road 16) the Hammer Creek Wildlife and Recreation Area. The impacts of these treatments would be limited because of the limited amount of acreage treated and the short duration of treatment (less than a week). Livestock grazing would be evident in areas of concentration near water developments and flat areas because of trampling of vegetation.

Camping Areas

Antelope Reservoir Campground is a popular heavily used site within a mature stand of predominantly ponderosa pine with areas of western juniper and scattered Douglas-fir. The campground lies within three management areas: Developed Recreation, General Forest Winter Range, and Visual Management Corridor. The campground is located approximately 43 miles southeast of Prineville at the end of Forest Road 1700-500. There are 25 campsites with a picnic area and boat launch. The reservoir is open year round for fishing.

The current stand is uneven-aged with scattered old overstory ponderosa pine over a mixture of ponderosa pine and western juniper of varying size and age. Stocking density of both pine and juniper is high considering the low site quality associated with these plant communities. Competition related stress is evident in shortened needles, lower crown ratios, and low growth rates. Bark beetles, including western pine beetle, mountain pine beetle and red turpentine beetle are active in the area with recent mortality of the large pine component.

Pine Creek dispersed camp is primarily used during hunting seasons. This site is located approximately 37 miles from Prineville off Forest Road 1750- 450. The meadow and large pine draw users to this camp.

In addition to Pine Creek Camp, there are approximately 54 other recognized dispersed camping sites within the project area with use ranging from high to low. It is likely that other dispersed camping sites exist because users are continually creating new sites. Management allocated dispersed sites receive management emphasis such as protecting the naturalness of the immediate area adjacent to the site, reducing hazards such as danger trees and fuel loadings, and avoid using them as industrial camps, slash piling, or rock material storage areas.

Direct, Indirect, and Cumulative Effects of No Action
With this alternative, no treatment would occur and there would be the continuation of mortality of the large pine component. In the long term, recreation experience and scenic quality would be degraded due to the loss of the larger trees becoming less abundant and overstocking and down material becoming more prevalent. In the event of a high intensity wildfire, those stands with high canopy closures and high stand densities would probably result in high mortality. The recreation experience would be degraded because of the lack of residual trees and areas could be closed due to the danger of falling hazard trees.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Treatments would improve the long-term health of timber stands adjacent to and within camping areas; however, short-term impacts (3-5 years) to the affected camping areas (whether developed and/or dispersed) from commercial harvest and noncommercial thinning would include increased noise from chainsaws and grapple piling. Burning activities would in result in smoke, blackened ground and scorched vegetation. Some screening that was provided by juniper trees would be removed in Antelope campground; however, the over all recreational experience would not be changed. Loss of screening in some dispersed sites may cause some users to choose other sites or select new sites with more privacy. The overall Roaded Natural Recreation Opportunity Spectrum would not be changed in any alternative.

Cumulative Effects of Alternatives 2, 3, and 4
There are no other current or planned activities that would affect camping areas within the project area. Recreational trends in the project area would continue to increase as populations in the Prineville area increase. Increased pressures on facilities such as developed campgrounds and dispersed sites would result in more emphasis on maintaining these facilities in a safe and enjoyable manner.

Non-native Invasive Plants (Noxious Weeds)

Affected Environment
Non-native invasive plants are aggressive plants capable of degrading environmental quality. Noxious weeds are a subset of these plants, and designated "noxious" by the Secretary of Agriculture or state agencies. Because some non-native species known to be aggressive have not been officially designated as "noxious," the term, "non-native invasive plants" is becoming more common. Many use the term, "noxious weeds" for all non-native invasive plants.

The introduction and spread of noxious weeds can reduce the diversity and abundance of native vegetation, forage, diversity and quality of wildlife habitat, increase erosion, and decrease water quality. They have developed many characteristics, such as rapid growth rates, high seed production, and extended growing periods that give them advantages over native plants (Sheley and Larson 1994, Shelly et al 1999, Scott and Pratini 1995, Roche and Roche 1998, and USDA/USDI 2000).

Most noxious plants are shade intolerant, and therefore have greater potential for invasion on non-forest sites or forest sites that have been disturbed. Proposed activities would remove vegetation and expose soils, creating conditions conducive to the establishment and increase of competing and unwanted vegetation, specifically noxious weeds.

Livestock grazing can increase the potential for introduction and spread by selective grazing of more palatable native species (Olson 1999). Other factors that may increase risk include recreational vehicles

(especially off-road vehicles), burning, and other activities that expose soils, creating an ideal seedbed for noxious weeds. Seed can be introduced from weed-infested areas through soils attached to vehicles and road maintenance or other equipment. No artificial regeneration or site preparation activities are proposed. Therefore, analysis is limited to noxious weeds.

Efforts to control competing and unwanted vegetation may affect the natural and human environment. The Ochoco NF is currently managing noxious weeds under the 1998 Integrated Weed Management Plan and Environmental Assessment/Decision Notice (USDA 1998), and the LRMP as amended in July 1995 to implement noxious weed management. Weed management includes a variety of strategies, depending on the species, size of infestation, and location. Included are chemical, cultural, mechanical and biological controls. In addition, the Forest Service Pacific Northwest Regional Office is preparing and Environmental Impact Statement that may result in additional noxious weed management.

Weed management is most effectively accomplished by prevention, detection, and early treatment. Prevention measures, such as requiring weed-free equipment for National Forest projects, detection (inventory) to identify new infestations, and early treatment are standard procedure for the integrated weed management program. Monitoring of treated infestations has shown that weed control has been effective, and herbicide use has declined where treatment has occurred. However, new infestations of all invasive plants are occurring and is likely to continue.

Noxious weed surveys are ongoing. As of 2003, several noxious weed species have been documented within the project area. Some widespread weed species, such as Canada thistle (*Cirsium arvense*), have not been fully documented or are not controlled as aggressively.

Biological controls (insects) have been introduced for Canada thistle within and outside the National Forest. Ongoing research and monitoring has shown some success in reducing weed densities in the Central Oregon region, but trends for biological controls have not been established. An overall assessment of long-term effectiveness of biological controls within the analysis area cannot be described at this time.

