Crawford Project

Timber Harvest, Fuel Treatments, Road Closure Activities

Record of Decision

Malheur National Forest
Blue Mountain Ranger District
Grant County, Oregon

June, 2008

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RECORD OF DECISION

and

FINDING OF NON-SIGNIFICANT FOREST PLAN AMENDMENT
(Forest Plan Amendment #65)

for the

Crawford Project

USDA Forest Service
Malheur National Forest
Blue Mountain Ranger District
Grant County, Oregon

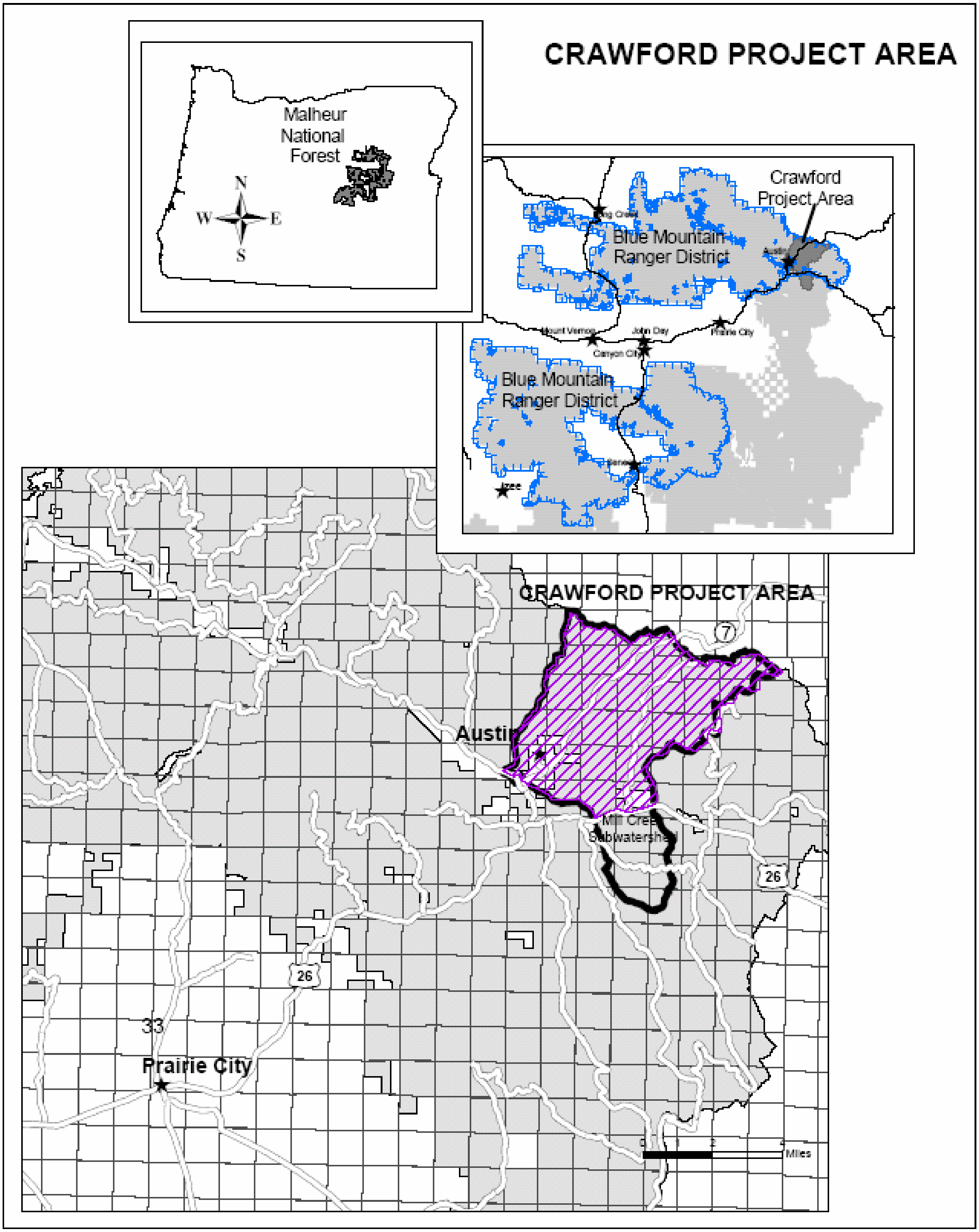
T.10S., R.35E., Sections 34 – 36; T.10S., R.35 ½ E., Sections 33 – 36; T.11S., R.35E., Sections 1 – 4, 9 – 16, 21 – 28, & 35; and T.11S., R.35 ½ E., Sections 1 – 4, 9 – 11, 14 – 16, 21, & 28, Willamette Meridian.

Introduction

This Record of Decision (ROD) documents my decision and rationale for the Crawford Project. The Crawford Project Area refers to the portion of the Mill Creek Subwatershed within the Malheur National Forest, Blue Mountain Ranger District (BMRD) that is north of U. S. Highway 26. This area is approximately 14,950 acres (See Figure 1) which is 83% of the subwatershed. Highway 26 is the administrative boundary between the Blue Mountain and Prairie City Ranger Districts. The three major drainages in the project area are Middle Fork John Day River, Crawford Creek, and Mill Creek.

The Crawford Vegetation Management Environmental Assessment (EA) was completed in November, 2001. A Decision Notice and Finding of No Significant Impacts (FONSI) was signed by Bonnie Wood, Malheur Forest Supervisor on April 26, 2002. This decision was appealed and then reviewed by the Appeal Deciding Officer, Richard Sowa. This review revealed that the analysis of cumulative effects was not sufficient to support the decision. The Forest Supervisor was directed to withdraw the decision.

Figure 1: Project Location Map



A Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) was published in the Federal Register on October 9, 2003 for the Crawford Timber Sale (Crawford Project). The Crawford Project and the Crawford Timber Sale are the same analysis. The original Crawford Vegetative Management EA and this EIS are intended to address many of the same needs and public comments. Some of the activities in the original EA have been removed from the proposed actions in the Crawford Project EIS, including precommercial thinning that is outside of harvest units, planting hardwoods, conifer removal from hardwood areas and meadows, cutting hardwoods to stimulate reproduction, caging shrubs, fencing to protect hardwoods, and slashing junipers to create barriers to hardwoods.

Modifications were made from the 2001 EA to the 2008 FEIS to address internal and public comments. They include:

- The project area was refined to only include a portion of the Mill Creek Subwatershed.
- Partial Removal and Regeneration Salvage treatment methods proposed in the 2001 EA are not proposed in the 2008 FEIS.
- To address the public issue regarding new road construction, construction of new system roads was removed from proposed actions. Various amounts of temporary road construction are proposed in the alternatives considered. All temporary roads will be decommissioned after use.
- The original Crawford EA proposed skyline logging on steeper slope areas. In the 2007 FEIS only ground-based harvest is proposed.