The road system serves a variety of human uses. While some areas offer rehabilitation opportunities, continued road effects are likely for some portion of the road system. Roads will continue to provide dispersal and susceptible sites for noxious weeds. Expanding non-native noxious weed infestations outside the National Forest will likely increase potential for new noxious plant infestations. Combined with increasing recreational use, the potential for new infestations and spread appears likely to increase.

Site Analysis
Most weeds have been present in the area for at least a decade. Weed inventories indicate most infestations begin on disturbed areas, such as road shoulders, old log landings, and recreation sites. With most infestations along roads, primary introduction of noxious weeds appears to be through vehicles. Other vectors include water (streams and canals), wind, livestock, wildlife, and mineral material and heavy equipment used for road maintenance and construction projects. See the following table for noxious weed infestations currently receiving treatment. Map 15 Noxious Weeds displays the locations.

Table 3.48 Existing Noxious Weed Sites

Site #	Location	Acres	Weed Species	Weed Densities	Treatment History
3-4	FS 16 Rd System	5 5 10 20	spotted knapweed diffuse knapweed Russian knap. Canada thistle	scattered plants along road system	chemical, limited hand pulling, biocontrol (1998 EA)
3-5	FS 17 Rd System	20 11 3	Canada thistle Russian knap. diffuse knapweed	scattered plants along road system	chemical, limited hand pulling, biocontrol (1998 EA)

Other weed infestations are scattered throughout the analysis area. The Botany Report Notes Table (Appendix A) lists proposed treatment units in proximity to weed infestations and is incorporated by

reference in this EIS. Other than Canada thistle, bull thistle, and teasel, most infestations not included in the current weed management plan are hand pulled and removed when encountered.

The aggressiveness of the prevention and treatment strategy is based on the type of weed to be controlled. For species such as spotted knapweed and yellow star thistle, the threshold for control is one plant. Some species, such as bull thistle, are not receiving active treatments. Though this species quickly establishes the first few years following burning or timber harvest, its density decreases over time as other vegetation becomes re-established. Aside from bull thistle, Canada thistle is particularly common in the analysis area and may be the most common noxious weed on the Ochoco National Forest. It can be found on a variety of sites, including rock pits, roadsides, dispersed camping areas, meadows, old harvest units, and others. It is well distributed among proposed treatment areas. This perennial plant has an especially deep root system, making hand pulling infeasible. Consequently, this species is a low priority for treatment. In susceptible areas, numerous, small infestations are often followed by rapid expansion (Sheley 2004). This species may be the greatest threat for expansion, especially following proposed treatment activities or wildfire.

Biological controls have been released, and have established in some areas. Within the West Maury project area, their effectiveness has not yet been determined. Because these species are so widespread, and treatment options so limited, not all infestations of Canada thistle, teasel, and bull thistle have been identified.

Weed densities have generally decreased where controls have been implemented, though on the majority of sites, some seed production still occurs from plants that germinate after treatment, re-sprout after incomplete pulling, or otherwise escape the control. As long as seed production continues, eradication is difficult. This situation is complicated by the persistence of viable seed in the soil for many years (Eddleman 1996). Some infestations, such as Canada thistle, are not being effectively contained by biological controls, and continue to expand.

Additional road construction, logging, burning and other activities that remove vegetation and expose soil may further increase potential for introduction and spread of noxious weeds. New infestations can also result from seed or plant parts carried in on soils attached to logging equipment.

Pre-project surveys were completed in 2003. Common weed species, such as teasel (not a state listed noxious weed, but considered an invasive non-native on the Ochoco National Forest due to its potential for displacement of native vegetation) and Canada thistle, have not been completely documented.

Risk Assessment
Forest Service Manual (FSM) direction requires that Noxious Weed Risk Assessments be prepared for all projects involving ground-disturbing activities. For projects that have a moderate to high risk of introducing or spreading noxious weeds, Forest Service policy requires that decision documents must identify noxious weed control measures to be used during project implementation (FSM 2081.03). Noxious weed control measures, including prevention measures, have been included in Mitigations, Design Criteria and Resource Protection Measures in Chapter 2 of this EIS.

Two types of analyses are included in the risk assessment. The first compares the amount of exposed soils for alternatives, and the other uses a checklist of risk factors, such as burning adjacent to infestations, etc. The risk assessment comparison of disturbed acres only includes direct and indirect effects of the alternatives. The risk factors assessment includes these effects, as well as the cumulative effects of recreation use, grazing and other maintenance activities expected to occur in the project area.

Soil Disturbance
The following table displays the amount of exposed soil disturbance anticipated for each Alternative.

Table 3.49 Soil Disturbance by Alternative

Activity	Exposed Soil (Acres) Alternative 1	Exposed Soil (Acres) Alternative 2	Exposed Soil (Acres) Alternative 3	Exposed Soil (Acres) Alternative 4
Road Decommission / Inactivate (0.7 acres/mile)	0	7	6	7
Road Construction (1.7 acres/mile)	0	20	14	0
Timber Harvest (estimate 20% for tractor, 6% for skyline, 3% for light)	0	1,224	927	0
Additional Prescribed fire (estimate 20% exposure)	0	10,660	8,813	3,281
Total Area	**0**	**11,911**	**9,760**	**3,288**

Direct and Indirect Effects of No Action
Alternative 1 would have no potential for increasing the risk for introduction and spread of noxious weeds. However, new weed infestations would still be likely to establish within the project area as a result of present and reasonably foreseeable future activities such as vehicle use by the public and continued cattle grazing. Discussion of the risk of wildfire risk and potential for expansion of noxious weeds is included in the cumulative effects section.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Alternatives 2, 3, and 4 would create additional ground disturbance as identified in Table 3.49 above. Alternative 2 has the most additional ground disturbance and Alternative 4 has the least amount of additional ground disturbance. Since noxious weeds would be more likely to spread to newly disturbed areas, Alternative 2 would have the highest risk for additional spread of noxious weeds with Alternative 4 having the least risk and Alternative 3 less than but closer in risk to Alternative 2.