The Purpose and Need for This Project

The Interdisciplinary Team (IDT) was directed to address the following purposes with the proposed action and alternatives:

1. Promote a change in tree species composition, stand densities, and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands.
2. Implement a road system that meets public and management access needs that reduces the risk of sediment reaching streams, and road impacts to aquatic species and wildlife habitat.
3. Adjust Dedicated Old-Growth (DOGs) areas, identify Replacement Old-Growth (ROGs) areas, and identify pileated woodpecker feeding areas (PWFAs) as required by the Forest Plan.
4. Capture the economic value of trees to provide wood products and jobs.
5. Accelerate development of future late and old structural (LOS) single-stratum wildlife habitats.
6. Reduce the fire fuels by primarily reducing density of standing vegetation, surface fuels, and fuel ladders.
7. Implement the Highway 26 and Highway 7 Viewshed Corridor Plans.

Decision and Reasons for the Decision

I have decided to select Alternative 2 with modifications from the Crawford Final Environmental Impact Statement (FEIS). Modifications include deferring all proposed activities within Units 22, 142, 146, 150, and 27 acres of Unit 78. A total of 151 acres of commercial harvest will be deferred out of the 2192 acres proposed in Alternative 2. I have decided to defer treatment of these areas because they are providing beneficial wildlife habitat at this time. Portions of all units are providing big game security cover and connectivity habitat. The 27 acres that will not be treated in Unit 78 are providing limited satisfactory cover, and equates to 6% of the remaining satisfactory cover in Mill Creek Subwatershed. Deferring treatments in Units 142 and 150 eliminates the need to construct approximately 0.4 miles of temporary road.

Table 1 shows my modifications to Alternative 2 compared to the original alternative in the FEIS. Any proposed actions not listed in the table are same as those described in the FEIS for Alternative 2. A full description of Alternative 2 (modified) is provided on ROD pages 9-16.

Table 1 - Alternative 2 (Modified) Compared to Original Alternative 2

Proposed Action	Alternative 2	Alternative 2 (modified)
Commercial Thinning (acres)	2,073	1,922
Temporary Road Construction (miles)	8.6	8.2
Road Maintenance (miles)	32.6	29.3
Road Reconstruction (miles)	10.9	10.5
Precommercial Thinning (acres)	935	811
Activity Fuel Treatments (acres) - Handpiling - Grapple Piling	 147 822	 141 677
Visual Corridor (Foreground Treatments) (acres)	461	455
Harvest in Satisfactory Cover	27	0

Rationale:

I think that it is important that I describe the thought process that went into making this decision.

I believe that this alternative, as modified, represents the best option for developing more resilient vegetation and reducing fire fuels in the Mill Creek Subwatershed, while capturing the economic value of trees to provide wood products and jobs in the community. A large portion of the project area contains warm and hot-dry upland forest biophysical environments. The composition in these dryer forest types has changed from those dominated by ponderosa pine to denser mixed species stands with higher components of fir species. Changes in composition and structure have increased the risk of greater fire severity and insect damage. In the past, ecosystem interactions included a natural disturbance regime that included frequent low intensity fire that supported a more resilient forest condition. These historic stands were more resilient to fire damage, insects, and disease and supported resistant tree species such as ponderosa pine, growing in a more open condition. Thinning in ponderosa pine stands will increase growth and vigor as the stand density is reduced. Fuel reduction treatments and prescribed burning will reduce the fuel loadings on the forest floor and reduce the chances of a fire becoming stand replacement intensity.

The Malheur Land and Resource Management Plan (Forest Plan) clearly establishes direction to evaluate actions that provide public economic returns and maximum outputs when these actions are consistent with the various resource objectives and environmental standards (Forest Plan Goal #25 and #26, IV-2). My selected alternative will capture the economic value of trees to provide wood products and jobs. The community of John Day is dependent on the wood products industry. This industry is currently struggling due to timber supply and market fluctuations, and the jobless rate in our local community exceeds the state average (Oregon Employment Division (OED) 2006). I know that no single timber sale will likely solve these problems, but I also know the significance of each contribution. The selected alternative will produce approximately 6.4 MMBF of timber.

In the early 1900s the first roads were built into the Crawford project area. The first roads were built for access for fire fighting, providing a transportation system to miners, loggers, and cattle and sheep ranchers. Old routes were low grade and followed many of the old Sumpter Valley railroad grades. Many of the initial roads constructed were in riparian areas and are now deemed unneeded for future management, and because of their location to streams pose a sediment risk to threatened fish species. This decision will decommission 18.0 miles of unneeded roads of which 5.8 miles are located directly within riparian habitat conservation areas thereby enhancing water quality and valuable listed fish habitat.

The Upper Middle Fork John Day Watershed Analysis (WA) identified the need for the development of old forest single stratum (OFSS) structure ponderosa pine-dominated stands (USFS 1998). Historic accounts show a strong presence of this habitat condition, structure, and tree composition across much of the project area and the watershed as a whole. In the analysis area, OFSS occurs on 3% (289 acres) and 0% (0 acres) of the warm-dry and hot-dry biophysical environments, respectively. Historically, this habitat type was estimated on 5 to 55% and 20 to 70% of the warm-dry and hot-dry biophysical environments, respectively. In Alternative 2 (modified), OFSS increases from 0 to 46% in the hot-dry, and 3 to 21% in the warm dry biophysical environments over the next 50 years, meeting the needs of species such as the white-headed woodpecker, flammulated owl, and other neotropical land bird species that depend upon open, mature ponderosa pine stands for foraging, nesting, and roosting.

Viewshed corridor plans have been completed that identify the existing and desired scenic conditions as well as recommending management opportunities within the Highway 7 and Highway 26 corridors. Both corridor plans recommend thinning and underburning in foreground areas to achieve desired conditions (See FEIS, page 384). Alternative 2 (modified) will commercially thin 455 acres in the Highway 7 and 26 corridors resulting in a more stable vegetation condition. Thinning will help develop larger trees in a shorter time span, as densities are reduced.

Public comments were considered and evaluated in the FEIS. Modifications were made from the original Crawford Vegetation Management Environmental Assessment (2001) to address issues related to proposed action. One of the biggest public concerns related to proposed road construction. The 2001 Crawford Vegetation Management EA proposed constructing nearly 15 miles of system and temporary road. My decision will still construct approximately 8.2 miles of temporary road, however I have achieved a balanced decision that addresses many of the issues regarding road construction. We are committed to ensuring that temporary roads will be decommissioned and effectively closed after use. All temporary roads will be decommissioning by subsoiling and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use. Concerns over road construction, sediment, and listed fish species habitat are addressed by ensuring that proper drainage is installed in temporary roads during decommissioning, and ensuring that all temporary road constructed are located outside of Riparian Habitat Conservation Areas (RHCAs) and most will be constructed greater than 500 feet away from streams.

Additional public comments on the Crawford Project and other projects on the Malheur National Forest have expressed concerns over regeneration harvesting, and maintaining variable thinning densities and untreated clumps or patches within thinning units. Regeneration Salvage treatment methods proposed in the 2001 EA were removed from the 2006 DEIS and the 2008 FEIS. My decision does include 119 acres of shelterwood harvest, which is defined as a regeneration treatment. Proposed shelterwood treatments are really a combination of thinning and shelterwood treatments that will result in a variable tree spacing with removal of less desirable trees from the middle and understory, and thinning of desirable trees where they are overstocked. This will result in some understocked patches (less than 10%) to be reforested. Shelterwood harvest in mixed conifer stands will shift the species composition towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires. Shelterwood harvest will occur outside of late and old structure (LOS) with the intent to maintain and/or enhance LOS components in the stands. The shelterwood harvest will also be designed for retention of all mature and yellow-orange bark ponderosa pine and western larch, regardless of diameter of the mature trees.