Following project activities, road closures and competitive seeding would reduce the potential for weeds. Increased risk from ground disturbance would be partially offset by reduced vehicle use.

RISK FACTOR ASSESSMENT
A checklist was developed, with various activities rated for risk of introducing or spreading weeds (Mafera 2003). Any high-risk activity results in a high risk ranking for that alternative. The complete risk factor assessment is in the Botany report and is incorporated by reference.

This checklist includes direct, indirect, and cumulative effects. An example of an activity with direct effects would be heavy equipment use, such as road grading, within infested areas. This activity would likely directly spread weeds. An activity with indirect effects would be burning slash piles adjacent to infestations. Burned sites would be highly susceptible to weed spread.

The checklist also includes the cumulative effects of reasonably foreseeable activities, such as off-road vehicle use within weed infestations. Vehicles are expected to continue to introduce and spread noxious weeds. Table 3.50 compares expected soil disturbance, and therefore, weed risk, by alternative.

Table 3.50 Summary of Noxious Weed Risk Factor Assessment by Alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Risk of Noxious Weed Introduction / Spread	HIGH	HIGH	HIGH	HIGH
Number of Risk Factors Rated High	2	10	10	6

The risk factor assessment indicates high risk for all alternatives, including no action. Vehicle use within infestations is high risk. Livestock movement within or from areas with known infestations is also high risk. These risk factors are present in all alternatives.

Direct and Indirect Effects of No Action
Alternative 1 is the baseline for comparison and no actions would be undertaken. Therefore, this alternative would have no potential for increasing the risk for introduction and spread of noxious weeds. However, new weed infestations are still likely to establish within the analysis area as a result of present and reasonably foreseeable activities, such as vehicle use by the public and grazing.

Because fuels would be largely untreated, risk of future wildfire, and its potential effects to noxious weed risk, would be the highest of all alternatives. Determining potential effects of wildfire, and weed risk, is not possible due to so many unknown variables, such as fuels conditions during a wildfire event, weather, suppression forces available, and other factors.

Direct and Indirect Effects of Alternatives 2, 3, and 4
These alternatives include ground disturbance, burning, and other activities that increase risk of noxious weed introduction and spread. In general, actions involving large equipment and heavy localized ground disturbance such as mechanical thinning or removal of trees with log skidders are likely to create more opportunities for infestation compared with activities using smaller equipment that travels on a bed of slash. Hand thinning is generally low risk, but vehicles and people can introduce weeds. Prescribed burning of natural and activity fuels are generally lower risk also, but can create bare soil areas that are also more vulnerable to infestation.

Risk assessment for introduction/spread of noxious weeds by project activities is a complex process because of many variables, such as type and season of logging, intensity of prescribed burning, proximity to noxious weed infestations, etc. However, the following have been considered in the assessment:

- Most weed populations are located along road corridors, indicating introduction and spread is primarily due to vehicles. Therefore, log-hauling activity may be no more responsible for introduction and spread of noxious weeds than other traffic. However, log haul can substantially increase overall traffic levels on National Forest roads, increasing weed risk.

- The potential for introduction of noxious weeds due to logging activity is much greater than other activities because of soil disturbance and removal of vegetation by log skidding and road and landing construction activity. Logging equipment (skidders, cats, feller-bunchers, etc.) is much more likely to bring in noxious weed seed or plant material because equipment may be transported from site to site with soil and weed seed or plant parts attached.

- Compared with log skidding and burning, soils heavily disturbed by road construction or use as log landings will be more susceptible to noxious weed infestation for many years, perhaps several decades.

- Burning of natural and activity fuels (logging and thinning slash) would increase susceptibility to some degree. However, compared with wildfire, this burning is generally low intensity. Vegetation recovers much more quickly (often with greater vigor than before burning), and the majority of the soil organic layer is retained. Maintaining vegetation and the soil organic layer results in less susceptibility to noxious weed introduction and spread.

- Risk assessment may also consider the costs associated with controlling noxious weeds as a result of project activities. For example, the Ochoco NF is currently spending approximately $200/year to control the spread of each knapweed infestation. With knapweed seed bank viability of up to 10 years, overall costs of eradication would be $2,000 per site, assuming no inflation and complete elimination of seed production.

- Present and reasonably foreseeable effects were considered, including livestock grazing, recreation use, road maintenance and road de-commissioning, thinning, burning of natural and activity fuels, riparian work such as planting and stream headcut repair, hardwood enhancements (e.g. aspen fencing) and other activities (e.g. firewood cutting).

- Road inactivation (closed but available for future use) and de-commissioning (closed with no anticipated future use) activities would be beneficial in reducing noxious weed risk because introduction vectors (vehicles) would be reduced.

- Not all noxious weeds can be effectively controlled by herbicides or other measures. The 1998 Noxious Weed Environmental Assessment and Decision Notice limits herbicide use to knapweed and a few other species. Limited controls are available for some species in certain locations, such as teasel in riparian zones. Limiting the potential for introduction and spread of these species is important in maintaining existing desirable vegetation.

- Firelines would be constructed by hand to facilitate natural fuels underburning. These lines are expected to re-vegetate quickly, and have minimal effect on weed risk.

Cumulative Effects of Alternatives 1, 2, 3, and 4
The exact source of present infestations is unknown, but they are expected to have originated over several areas. The location pattern shows concentrated sites along primary travel corridors. The primary vector for noxious weeds appears to be vehicles. Other infestations are associated with recreation sites and mineral material sites, indicating introduction by vehicles and equipment. Weeds can be introduced through contaminated hay brought in for horses by the recreating public. Weeds also spread by wind, canals and streams. Livestock and wildlife can carry seed in their digestive tract, as well as in their coat (Sheley et al 1999b).

The West Maury road system serves a variety of human uses. Roads would continue to provide dispersal and susceptible sites for noxious weeds. Expanding non-native noxious weed infestations outside the West Maury area would likely increase potential for new noxious plant infestations. Combined with increasing recreational use, the potential for new infestations and spread appears likely to increase.