To address public concerns over maintaining stand variability and untreated patches across the landscape, commercial thinning will retain trees at a varied spacing, with the density varying as much as 50% across the stands. Table 2.4 of FEIS Chapter 2, Design Measures Section, shows the variable spacing that will be applied in dry forest types and dry forest mixed conifer sites. In addition, 5 to 15% of the understory will be left in unthinned patches from 2 to 5 acres in size for wildlife cover.

I evaluated all of the environmental consequences of the alternatives, including the no action alternative, to determine which alternative would best meet my purpose and need for the project while minimizing environmental impacts. Alternative 1 (No Action Alternative) fails to meet the purpose and need; however, it provides the least impact on the environment. Since no timber harvest takes place, no economic returns emanate from Alternative #1. The No Action alternative would not decommission roads that are potential sediment sources to streams. Therefore, no beneficial effects from road decommissioning and culvert removal would occur.

Since all the action alternatives address the purpose and need to a varying extent, I carefully considered each of these action alternatives in terms of their environmental benefits, economic returns, and environmental impacts to determine which one to select. This evaluation process required me to assess each of the action alternatives in light of the significant issues: effects on soil, water quality, and listed aquatic species habitat; and effects of commercial thinning on satisfactory big game cover; and overall success in addressing the purpose and need.

Alternative 4 provides the least direct impact to soils, but treats fewer acres with high to extreme crown fire potential. When I compared Alternative 2 (modified) to Alternative 4, I could clearly see that if I made the decision to select the latter, it would result in limited benefits to vegetation resiliency and future development of deficient old forest structures. Additionally, Alternative 4 (precommercial thinning only) would provide no commercial harvest related employment or income.

When I compared Alternative 2 (modified) to Alternative 3, I could clearly see that if I made the decision to select the latter, it would result in 33% less timber volume (4.3 MMBF) being offered for sale than under Alternative 3, with a resulting comparable decrease in timber sale receipts. The analysis pertaining to percent change in area with high to extreme crown fire potential showed less of a reduction in acres (9%). Projected development of old forest single-stratum (OFSS) structure over the next 50 years was 7% less, and 51% fewer acres would be treated in visual corridor foreground areas. Alternative 3 would construct 1.5 miles of temporary road compared to 8.2 for Alternative 2 (modified); and would commercially harvest 26% fewer acres resulting in less soil impacts. Alternative 2 (modified) or Alternative 3 would both defer activities in satisfactory cover which is currently below the Forest Plan Standard. Both Alternatives decommission 18.0 miles of unnecessary roads that are causing potential sediment impacts. I weighed the difference in purpose and need benefits described above against constructing fewer temporary roads and less harvest acres and soil impacts and chose to select Alternative 2 (modified). Alternative 2 (modified) presents the best balance between addressing the purpose and need, environmental impacts and economic benefits. All Forest Plan Standards including soil protection standards would be met in Alternative 2 (modified).

Decision Description – Alternative 2 (modified)

The following is first a table summarizing my decision followed by a detailed description. See **Table 2** for a summary list of project activities for Alternative 2 (modified). This table corresponds to FEIS Table 2.24, pp.98-99 with changes made to reflect my decision:

Table 2 - Alternative #2 (Modified): Summary of Activities

Comparison /Purpose and Need	Alternative 2 (Modified)
1. Vegetation Restoration	
▪ Commercial Thinning (acres)	1,922
▪ Precommercial Thinning (acres)	811
▪ Shelterwood Harvest (acres)	119
▪ Planting Conifers (acres)	119
▪ Tractor Harvest (acres)	2,041
2. Road System	
Road Activities from Timber Harvest ▪ Temporary Road Construction (miles)	8.2
▪ Road Reconstruction (miles)	10.5
▪ Road Maintenance (miles)	29.3
Road Restoration Road Closures (Gate or Sign) (miles)	1.5*
▪ Decommissioning (miles)	18.0**
▪ Decommissioning (RHCA) (miles)	5.8
▪ Open Closed Road (miles)	2.1***
3. Adjust Dedicated Old-Growth/ Identify Replacement Old-Growth	
▪ Additional ROGs designated	3 (new)
▪ Adjustment of DOGs	3
4. Capture Economic Value	
▪ Volume Harvested (MBF)	6,371
6. Fire and Fuels Treatments	
▪ Prescribed burning (acres)	5,300
Activity Fuel Treatments with Harvest and Precommercial Thinning Activities ▪ Yard tops attached (acres)	441
▪ Hand pile (acres)	141
▪ Grapple pile (acres)	677
▪ Yard tops attached and hand pile (acres)	11
▪ Yard tops attached and grapple pile (acres)	55
▪ Prescribed burning (acres)	563
▪ Hand pile and prescribed burning (acres)	16
7. Visual Corridor	
▪ Foreground Treatments (Commercial)	455

* 0.7 miles - Mill Creek Subwatershed, 0.8 miles – Idaho/Summit Subwatershed
** 17.8 miles – Mill Creek Subwatershed, 0.2 miles – Dry Fork Subwatershed
*** 1.7 miles – Mill Creek Subwatershed, 0.4 Dry Fork Subwatershed

Detailed Description:

The following detailed description of my decision is excerpted from the FEIS (FEIS Chapter Alternative 2 on pages 72 to 80) and I incorporate by reference the detailed description of Alternative 2 presented in that document; including the maps and legal descriptors that denote locations of actions. The maps can be found in FEIS Appendix B. The acres listed have been modified to reflect my decision to deletion of Units 22, 142, 146, 150, and 78 (27 acres).

Commercial Harvest

- Commercial Thinning – 1,922 acres
- Shelterwood Harvest – 119 acres

There are two different harvest prescriptions that will be implemented with the alternative, commercial thinning and shelterwood harvest. Both harvest prescriptions will be completed using ground based harvest systems. The commercial thinning prescription promotes ecologically appropriate compositional and structural conditions in order to increase resiliency and promote development of structural and wildlife habitat conditions currently lacking across the area and watershed as a whole.

Commercial thinning - Commercial thinning will harvest merchantable trees in immature forest stands by thinning from below to reduce stocking levels to enhance tree growth and to allow for the reintroduction of fire. This treatment will thin small/medium size trees (7 to 20.9 inch dbh). An additional objective in mixed species stands will be to select for retention of ponderosa pine and western larch. It's designed to reduce the competition among trees for sunlight, water, and nutrients resulting in more vigorous, healthier forest stands. Trees will be left at a varied spacing, with the density varying as much as 50% across the stands. Table 2.4 in Chapter 2, Design Measures Section, shows the variable spacing that will be applied in dry forest types and dry forest mixed conifer sites. In addition, 5 to 15% of the understory will be left in unthinned patches from 2 to 5 acres in size for wildlife cover.

A portion of the commercial thinning areas are located within wildlife connectivity corridors. The objective is to reduce stocking in these stands while retaining sufficient trees per acre to provide denser forest stands than the surrounding area for security. To meet Forest Plan wildlife connectivity standards, fewer trees will be thinned to retain a higher density and clumps of trees will also be designated. Specifically, the canopy cover is to be left in the upper 1/3 of the site potential.