The cumulative effects of present and reasonably foreseeable activities indicate a high risk for introduction and spread of noxious weeds for all alternatives. Weeds would continue to be introduced and spread by vehicles, equipment such as used for road maintenance and construction activities, livestock fence maintenance, the recreating public (mountain bikers, horseback riders, hikers, and campers), dog and horse trial events, off-road vehicles, water, windborne seed, livestock, wildlife and other sources.

Prevention techniques for weed risk associated with reasonably foreseeable activities would be employed. Examples include clean equipment requirements for road maintenance activities. The majority of other activities, including recreational driving and illegal off-road vehicle use, would be more difficult to control.

Fire suppression can result in introduction or spread of weeds by equipment brought in from different areas that may contain weed seed or plant parts. Due to the emergency nature of wildfire, prevention measures including equipment cleaning are not always implemented or feasible. Dozer lines, hand lines, drop points, safety zones, staging areas, etc all create bare ground with heavy travel and disturbance. Vehicle traffic during and after suppression activity can introduce weeds to highly susceptible soils. Fire rehabilitation efforts mitigate many of the negative effects through seeding, weed control, erosion control and area closures. Potential for major wildfire and subsequent weed risk is considered negligible when compared to ongoing and anticipated increased use by the public.

Wildfire and suppression effects associated with No Action could exceed action alternatives in degree of exposed soils and reductions of shade, creating conditions highly susceptible to weeds. Completing a more specific analysis of potential wildfire effects, and weed risk, is not possible due to so many unknown variables, such as fuels conditions during a wildfire event, weather, suppression forces available, and other factors that determine the size and intensity of wildfire, as well as the unknown suppression effects such as the extent of construction of dozer line and safety zones.

However, in general, No Action Alternative 1 maintains the highest risk of adverse wildfire effects. Because fuels would be largely untreated, risk of future wildfire, and its potential effects to noxious weed risk, would be the highest of all alternatives. Wildfire risk would decrease somewhat with thinning and burning that would occur outside the West Maury projects.

Alternatives 2, 3, and 4 would decrease potential adverse effects somewhat due to thinning and prescribed fire. These alternatives would result in a more substantial reduction in wildfire risk than Alternative 1, with Alternative 2 resulting in the lowest risk of future wildfire. Alternative 3 would have a slightly lower risk of wildfire than Alternative 4.

Weed infestations included in the 1998 Integrated Weed Management Plan are expected to be treated each year, and would continue to decrease in size. The remaining untreated infestations would continue to spread, displacing native and desirable non-native vegetation and reducing biodiversity. Projecting the rate and extent of spread is difficult due to many unknown variables, including weather patterns and the completion date, funding, and decisions related to the current Region 6 EIS process for managing non-native invasive plants.

Cumulative impacts of travel on West Maury roads by visitors would be detrimental to native vegetation through the spread of noxious weeds in the long term. Human use of the National Forest is increasing and is expected to increase in the future as populations in nearby towns continue to grow. Wet season off road use and legal road use can be conducive to weed spread due to mud clinging to tires.

Prevention techniques through design elements incorporated into the alternatives and the current weed treatment program would help reduce cumulative effects.

Areas where prescribed burning would take place are expected to re-vegetate quickly and become less susceptible to non-native noxious weeds, especially with low intensity winter/spring burns that are planned with this project. Project design criteria to evaluate pastures following burning would occur, and may necessitate adjustments to grazing plans.

Prescribed burning generally avoids construction of fire lines, using instead natural fuel breaks such as ridge tops, or human-created breaks, such as roads. This practice reduces the amount of soil disturbance associated with wildfire suppression and prescribed burning projects; therefore reducing opportunities for weed establishment and spread.

In addition, new weed infestations have been documented in the analysis area on sites that have had relatively little disturbance. There is an inherent risk of new infestations (such as from windblown seed) in all alternatives, regardless of other activities.

Summary of Noxious Weed Risk, by Alternative

Alternative 1 creates no additional ground disturbance, and therefore has the lowest risk for introduction and spread of weeds assuming no additional wildfire or large scale disturbance occurs. Alternative 4 has the lowest risk of the action alternatives. Alternative 3 has a higher risk, with Alternative 2 creating the most exposed soils, and therefore carries the highest risk. Effects of potential wildfire are difficult to estimate, but risk from weeds due to wildfire effects corresponds with degree of vegetation and fuels treatments. Therefore, wildfire risk is lowest on Alternative 2, followed by Alternatives 3, 4, and 1. All alternatives include the high risk factors of vehicle use near infestations, and the reasonably foreseeable livestock grazing activity. Table 3.51 summarizes the two weed risk assessments, by alternative.

Table 3.51 Summary Table for Noxious Weed Risk, by Alternative

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Total Acres of Disturbed Soils	0	11,911	9,760	3,288
Risk Factors Assessment / # High Risk Factors	HIGH/3	HIGH/10	HIGH/10	HIGH/6

Range Resources

Affected Environment

The West Maurys Fuels and Vegetation Management project area is within five allotments. These allotments are: West Maury, Sherwood, Klootchman, Double Cabin, and Shotgun. Table 3.52 displays information regarding the allotments.

Table 3.52 Range Allotment Description

Allotment	Acres	Number of permits	Season of Grazing (varies by year and status of forage)	Number of Cow / Calf Pairs
West Maury	7,512	2	May to August	300
Sherwood	6,095	1	May to August	300
Klootchman	10,629	1	May to August	288
Double Cabin	11,844	1	May to August	220
Shotgun	17,207	1	May to August	135

Direct, Indirect, and Cumulative Effects of No Action

Grazing would continue under current direction. There would be no effect to the grazing resources or management with this alternative. The risk of high-intensity wildfire occurring with this alternative is high with the continued accumulations of fuels and high dense stand conditions. If a wildfire occurred with damage to conifer stands, it would be likely that livestock grazing would be suspended until the soils and herbaceous vegetation recovered.