Commercial thinning will also occur in approximately 88 acres of Replacement Old-Growth. The objective of thinning is to reduce stocking to increase resiliency of the area for the long-term and accelerate growth and the development of large trees. Instead of rigidly thinning from below, the objective will be to thin trees from each size class to encourage the development of a multi-storied stand. All trees that are over 21 inch dbh will be retained to provide structural diversity, regardless of their condition.

Commercial and precommercial thinning will occur in approximately 61 acres of Late and Old Structures (LOS). Acres treated will enhance the LOS, and there would be no net loss of LOS. Five acres of old forest multi-strata (OFMS) are included as small pieces in several units that are predominately comprised of young forest structure. These acres are located in the hot-dry biophysical environment and will be converted to old forest single-stratum (OFSS) after thinning. The hot-dry biophysical environment is currently above HRV in the OFMS structure and below HRV in the OFSS structure

Commercial thinning to improve the sustainability of the multi-structure on 39 acres of OFMS (unit 78) is proposed in the cool-dry biophysical environment. The cool-dry biophysical environment is currently within HRV. Approximately 27 acres (out of the remaining 33 acres) are classified as satisfactory cover. Commercial thinning of these acres will be deferred in my decision.

Approximately 17 acres of OFSS will be commercially thinned to reduce the understory and maintain the OFSS structure. This will occur in the warm-dry biophysical environment. The acres are small pieces of several units.

Other than those treatments described above all other proposed thinning and shelterwood treatments are located in non LOS stands and are designed to manipulate vegetation towards appropriate late and old structure in the future.

A nonsignificant Forest Plan amendment was proposed to commercially thin 27 acres of satisfactory cover (Unit 78). ***In my modified decision, treatment of these acres will be deferred, eliminating the need for this Forest Plan amendment.***

Shelterwood harvest - The shelterwood harvest will remove less desirable trees from the middle and understory, thin desirable trees where they are over stocked, and reforest the resulting understocked areas. Shelterwood harvest will occur outside of late and old structures (LOS). The intent is still to maintain and/or enhance LOS components in the stands subject to timber harvest, as much as possible. The shelterwood harvest will also be designed for retention of all mature and yellow-orange bark ponderosa pine and western larch, regardless of diameter of the mature trees.

Both the commercial thinning and shelterwood treatments will include the following design features:

- All trees 21 inches and larger in dbh will be retained, except where they present a safety hazard or operational constraint such as in the construction of temporary roads and landings during logging operations.
- There will be no net loss of old forest structures (OF) only a change in the types of OF structure. This includes converting very small amounts of OFMS to OFSS where ecologically appropriate.
- Existing snags 12 inches or larger in dbh will be retained except where they present a safety hazard.
- No harvest activities will occur within RHCAs.

Road Use during Harvest

- Temporary road construction – 8.2 miles. Temporary roads will be constructed in several short segments ranging from a few hundred feet to approximately a mile in length. All temporary roads will be located outside of RHCAs.
- Road reconstruction – 10.5 miles
- Road maintenance – 29.3 miles.

In order to accomplish timber harvest activities, road reconstruction, temporary road construction, and road maintenance will occur to provide adequate access for harvest and to meet safety and resource protection needs. Appendix C in the FEIS identifies each road proposed for log haul under Alternative 2.

Most of the National Forest System land in the project area is roaded with the majority of the roads being Maintenance Level 1 and 2 (native surface or gravel). All of the roads will need some work done to meet maintenance standards. This work will range from simple maintenance to reconstruction. None of this work will be done in a stream. The culvert work will be on a ditch relief culvert, not a stream culvert.

Temporary roads will also be needed to support timber harvest. All temporary roads will be decommissioned after use. Decommissioning will eliminate future use of the road with the objective of restoring hydrological function. This will include subsoiling and seeding as necessary.

Precommercial Thinning

- Precommercial thinning – 811 acres

Following timber harvest, areas with remaining high density will be thinned by further removal of small diameter trees (generally less than 9 inches in diameter) to achieve desired stand conditions. The precommercial thinning prescription is recommended where the small trees to be cut are not merchantable saw log sized material. The objective is to reduce ladder fuels by reducing the amount of live or dead fuels, and increasing tree growth.

Reforestation

- Conifer Planting – 119 acres

Following the shelterwood harvest, areas that are understocked and greater than ½ acre in size will be planted with early seral (ponderosa pine and western larch) tree seedlings.

Activity Fuels Treatments

- Yard tops attached – 441 acres
- Hand pile – 141 acres
- Grapple pile – 677 acres
- Yard tops attached and hand pile – 11 acres
- Yard tops attached and grapple pile – 55 acres
- Prescribed burning – 563 acres
- Hand pile and prescribed burning – 16 acres (hand pile is in visual area)
- No treatment - 138

The activity fuels treatments in Alternative 2 (modified) include yard tops attached, hand piling, grapple piling, and prescribed burning. The acres of prescribed burning above are reflected in the 5,300 acres of prescribed burning below. Additional acres of underburning, to those listed above, will occur in commercial and precommercial thinning units to treat natural fuels (approximately 1,200 acres).

Prescribed Fire

Prescribed burning (underburning) will occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. There are two burning objectives as described below. Burning will be accomplished in the spring and fall seasons when weather and moisture conditions are appropriate and after much of the mechanical work is completed.

Prescribed burning – Approximately 5,300 acre perimeter which includes:

- Excluding fire from approximately 753 acres
  - 450 acres of DOG (including 03134PW and a portion of 03335PP)
  - 14 aspen sites of (approximately 27 acres)
  - 11 research plots (approximately 11 acres)
  - 265 acres of RHCA (Category 1 and 4)
- Allowing fire to back into approximately 1,100 acres (RHCAs, non-forested stands)
- Lighting approximately 3,400 acres

The prescribed fire perimeter is comprised of roads and all other interior control lines would primarily be roads. An estimated 1.5 miles of hand line may be used as a control line around and adjacent to private lands and to tie road to road. Hand line, in addition to that described, may be needed to exclude fire from aspen, Dedicated Old-Growth (DOG), research plots or identified RHCAs, if roads are not used. (See FEIS Appendix B for a map of the prescribed burning area.)

General Burning Objectives

The objectives of utilizing prescribed fire are to reduce surface fuels, reduce litter depth, and increase canopy base height. Prescribed fire is not being utilized to change the structural stage of any of the stands. Some tree mortality is expected and acceptable in forested stands. Acceptable mortality ranges are as follows:

- Trees 0 – 5 inch dbh, tree mortality is expected to range from 5 to 15%.
- Trees 5 – 10 inch dbh, tree mortality is expected to range from 5 to 10%.
- Trees 10 – 20+ inches and larger dbh, tree mortality is expected to range from 1 to 5%.

These mortality levels are based on averages over the whole burning area and recognize the fact that fire is a relatively inexact tool and that there will be some localized areas where mortality reaches 100%. Mortality patches should be kept to less than 2 acres wherever possible and preferably to the ¼ to ½ acre size that was thought to exist under historic conditions (Agee, 1993).

RHCAs, Replacement Old-Growth (ROG), late and old structure (LOS), and satisfactory cover burning objectives:

- RHCAs – approximately 653 acres
  - 122 acres of Category 1
  - 19 acres of Category 2
  - 512 acres of Category 4
- ROG – 340 acres
- Late and old structure – 425 acres
- Satisfactory cover – 135 acre

Within the RHCAs identified to let fire back into, ROGs, late and old structure stands, and satisfactory cover stands, the objective of utilizing prescribed fire is to reduce surface fuels and litter depth. Prescribed fire is not being utilized to change the structural stage or canopy cover of the stands in these identified areas. Some tree mortality is still expected and acceptable in these forested stands but is less than in the general forest. Acceptable mortality ranges are as follows:

- Trees 0 – 10 inch dbh, acceptable tree mortality is up to 5%.
- Trees 10 inches and larger dbh, acceptable tree mortality is up to 2%

Also within the 5,300 acres, lighting will not occur but fire would be allowed to back into approximately 500 acres of non-forested stands and into RHCAs. The non-forested acres typically have minimal fuel loads which are discontinuous and therefore rarely burn. Past district experience has shown that when fire is allowed to back into RHCAs the effects are dependent on the existing vegetation. As soon as vegetative species and moisture regimes within the RHCA change and become more shaded with more moisture and higher humidity, the fire would not burn, so riparian vegetation is rarely affected. Shrubs and conifers providing streamside shade and riparian vegetation are rarely affected because they do not burn with enough intensity to cause mortality.

Approximately 340 acres of ROG are within the 5,300 acres. Prescribed fire in this area will also minimize loss of snags and large down wood.

Approximately 425 acres of late and old structure (LOS) are within the 5,300 acres and not within the DOG. Methods to protect large trees can include raking the litter and bark accumulation away from the base of the tree, not burning areas where concentrations of large trees exist, and burning when duff moistures under the larger trees is 120% or greater which has been determined to not cause damage to the base of the tree (Scott, 2002).

Approximately 135 acres providing satisfactory cover are within the 5,300 acres. Much of the identified satisfactory cover is also LOS. Underburning in these areas will retain multi-storied stand characteristics and high canopy closures. After implementation, these areas will still meet the requirements of satisfactory cover. Emphasis will be placed on minimizing under-story tree mortality to less than 5% since the understory is currently providing big game security cover. If moisture conditions or other burn parameters for meeting the acceptable mortality limits can not be met in any given year, the burn boss may decide to exclude fire from these 178 acres. (See FEIS, Table 2.5).

Road Closures and Decommissioning

- Gated closures – 1.5 miles (0.7 Mill Creek Subwatershed, 0.8 Idaho/Summit Creek)
- Decommissioning – 18.0 miles (17.8 Mill Creek Subwatershed, 0.2 Dry fork Subwatershed)
    - Closed roads – 17.7 miles (17.5 Mill Creek Subwatershed, 0.2 Dry Fork Subwatershed)
    - Currently open roads – 0.3 miles (0.3 Mill Creek Subwatershed)
- Opening of closed roads – 2.1 miles (1.7 Mill Creek Subwatershed, 0.4 Dry Fork Subwatershed)

The new road closures will be gated or signed and restrict yearlong use to motorized vehicles. Decommissioning will eliminate future use of the road with the objective of restoring hydrological function. Over 90% of these roads are already closed. The decommissioned roads will be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, and drainage provided for the road surface. Conifers will be planted on decommissioned road segments located in RHCAs where conditions will support establishment and growth and these roads will be removed from the Forest Road Transportation System.

Proposed decommissioning activities will also include removal of one culvert on Forest Service Road (FSR) 2620156, ripping/subsoiling and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use and ensure that proper drainage occurs over time.

Approximately 2.1 miles of road currently closed will be reopened (see FEIS, Appendix B, ATM Plan West Map). This consists of two road segments that were closed in the early 1990s to reduce wildlife disturbance. Monitoring has identified some problems associated with the closures. In both cases, damage to nearby environmentally sensitive areas can be reduced by reopening the road segments, which are not in environmentally sensitive areas. For the 7000255 segment a nearby unauthorized road is located in a meadow area and the public has been consistently driving around the attempted blockage causing rutting and meadow damage. The proposal is to decommission the unauthorized road and reopen the 7000255 segment, which will remove the incentive to drive around the blockage. For the 2600237 / 2600235 segment, closure forced use of a 2600237 road segment located in a riparian area. Use of the riparian road is causing resource damage and sediment concerns. The proposal is to decommission the riparian 2600237 segment and re-opening the stable upland 2600237 / 2600235 segment for public access.

Table 2.26 displays the miles of road proposed for closure in the Mill Creek Subwatershed. Additional maps and summary information regarding road closures and decommissioning can be found in Crawford Project FEIS, Appendix B and Appendix C.

Old-Growth Adjustments

Alternative 2 (modified) will require a nonsignificant Forest Plan amendment to adjust three DOGs and delineate three new ROGs within the Crawford Project Area (see FEIS, Appendix B for map). The DOG adjustment is needed to better delineate suitable wildlife habitat (see Table 1.3 and Table 2.27). Currently, no ROGs have been allocated to be managed as replacement areas for associated DOGs (see FEIS, Table 1.3 and Table 2.27).

Forest Plan Amendment

I have decided to amend the Forest Plan to bring this decision into consistency with the Plan (Forest Plan amendment # 65).

Management Area 13 – Dedicated Old Growth

- I am amending the Malheur Forest Plan MA-13 – Dedicated Old Growth to: adjust the boundaries of existing Dedicated Old Growth Areas (DOGs) that do not currently meet Forest Plan Standards for size and habitat requirements. To identify Replacement Old-Growth areas (ROGs) which have not been identified for any of existing DOG areas. *The amendment will last beyond project duration and will remain in effect until the Forest Plan is amended or revised.*

Public Involvement

The Crawford project has a long history of public involvement. Based on public involvement several changes were made, some of which are summarized in the ROD introduction and in the FEIS Chapter 1 on page 37.

Public comments were received after four separate scoping requests. The original analysis began in the fall of 1993, and was called the Flat Analysis. Two scoping efforts were initiated during this season: during November, 1993 to alert hunters to the imminent project and in late October, 1993, to alert the general public. However, the analysis was delayed because of higher priority projects until April 1999, when it was renamed the Crawford Vegetation Management Project.

When the analysis resumed, the Upper Middle Fork John Day Watershed Report and its recommendations were included to define the purpose and need for the project. The formal scoping package was mailed to the public on May 21 and June 17, 1999.

These letters and correspondence are filed in the Crawford Project Record.

Additional public comments on the Crawford Project were received in 2000 and 2001 during comment periods on two different versions of the Crawford Vegetation Management Project EA. The comment letters and Forest Service response to these comments are in the project record.

A Decision Notice and FONSI were signed by Bonnie Wood, Malheur Forest Supervisor on April 26, 2002. This decision was appealed and then reviewed by the Appeal Deciding Officer, Richard Sowa. This review revealed that the analysis of cumulative effects was not sufficient to support the decision. The Forest Supervisor was directed to withdraw the decision.