Direct, Indirect, and Cumulative Effects of Alternatives 2, 3, and 4

There is no difference between the action alternatives relative to the range resource except in the magnitude of treatments. Alternative 2 treats more acres so relatively more short-term effects would occur . Longer term effects, such as those associated with thinning in conifer stands, would occur in greater magnitude in Alternative 2 than in Alternative 3 or Alternative 4. Disturbance resulting from commercial harvest, noncommercial treatments, and prescribed fire could result in some displacement of livestock as they temporarily avoid these activity areas. Available forage would be immediately reduced following prescribed fire activities. The first few growing seasons following prescribed fire activities could result in an increase in palatability of forage and could result in increased forage consumption and frequency of use. Decreasing surface fuels could increase livestock distribution, as those areas previously avoided because of difficulty in passage, would now be accessible to livestock. Thinning of conifer trees would result in decreasing the canopy closure and allowing more sunlight to the forest floor. Over time, because of the increase in available nutrients, it is expected that forage production would increase in areas where thinning occurred and growth of herbaceous plants has increased. In the longer-term, canopies would eventually close and any increase in available forage would no longer be available.

The Sherwood Burn would occur within the Sherwood allotment in 2004. The prescribed fire activities in the Sherwood Burn do not overlap any of the activities proposed in the action alternatives. Beginning in 2005 forage palatability in this burn area is expected to improve for a few growing seasons. Cattle in the Sherwood allotment may more frequently use the burn area if they are displaced during the timber harvest, noncommercial thinning, and prescribed fire activities that are taking place in other portions of the allotment. Ongoing noxious weed treatments and road maintenance are occurring along roads, and are not expected to affect livestock grazing.

The Forest Service is also developing a proposal to update the five allotment management plans in the project area. The proposal is likely to contain provisions for improving riparian conditions based on

recommendations in the Maury Mountain Watershed Analysis. The proposal is also likely to include provisions related to the range utilization standards contained in the Grazing Implementation Monitoring Module (IIT 2000). The effects of any changes to livestock grazing, such as season of use and allotted numbers, are speculative at this time.

Roads / Transportation System

Affected Environment

Roads provide access to National Forest lands and are classified as arterial, collector, and local roads. Arterial roads serve large land areas, usually connect to other arterial roads and public highways. They provide the main access into the Ochoco National Forest. Collector roads provide service to smaller land areas usually connecting arterial roads with forest local roads. Local roads connect terminal facilities with forest collector, arterial, or public highways, or provide minor linkage with other roads.

Forest roads are managed by a system of maintenance levels 1 through 5. Those in maintenance level 1 (inactivated) are closed to highway vehicles and managed in a storage category, primarily for resource protection and safety reasons. Maintenance level 2 roads are open for high clearance vehicles (pickups, all purpose vehicles). Levels 3, 4, and 5 are maintained as suitable for use by low clearance vehicles (passenger cars). Those in levels 4 and 5 are usually asphalt paved and provide a more comfortable ride at higher travel speeds. There are no level 4 or 5 roads in the project area.. There are 177 miles of existing roads of which 37 miles are closed and managed under maintenance level 1. There are 140 miles of existing open roads. Decommissioned roads are no longer needed in the transportation system. There are 40 miles of decommissioned roads within the project area.

Direct and Indirect Effects of No Action

Continued use would occur on all existing open roads. No unneeded roads would be decommissioned and would still require maintenance to ensure resource damage did not occur. No roads would be constructed or reconstructed.

Direct and Indirect Effects of Alternatives 2, 3, and 4

Road Activities

New system roads constructed would be closed and temporary roads constructed would be decommissioned following timber sale and associated activities in Alternatives 2 and 3. Alternative 2 would construct 6.6 miles of system road and Alternative 3 would construct 3.3 miles of road. There would be 5.2 miles of temporary road construction in Alternative 2 and 4.3 miles in Alternative 3. There would be 37.4 miles of reconstruction in Alternative 2 and 34.1 miles in Alternative 3. There would be no reconstruction or construction of roads in Alternative 4. Roads no longer needed to maintain access would be decommissioned with 10.2 miles in Alternative 2 and Alternative 4 and 8.8 miles in Alternative 3.

Access

The current uses of the transportation system would change. Administrative use traffic would continue. Logging-related traffic would occur within the watershed. Temporary road closures for public safety would occur in the vicinity of active logging operations. Newly constructed roads and temporary roads would be used for logging activities and then closed. Personal use would not be allowed on these roads. Other commercial uses such as rock haul and cattle haul would continue and would be coordinated with logging traffic to reduce potential conflicts.

Personal uses, such as access for recreation or tribal access for gathering, would continue; however, some areas would be temporarily closed during logging activities. When logging activities are completed, some areas would be closed to vehicular access.

Overall, vehicular access in the West Maurys project area would be reduced because roads would be decommissioned. When all road management actions are complete, the open road density in the project area would be 2.3 miles per square mile for Alternatives 2 and 4 and 2.2 miles per square mile for Alternative 3. Road density including closed roads (but not decommissioned roads) would be 2.9 miles per square mile for all action alternatives.

The use on roads is limited to vehicles with legal size loads unless restricted. The forest Commercial Road Rules document lists road use restrictions and others may be added to the contract. It is standard to restrict log haul to dry or frozen ground conditions.

Road 1680152 accessing units 18, 29, and 81 passes through private property in T. 17 S., R. 20 E., Section 30. The Forest Service does not have right-of-way or an easement through this section. The forest reality specialist would contact the land owners to inquire about obtaining right-of-way or easement. For this project, a road use permit would need to be obtained from the landowner to haul logs over their property as right-of-way and easement acquisition usually takes several years to complete. If this cannot be accomplished by the time of decision, the units would not be commercially harvested.

Cumulative Effects of Alternatives 1, 2, 3 and 4
Currently, access to the project area is restricted because of structural deterioration on bridges accessing the project area. The bridge at the west termini of Road 16 is closed due to structural deterioration until it is replaced. This bridge is on county road and work would be done by Crook County. The bridge is planned to be replaced in summer 2004. The other two bridges over the Crooked River on Roads 17 and the east termini of 16 also have structurally deteriorated. The bridge on road 17 (Pine Creek) may have weight restrictions imposed within the next year. The bridge on the east termini of road 16 is currently closed to all traffic.