Following the withdrawal of the decision, a Notice of Intent (NOI) was published in the Federal Register on October 9, 2003. The NOI asked for public comment on the scope of the analysis by November 15, 2003. One comment was received from Doug Heiken, Oregon Natural Resources Council (ONRC[1]). Additional comments were provided by ONRC on January 31, 2006.

The project has been listed in the Malheur National Forest Schedule of Proposed Activities (SOPA) beginning in the winter of 2003 and subsequent quarterly SOPAs through the spring of 2008.

The analysis work on the Crawford Project was resumed in 2005. This delay was the result of Forest Planning Teams needing to work on high priority fire recovery projects. A Project Initiation Letter (letter of direction) was issued from the Blue Mountain District Ranger to the Team Leader and Interdisciplinary Team (IDT) on June 21, 2005. The District Ranger stated in this letter that there had already been substantial previous public comments received on past analysis projects in the Crawford Area. He felt this public involvement was adequate to continue the analysis without additional scoping. He directed the IDT to review all previous public comments received to date on the Crawford Project and past projects. After this review he asked the IDT to recommend any proposed changes to the Key Issues for his approval. To meet this direction, the IDT met in December 2005 to review the following:

- Comments received during initial scoping efforts. These comments were used to develop significant Key Issues in November, 2001 Environmental Assessment (EA),
- Public comments received during 30-day comment periods (November, 2001 EA),
- Appeal points on the November, 2001 Crawford EA and April 26, 2002 Decision Notice,
- Comments received on the October 9, 2003 Notice of Intent to Prepare an EIS.

Recommended refinements and changes to Key Issues were then approved by the District Ranger at later meetings. Notes from these meetings are available in the project record. Further discussion of Key Issues can be found in the section below.

Public comments received on the November, 2006 Draft Environmental Impact Statement are listed and addressed in the FEIS, Appendix E.

Tribal consultation is ongoing with three American Indian Tribes with ceded lands or traditional use areas in the Crawford Project Area (The Burns Paiute Tribe, The Confederated Tribes of the Umatilla Indian Reservation, and The Confederated Tribes of the Warm Springs Reservation of Oregon). The government-to-government consultation is being conducted under the terms of specific agreements with the individual tribes and includes regular contact and meetings as appropriate.

The Confederated Tribes of the Warm Springs Reservation provided comments on the initial Flat Planning Area scoping on December 23, 1997. When the project was renamed the Crawford Vegetation Management Project, a pre-scoping letter was sent to Tribal

[1] ONRC is now known as Oregon Wild.

agencies on April 26, 1999, before the general public, in accordance with management direction. Comments were received by letter from the Burns Paiute Tribe on December 10, 2001, and The Confederated Tribes of the Warm Springs Reservation of Oregon on October 13, 2000.

Tribal interests also provided comments on the November 28, 2001 Crawford Environmental Assessment. Both the Burns Paiute Tribe and The Confederated Tribes of the Warm Springs Reservation of Oregon provided comments. From 2000 through 2002 several letters and phone calls took place between interested Tribes and the Forest Service.

Concurrent with the Notice of Intent (NOI) to publish an Environmental Impact Statement (EIS), letters were mailed on October 1, 2003 to The Confederated Tribes of the Warm Springs Reservation of Oregon, The Confederated Tribes of the Umatilla, and The Burns Paiute Tribe. The letter informed the three tribes that the Forest Service was starting to work on the project again and therefore would like to continue consultation. The letter summarized changes to the proposed action that would be made from the original EA and the proposed action in the EIS and provided a copy of the NOI.

The DEIS was mailed to tribal leaders and program managers of The Confederated Tribes of the Warm Springs Reservation of Oregon, The Confederated Tribes of the Umatilla Indian Reservation, and The Burns Paiute Tribe. No comments were received from any of the Tribes during formal DEIS notice and comment period.

Issues

During public scoping and comment on the Draft EIS we received and evaluated individual comments to determine whether they constituted issues relevant to this planning process. We then determined where in the planning process they most appropriately applied: project design; alternative development, or environmental effects. The concerns that applied to all parts of the planning process were further evaluated to determine Significant Issues. “Significant issues”, referred in the analysis as Key Issues, were defined as those issues that drove the development of an alternative. Key Issues were factors that were analyzed to allow comparison of the alternatives.

The issues that were weighed most heavily in my decision making process are discussed in “Decision and Rationale”. Other issues used in this analysis are incorporated by reference from the DEIS and FEIS. (See FEIS Tables 1.4, 1.5, and 1.6 on pages 57 to 61 for a complete list of significant/key issues and analysis issues).

Alternatives Considered

In addition to the selected alternative (Alternative 2, modified), I considered three other alternatives, which are discussed below. Alternative 2 was the environmentally preferred alternative because it would move the landscape towards more resilient vegetation conditions and reduce fuels. A more detailed comparison of these alternatives can be found in the FEIS on pages 72 to 98.

Alternative 1 (No Action)

In this document the No Action Alternative means the proposed project (which includes all activities identified in the proposed action) would not take place at this time. Alternative 1 is designed to represent the existing condition.

Description of Specific Features:

Commercial Harvest/Road Use

- None

Precommercial thinning

- None

Activity Fuels Treatment

- None

Prescribed Fire

- None

Road Closures and Decommissioning

- No Change from existing situation of open and closed roads

Old-Growth Adjustments

- No change from the existing allocations.

Alternative 3

Alternative 3 responds to the two significant (key issues).

> Key Issue #1: *There is a concern that the proposed ground disturbing activities associated with road construction, commercial timber harvest, and prescribed burning could degrade water quality, and impact soil productivity and habitat for aquatic species. See Chapter 1of the FEIS for full issue description.*
>
> Key Issue #2: *Commercial thinning of about 27 acres is proposed in forested areas identified as satisfactory big game cover. Currently satisfactory cover is 2.5% of the Mill Creek Subwatershed, below the Forest Plan Standard of 12%. These forested areas provide some of the highest quality cover habitat available for big game species (elk) in the project area. This thinning would degrade the satisfactory cover by decreasing the tree distance which in turn reduces the average canopy closure needed to maintain this standard. See Chapter 1 for full issue description.*

Alternative 3 minimizes temporary road construction to less than 0.1 miles (500 feet) for each road. The average skidding was increased in some of the harvest units in response to decreasing the length of the temporary roads. With this reduction in access, approximately 1/3 of the harvest areas in Alternative 2 were dropped due to high logging costs. Without longer temporary or specified access roads, skidding distances made harvest not viable in these areas.

Alternative 3 excludes harvest in those areas identified as satisfactory cover to maintain the existing tree density needed to maintain this Forest Plan cover standard

A map of the harvest activities and listing of harvest units are located in FEIS, Appendix B.

The following are Alternative 3 activity descriptions. Specific design measure requirements are listed at the end of Chapter 2 in the FEIS.

Commercial Harvest

The proposed harvest in this alternative has been reduced by approximately 30% from Alternative 2. The treatment units common to Alternative 2 have the same harvest prescriptions as previously described.

- Commercial thinning – 1,506 acres
- Shelterwood harvest – None

Commercial and precommercial thinning would occur in approximately 54 LOS acres. Acres treated would enhance the LOS, and there would be no net loss of LOS. One acre of old forest multi-strata (OFMS) in the hot-dry biophysical environment is included within a unit predominately comprised of young forest structure. The hot-dry biophysical environment is currently above HRV in the OFMS structure and below HRV in the OFSS structure.

Commercial thinning to improve the sustainability of the multi-structure on 39 acres of OFMS (unit 78) is proposed in the cool-dry biophysical environment. The cool-dry biophysical environment is currently within HRV. Approximately 14 acres of OFSS would be commercially thinned to reduce the understory and maintain the OFSS structure. This would occur in the warm-dry biophysical environment. The acres are small pieces of several units.

Other than those treatment described above all other proposed treatments are located in non LOS stands and are designed to manipulate vegetation towards appropriate late and old structure in the future.

A portion of commercial thinning areas are located within wildlife connectivity corridors. The objectives are the same as Alternative 2.

Commercial thinning would also occur in approximately 50 acres of ROG. Objectives are the same as Alternative 2.

Road Use during Harvest

The amount and type of road reconstruction and road maintenance is similar to Alternative 2. The number of miles of temporary road construction was reduced by approximately 82% compared to Alternative 2. The location and description of the reconstruction, maintenance, and temporary road construction activities common to Alternative 2 are the same as previously described.

- Temporary road construction – 1.5 miles
- Road reconstruction – 10.9 miles
- Road maintenance – 29.2 miles

Precommercial thinning

- Precommercial thinning – 666 acres

The precommercial thinning treatments areas and activity descriptions are similar to Alternative 2, as well.

Activity Fuels Treatments

- Yard tops attached – 276 acres
- Hand pile – 140 acres
- Grapple pile – 631 acres
- Prescribed burning – 327 acres
- Hand pile and prescribed burning – 6 acres (hand pile is in visual area)
- No treatment – 133 acres

Activity fuels treatment is also similar to Alternative 2. Since harvest levels were reduced in Alternative 3, the amount of activity fuels treatments were reduced accordingly. The description of each of the following fuels treatment can be found in the narrative for Alternative 2.

Prescribed Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as in Alternative 2.

Old-Growth Adjustments

The delineation of three new ROGs including delineation of Pileated Woodpecker Feeding Areas, (PWFA) and adjustment of three DOGs are the same as described in Alternative 2.

Alternative 4

> Alternative 4 was developed in response to the Key Issue #1: *There is a concern that the proposed ground disturbing activities associated with road construction, commercial timber harvest, and prescribed burning could degrade water quality, and impact soil productivity and habitat for aquatic species. See Chapter 1 for full issue description.*

Alternative 4 does not include any commercial timber harvest activities or temporary road construction. The alternative does include precommercial thinning to reduce stand density of smaller trees, and prescribed burning, however, it maintains satisfactory condition.

Commercial Harvest/Road Use

There are no commercial harvest, temporary road construction, road maintenance, or reconstruction activities proposed in this alternative.

Precommercial Thinning

- Precommercial thinning – 795 acres

The precommercial thinning treatments are the same as described in Alternative 2. Precommercial thinning would occur in approximately 88 acres of Replacement Old-Growth. The objective of thinning is to reduce stocking to increase resiliency of the area for the long-term and accelerate growth and the development of large trees. Thinning would be limited to trees less than 9 inches dbh.

Precommercial thinning would occur in approximately 45 LOS acres. Stands treated would remain as LOS, and there would be no net loss of LOS structure in the subwatershed as a result of proposed actions. Precommercial thinning to improve the sustainability of the multi-structure on 39 acres of OFMS (unit 78) is proposed in the cool-dry biophysical environment. The cool-dry biophysical environment is currently within HRV in the OFMS structure. Approximately 6 acres of OFSS would be precommercially thinned to reduce the understory and maintain the OFSS structure. This would occur in the warm-dry biophysical environment. These acres would remain as OFSS. The acres are small pieces of several units

Activity Fuels Treatments

- Hand piling – 146 acres
- Grapple piling – 649 acres

The activity fuels treatment is similar to Alternative 2, except there is no commercial harvest associated with fuels treatment. The description of each of following fuels treatment can be found in the narrative for Alternative 2.

Prescribed Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as Alternative 2.

Old-Growth Adjustments

The delineation of three new ROGs and adjustment of three DOGs are the same as described in Alternative 2.

Findings Required by Other Laws and Regulations

After consideration of the discussion of environmental consequences (FEIS, Chapter 2), I find Alternative 2 (modified) is consistent with all applicable laws and regulations. This decision incorporates by reference the detailed discussion of policy and law consistency presented in the FEIS, Chapter 3, pages 418 to 425.

Consistency with the Planning Rule

On December 22nd, 2004 the Under Secretary of Agriculture approved regulations for National Forest System land management planning (36 CFR 219, published in the Federal Register on January 5, 2005). These regulations became known as the 2005 Planning Rule. On March 30, 2007 the court in *Citizens for Better Forestry v. USDA Civ. No. 05-1144* and *Defenders of Wildlife v. Johanns Civ. No. 04-4512*, in the Northern District of California, enjoined the Forest Service from implementation and utilization of the 2005 Planning Rule. On July 3, 2007 the same court refused to amend its prior judgment and affirmed that the March 30, 2007 order applied nationwide. The result of these two rulings is that the entire Forest Service is currently operating under the prior planning rule, adopted in November 2000 at 36CFR 219 and subsequently interpreted in an Interpretative Rule at 69 Fed. Reg. 58055 (September 29. 2004). This project is planned under the regulation at 36 CFR 219.35 (2000) and the Interpretative Rule of September 29, 2004. As required by 36 CFR 219.35, I have considered the best available science in making this decision. The project record demonstrates a thorough review of relevant scientific information, consideration of responsible opposing views, and, where appropriate, the acknowledgment of incomplete or unavailable information, scientific uncertainty, and risk.

Consistency with Forest Plan Direction

The selected alternative is consistent with the Malheur National Forest Land and Resource Management Plan Final Environmental Impact Statement, Record of Decision, the accompanying Land and Resource Management Plan, as amended, (USDA Forest Service 1990), dated May 25, 1990 (FEIS Chapter 3, pages 146 to 147, 178 to 179, 190, 251 to 254, 331 to 333, 350, 359, 371, 380, 391, 398, 405, and 417).

Consistency with Laws and Regulations

Air Quality and Clean Air Act of 1977, as Amended

Alternative 2 (modified) is designed to be in compliance with the Clean Air Act and the Oregon State Smoke Management Plan. Burning of any kind will not occur unless prior approval is granted by Oregon Department of Forestry. (FEIS, Design Measures page 95). All amounts of PM 10 and PM 2.5 emissions will be calculated using the CONSUME software in the SmokeTracs reporting system, which is also submitted with planned burn operations to the Oregon Department of Forestry to determine compliance with the Clean Air Act. All burning will occur outside visibility-protection periods set for Central Oregon of July 1 to September 15. Burning will be planned for times when transport winds are sufficient to displace much of the smoke from the area.