Access to the project area is restricted on three routes (Road 16 Newsome; Road 17 Pine; and Road 16 east Drake) to 1 (Road 17 Pine). There is expected be more traffic on Road 17 compared to having all three routes/bridges open. Traffic has the opportunity to disperse east and west to Road 16 along Shotgun Road (a county road) which parallels the Crooked River. If the Newsome Bridge is still closed at the time of project implementation, log haul would still use Road 16 and back haul on Shotgun Road to the bridge on Road 17.

Public and administrative road users would experience encounters with log trucks on all the arterial and collector roads in the project area. Most spur roads accessing commercial harvest units would be signed "For Logging Use Only."

The demand for vehicular access to National Forest System lands is expected to increase as the demand for recreation increases. The amount of open roads available for vehicular access is expected to decrease. More users on fewer roads are expected to increase the need for road maintenance. The Roads Analysis for the West Maurys Project Area identified that there are several opportunities to reduce the resource risks associated with the existing road system. This includes recommendations for decommissioning, closing (inactivating) or reconstructing roads. There are no proposals at this time to analyze or implement any recommendations included in the Roads Analysis other than those road-related activities included as part of the action alternatives. If the Forest Service chooses to implement any of the recommendations in the future, those activities would undergo environmental analysis at the time the road activities would be proposed for implementation. Because none of the recommendations in the Roads Analysis (other than those already analyzed as part of the action alternatives) are proposed at this time, there are no cumulative effects.

Visual Quality Objectives

Affected Environment

The LRMP assigns visual quality objectives to management areas. They are:

Developed Recreation – Retention
Eagle Roosting – Modification
General Forest – Maximum Modification
General Forest Winter Range – Maximum Modification
Hammer Creek Wildlife and Recreation – Partial Retention in area, Retention on Trails
Old Growth – Retention
Visual Management Corridors – Partial Retention
Riparian Habitat Conservation Areas – Modification

Definitions of Visual Quality Objectives

Retention – Human activities are not evident to the casual forest visitor.
Partial Retention – Human activities may be evident, but must remain subordinate to the characteristic landscape.
Modification – Human activity may dominate the characteristic landscape, but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in the foreground or middleground.
Maximum Modification – Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Direct and Indirect of No Action

There would be no treatments associated with this alternative. There would be no changes to the vegetation and no additional activities that would affect the visual quality. Mortality would continue to increase and more dead trees would occur across the landscape. Increasing levels of fuel loadings could result in high intensity wildfire, potentially creating large expanses of dead trees and open areas in the long-term.

Direct and Indirect Effects of Alternatives 2, 3, and 4

All treatments prescribed under all the action alternatives meet the visual quality objectives for the management areas. Commercial treatments proposed in Alternatives 2 and 3 are not regeneration harvests and would only result in reduced tree densities at the highest intensities of treatments in Alternative 2. The current condition of forested landscape pattern, line and texture would remain after treatments, and may even be improved with the reduction of smaller diameter tree densities which would result in more open stands and greater viewing distances within stands. The density treatments would also result in increased growth rates of residual trees which would in the future result in more numbers of large diameter trees across the landscape. Noncommercial treatments would reduce the densities of smaller diameter trees, enhance growth of residual trees, and create more open viewing distances. Slash resulting from noncommercial thinning would be evident until the piles were burned and re-vegetated. Prescribed fire would result in scorched trees and red needles. These effects would become less evident in 2-3 years after the burn. Herbaceous vegetation would be stimulated for a few years after the burn.

For Developed Recreation and the treatments proposed within this management area, the Ochoco LRMP provides a clarification for the retention VQO. It states "Timber harvest activities will normally not be visually evident, but may for safety and visual enhancement. Scenic views may be enhanced through harvest or thinning, but will appear natural." (LRMP 4-71) The treatments proposed include commercial harvest and prescribed fire in and around Antelope Campground. Thinning would occur around large trees and in dense clumps to reduce overall stocking to about 40 square feet basal area per acre. Created slash would be treated by hand-piling concentrations and underburning. The fire prescription would seek to reduce scorching of residual trees and shrubs. Residual canopy closure would be about 40 percent. Human activities would be evident during treatments but a few years after treatments, the visual quality of the area

would be improved. Fewer large trees would die as a result of competition stress reducing potential hazard trees in a developed recreation site and reducing potential for high intensity fire.

Cumulative Effects of Alternatives 1, 2, 3, and 4
Past timber management has resulted in differences in line, form, color and texture due to the amount of regeneration harvests where the majority of trees were removed juxtaposed against forested stands and provides a sharp contrast across the landscape. Many of these treatments occurred prior to 1989 and the LRMP.

The Sherwood burn project (1,300 acres) would occur within the Hammer Creek Wildlife and Recreation Area under partial retention. The burn would result in scorched trees and red needles that would persist for several years following the burn but would meet the criteria of being evident while remaining subordinate to the characteristic landscape as no trees would harvested in this project. Livestock grazing would not affect the forested character of the landscape in the project area. There would be no other additional past, present or reasonably foreseeable future actions that would affect the visual quality objectives.

Unroaded Character

Unroaded areas are defined in the FEIS for the Roadless Area Conservation Final Rule as "any area, without the presence of a classified road, of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition. Unroaded areas do not overlap with the inventoried roadless areas." (USFS 2000, page G-12). Unroaded areas have typically not been inventoried and are, therefore, separate from inventoried roadless areas. This document uses the term "unroaded area" to differentiate these areas from inventoried roadless areas. There are no Inventoried Roadless Areas (IRA) within the West Maurys Fuels and Vegetation Management Project. There are no Inventoried Roadless Areas within the Maury Mountains section of the Ochoco National Forest. The nearest IRA is the Lookout Mountain Inventoried Roadless Area approximately 20 miles to the north-northeast of the West Maurys project area.

The Oregon Natural Resources Council (ONRC) submitted a map on February 4, 2003 that displayed two unroaded areas within the vicinity of the West Maurys project. The District followed up with a request for ONRC to provide digital mapping information for a more accurate representation of the unroaded areas. ONRC provided a GIS coverage which did not reflect the hard copy map mailed in their 2/4/2003 letter; only one area was mapped on their digital version. Further communication resulted in ONRC's request to utilize the digital information as this displayed more recent accurate information. The unroaded area provided by ONRC closely, but not exactly, coincides with the Hammer Creek Wildlife and Recreation Management Area. Road 1750-363 along Hammer Creek that bisects the area has been decommissioned. All other existing roads are on the periphery of the ONRC unroaded area. ONRC requested that the Forest Service consider the impacts to the values that unroaded areas may have prior to logging. ONRC also stated that the Forest Service should avoid logging and road building in these areas.

Direct and Indirect Effects of No Action
Current conditions within the unroaded area would not change with the implementation of this alternative. No new road construction would occur. No vegetation management or fuel reduction activities would take place. Vegetation conditions would continue to increase in density with site conditions exceeding carrying capacity with mortality continually increasing. The likelihood of high intensity unplanned fire in the event of an ignition from lightening increases with the continual increases in fuel loadings. Suppression of unplanned fire would be difficult because of the lack of access roads and dense forest conditions in portions of the unroaded area. Approximately 1,300 acres of a mosaic prescribed fire authorized under a separate decision signed in February 2004 would be done in the spring of 2004 in the western one half of the area reducing fuel loadings in the short term in this portion. This prescribed fire project is west of the Old Growth Management Area within the unroaded area / Hammer Creek Wildlife and Recreation Management area. Mechanized equipment would not be used to construct firelines in this prescribed fire project. The objective of the prescribed fire project is to improve forage quality for big game and to reduce the risk of future high intensity wildfires.

Direct and Indirect Effects of Alternatives 2, 3, and 4
No new specified road or temporary road construction is proposed with either Alternative 2 or 3 or 4 in the ONRC identified unroaded area. Table 3.53 displays the treatments proposed in each alternative within ONRC identified unroaded area.

Table 3.53 Acres of Treatment within ONRC Identified Unroaded Area

Alternative	Total Acres within ONRC Unroaded Area	Commercial Harvest (Individual Tree Selection) Precommercial thinning Grapple Piling Acres	Noncommercial Thinning and Associated Fuels Treatments Acres	Prescribed Burning Acres	Total acres Treated	Percent of ONRC Unroaded Area Treated
Alternative 2	3,039	43	138	54	235	7.7
Alternative 3	3,039	43	95	54	192	6.3
Alternative 4	3,039	0	184	54	238	7.8

All treatments proposed within the ONRC unroaded area are adjacent to existing roads and are on the periphery of the unroaded area. All proposed activities are within previously managed areas and unroaded characteristics associated with the human activities would remain similar to pre-treatment conditions.

Uneven-aged Management, Noncommercial Thinning and Grapple Piling - 43 Acres, Alternative 2 and 3, No commercial treatment in Alternative 4
In the 43 acres of individual tree selection (commercial harvest) and associated treatments for Alternatives 2 and 3, there would be a short term increase in disturbed soils from skidding and more stumps would be visible. Fresh cut stumps would eventually fade and blend with the scenery over time. No trees over 21 inches in diameter at breast height, live or dead, would be harvested except for hazard trees. Reducing densities of the smaller diameter trees would approximate stand structures present historically. Reducing stand densities also provides reduced competition among residual trees thereby increasing the resiliency of the stand to insect and disease attacks. Noncommercial thinning would increase sight distances within the treated stands and increase the number of small diameter stumps. These stumps would deteriorate quite rapidly and would not be evident within 10 years of treatment. Grapple piles of slash after noncommercial thinning would be evident for approximately one to two years until they were burned. These 43 acres of commercial treatments proposed in Alternatives 2 and 3, are not within the Hammer Creek Wildlife and Recreation Management Area but are within the General Forest Management Area.

Noncommercial Thinning and Prescribed Fire – 138 acres Alternative 2; 95 acres Alternative 3, 184 acres Alternative 4
Prescribed Fire Only – 54 acres, Alternatives 2, 3, and 4
Noncommercial thinning effects have been discussed in the previous treatment description section. During and after prescribed burning for approximately 5 years, blackened boles of residual trees and scorched foliage would be evident but would also approximate characteristics found normally in this fire regime. Smaller diameter trees killed during the prescribed burning would have red needles for approximately 1-2 years and then only the black bole of the tree would remain for approximately 3-8 years until decay resulted in the bole no longer remaining upright. Firelines would utilize natural features and existing barriers such as roads and streams as much as possible to reduce the amount of hand fireline construction. Constructed hand fireline would become less evident as needles, branches and other material fell and covered the fireline.

Overstory removal harvest occurred in the 1970's in the stand proposed for harvest treatment in this project. The current stand is composed of a mixture of young ponderosa pine, Douglas-fir and western juniper with scattered overstory pine. Although the site is droughty, forest cover has expanded from the

pre-1900 extent. In Alternative 2 and 3 treatments would include commercial thinning, noncommercial thinning and grapple piling of slash. Treatments would reduce stocking to recommended levels, retain all trees larger than 21 inches in diameter, reduce canopy closure and create small stumps. No additional road construction is necessary. Logging equipment would utilize existing skid trails when practicable. Because the treatments proposed with all action alternatives are within previously harvested and treated units where evidence of past management practices are already present, are adjacent to existing roads, are not utilizing regeneration harvest methods, do not need road construction to implement, and have the objective of promoting late and old structure conditions, the majority of the area would still retain the characteristics of naturalness needed for consideration for potential wilderness or inventoried roadless designation.

Cumulative Effects of Alternatives 1, 2, 3, and 4
Sherwood prescribed fire project of 1,300 acres authorized in 2004 would occur in the western portion of the Hammer Creek Wildlife and Recreation Management Area. The objectives for this project include reducing the densities of seedlings and saplings and stimulating forage production for elk. This project would not alter the naturalness needed for consideration for potential wilderness or inventoried roadless designation. There are no other reasonable foreseeable future actions that would affect the characteristics of the unroaded area.

Environmental Justice and Civil Rights

Affected Environment
Civil Rights legislations, especially the Civil Rights Act (CR) of 1964, Title VI, prohibit discrimination in Forest Service program delivery. The underlying principal behind the Civil Rights Act is that no activity shall negatively affect minorities, woman, or persons with disabilities by virtue of their race, color, sex, national origin, religion, age, disability, or material or familial status. Environmental Justice (EJ), Executive Order 12898, demands the fair treatment and meaningful involvement of all people. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from the execution of our actions. EJ focuses on minority, low income groups, and subsistence lifestyles (including Indian Tribes). The purpose of involving these groups (EJ) and analyzing the effects upon them is to determine whether adverse civil rights impacts (CR) are anticipated, or whether disparate or disproportionate impacts associated with the alternatives is anticipated on any of these groups (CR/EJ).

Direct, Indirect, and Cumulative Effects of No Action
Alternative 1 would result in increased wildfire risk and the associated risks to public health and safety. If larger and more intense wildfires would occur, it would support short term increases in opportunities in jobs related to fire suppression activities and subsequent restoration activities. In the long term, fewer opportunities for jobs would result. Alternative 1 would not provide any of the opportunities (jobs, access to firewood, etc.) that Alternatives 2, 3, and 4 would provide.

Other present and reasonably foreseeable future projects, such as Sherwood prescribed burn, riparian plantings, and headcut repairs provide opportunities for short-term seasonal employment.

Direct, Indirect, and Cumulative Effects of Alternatives 2, 3, and 4
With this project, there is no known potential for disparate or disproportionately effects, or to discriminate or negatively impact any individual or subset of the population described above. Part of the objectives of the action alternatives is to provide for human health and safety of all members of the public by reducing the risk of wildfire. In addition, the commercial harvest treatments in Alternatives 2 or 3, would provide for easier access to firewood (landing/harvest units) which should positively effect low-income, older, or those with disabilities, who are not able to afford the type of vehicle needed to access, or physically manage gathering firewood from anything but very accessible sites. Also, the types of employment opportunities provided by the alternatives, timber harvest activities (logging, hauling, etc.), prescribed burning, noncommercial thinning, millwork, etc., would have positive effects on the categories of individuals and population groups these laws and regulations are intended to protect. Other present and reasonably foreseeable future projects, such as Sherwood prescribed burn, riparian plantings, and headcut repairs provide opportunities for short-term seasonal employment.

With the 10.2 miles of road closure and decommissioning in Alternative 2 and 4, and 8.8 miles in Alternative 3, there would still be ample access throughout the project area. Tribal rights (ceded lands) and Tribal traditional uses were covered earlier under Heritage, Ceded Lands, Tribal Trust Resources, and Tribal Interests and the actions in Alternatives 2, 3, or 4 would not have any measurable impacts on Tribal interests. The project is not located in a minority community nor would it affect residents of low or moderate income. Any impacts would not affect any specific subset of the American population at a disproportionately higher rate than others.

In addition, the effects of this project on the social and economic context of these groups are within those described in the Ochoco Land and Resource Management Plan. The benefits and risks associated with implementation of the proposed action are provided to all members of the public. Therefore, the project would not pose disproportionately high or adverse effects to minority communities or to low income groups. As a result, no formal Civil Rights Impact or Environmental Justice Analysis was undertaken.

Prime Farmland, Rangeland, and Forestland

There is no prime farmland, rangeland, or forestland within the project area.

Floodplains and Wetlands

Direct, Indirect and Cumulative Effects of No Action

Effects to floodplains or wetlands are already discussed under Fisheries, Water Quality (Issue 2) and Riparian Habitat Conservation Areas sections of this document.

Direct, Indirect and Cumulative Effects of Action Alternatives

Treatments within Riparian Habitat Conservation Areas have already been identified in Chapter 2 and the effects of those treatments have been described in Water Quality, Fisheries and Riparian Habitat Conservation Areas sections of this chapter. Treatments are designed to meet riparian management objectives and to enhance conditions within the areas by promoting deciduous trees and shrubs to increase shading, reducing competition in conifers to promote development of future coarse woody debris and to reduce fuel loadings to reduce the impacts in the event of wildfire. Mitigation measures described in Chapter 2 would ensure protection of riparian habitat and conditions.

Irreversible and Irretrievable Commitment of Resources

Irreversible commitments are decisions affecting nonrenewable resources such as soils, wetlands, roadless areas, and cultural resources. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at great expense or because the resource has been destroyed or removed.

The construction of roads, to provide access to timber, is an irreversible action because of the time it takes for a constructed road to revert to natural conditions. All action alternatives propose some level of road construction.

Removing aggregate (gravel) from mineral material sources would result in an irreversible commitment of resources. Once aggregate is removed from material source sites and placed on roads, it cannot be renewed except over long periods of time.

Irretrievable commitments of natural resources involve the loss of production or use of resources. This represents opportunities foregone for the period of time that the resource cannot be used.

Timber stands that are not managed at this time present an irretrievable loss of growth potential. Although the lost growth is irretrievable, it is not irreversible because the stands could be managed at a later date.

Short-term Uses versus Maintenance and Enhancement of Long-term Productivity

The action alternatives propose short-term harvest of timber, while enhancing the long-term health of forested stands. Existing conditions are outside the historic range of variability and may not be sustainable over the long term. Proposed treatments including prescribed fire, in part, mimic natural disturbance processes and move conditions toward a balance of sustainable vegetative conditions. Soil and Water are two key factors in ecosystem productivity and protection of these resources is provided by the use of mitigation measures and design features discussed in Chapter 2. Sustainable levels of timber, wildlife habitat, water quality and other resources depend on maintaining the long-term soil productivity upon which vegetation relies. Quality and quantity of water from the project area would fluctuate as described already in this chapter, but no long-term effects to water resources are anticipated as a result of commercial harvest, non-commercial , and fuels reduction treatments. All alternatives provide fish and wildlife habitat at levels necessary to maintain viable populations of the species within the project area. The amounts of suitable habitat vary with the level of density management in each alternative.