Clean Water Act of 1982

Alternative 2 (modify) will meet and comply with the Clean Water Act (1982) as amended in 1982 (FEIS, Chapter 3 page 253). Best Management Practices (BMPs) will be applied as specified in “Forest Service R6 General Water Quality Best Management Practices” (1988), and in standards and guidelines in the Forest Plan. The site specific BMPs are listed in Chapter 2 (in the description of the alternatives and in the

Management Requirements, Constraints, and Design Measures) and Appendix F (Best Management Practices). See Aquatics & Water Quality section in Chapter 3 for detailed analysis.

The Middle Fork John Day River, Crawford Creek, and Mill Creek are on the Oregon 303(d) list for water quality-limited water bodies for high temperatures. In the project area, the Middle Fork is listed for standards associated with the Designated Beneficial Uses of bull trout spawning and rearing. The selected alternative considered will not cause a measurable increase in stream temperature.

The Endangered Species Act of 1973, as Amended and Magnuson-Stevens Fisheries Conservation and Management Act (MSA) of 2000

The Endangered Species Act requires protection of all species listed as "Threatened" or "Endangered" by Federal regulating agencies (Fish and Wildlife Service and National Marine Fisheries Service). The Forest Service also maintains, through the Federal Register, a list of species which are proposed for classification and official listing under the Endangered Species Act, species which occur on an official State list, or that are recognized by the Regional Forester as needing special management to prevent their being placed on Federal or State lists. On January 31, 2008, Regional Forester Linda Goodman released an updated Sensitive Species List which includes federally listed, federally proposed and sensitive species lists. In the cover letter for the updated species list the Regional Forester states that projects initiated prior to January 31, 2008 may use the updated sensitive species list or the list that was in effect when the project was initiated. The Responsible Official for the project has authority to decide which list to use. "Initiated" means that a signed and dated document such as project initiation letter, scoping letter, or Federal Register Notice for the project exists. The Draft Environmental Impact Statement for the Crawford Project was issued in November 2006. Consequently, the 2004 Regional Forester Sensitive Species list in effect at that time was used for field reconnaissance and the Biological Evaluation. Alternative 2 (modified) is consistent with the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the requirements of the Regional Forester's Sensitive Species list.

Biological Evaluations have been completed for all threatened, endangered, and sensitive (TES) plant, aquatic, and terrestrial wildlife. Alternative 2 (modified) is expected to have ***No Effect*** to threatened Canada lynx. (FEIS, Chapter 3 pages 315 -316).

Consultation with U.S. Department of the Interior (USDI), Fish and Wildlife Service (USFWS), has been completed (Biological Assessment and letter of concurrences are located in the project file). Informal consultation with the USFWS was completed on April 17, 2002 with the receipt of the Letter of Concurrence (LOC) for the Crawford Vegetation Management Project. When the 2002 LOC was issued, bull trout critical habitat designation was being proposed for the John Day Basin. Since then, a final critical habitat designation for bull trout, published on September 26, 2005, excluded the John Day River System. Thus, analysis of effects to bull trout critical habitat is not necessary. The effects determination for the Crawford Timber Sale EA (Alternative 2) was a ***may effect, not likely to adversely affect bull trout***. (FEIS, Chapter 3 page 231 - 232) On March 27, 2008 the Forest Service received a letter from USFWS stating that the "Service concurs that the project, as modified, is not likely to result in additional effects to bull trout, beyond what were addressed previously in the 2002 LOC. Effects due to the project modifications are no greater than those analyzed in the original consultation so the April 17, 2002 LOC is still valid."

Formal consultation with the NMFS was completed on April 16, 2002 with the receipt of the Biological Opinion (BO) for the Crawford Timber Sale EA. The effects determination for the Crawford Timber Sale EA (Alternative 2) was a may effect, likely to adversely affect MCR steelhead. Between 2007 and 2007, the Malheur National Forest (MNF) modified the proposed project and NMFS designated new critical habitat for MCR steelhead. Consequently, the MNF reinitiated formal consultation the spring/summer of 2007. During formal consultation, NMFS and the MNF determined that the stream habitat restoration portions of the proposed project (road decommissioning and closures) were not interrelated or interdependent to the vegetation and fuels management activities. To simplify the consultation process and expedite implementation of restoration actions, both agencies agreed to separate these actions, with restoration projects covered under April 28, 2007 Endangered Species Action Section – Section 7 Programmatic Consultation Biological and Conference Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation.

On May 6, 2008, NMFS received a request for written concurrence from the MNF that effects of carrying out the Crawford Project vegetation and fuels management activities is not likely to adversely affect (NLAA) MCR steelhead or their critical habitat. The request also included the information necessary to complete an essential fish habitat (EFH) assessment under the Magnuson-Steven Fishery Conservation and Management Act. On May 28, 2008 a letter was received from NMFS with concurrence that the action as proposed ***may effect, not likely to adversely affect MCR steelhead and their designated critical habitat.*** The letter also transmits the results of the analysis of EFH, stating that the proposed action will not have an adverse effect on EFH designated for steelhead salmon.

Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (February 11, 1994) on Environmental Justice directs federal agencies to consider whether proposed alternatives may have disproportionately high and adverse environ-mental effects on minority populations, low-income populations, or Indian tribes. The order directs federal agencies to focus attention on the human health and environmental effects to ethnic minorities (American Indians, Hispanics, African Americans, and Asian and Pacific-Islander Americans), disabled people, and low-income groups.

Alternative 2, as modified provides a variety of opportunities for potential employment in logging, mill production, reforestation, and other potential contracts. Employment and income will be available to all people, including minority and low income groups. Opportunities for all groups of people to collect species from disturbed and undisturbed sites will be maintained by all alternatives, and no disproportionate effect is anticipated to subsets of the general population (FEIS, Chapter 3 page 416).

Facilitation of Hunting Heritage and Wildlife Conservation: (Executive Order 13443)

The purpose of this 2007 Order is to direct Federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and management of game species and their habitat. Federal agencies shall evaluate the effect of agency actions on trends in hunting participation; consider the economic and recreation values of hunting in agency actions; manage wildlife and wildlife habitat on public lands in a manner that expands and enhances hunting opportunities and work collaboratively with State governments to manage and conserve game species in their habitats.

With the implementation of Alternative 2 (modified) there will be limited short-term effects to hunters. Harvest activities and smoke from fuel treatment activities may displace some recreationists to new areas to camp, hunt, or to travel. (FEIS, Chapter 3 pages 378 – 379).

Road closures are not expected to greatly impact recreation access. Most roads proposed for decommission are already closed.

The economic values of big-game hunting will depend on changes in population levels and special distribution across the landscape. Hunting opportunities, as managed by Oregon Department of Fish and Wildlife, are expected to be unchanged in all alternatives. Elk population census data for the Desolation and Sumpter Management Units indicate a relatively stable, level, population trend. It appears that past forest management has not been detrimental to elk populations in these management units. It is not anticipated that planned activities will cause a decline in elk populations either. However, activities will likely cause a redistribution of animals across the landscape.

Floodplains (Executive Order 11988)

Executive Order 11988 says that Federal agencies shall avoid adverse effects to floodplains or minimize potential harm. Floodplains several feet wide occur along much of the Middle Fork, Crawford Creek, and Mill Creek. The floodplains are well within RHCAs, and so all alternatives avoid adverse effects to the floodplains, and thus are consistent with Executive Order 11988 (FEIS, Chapter 3 page 254).

Wetlands (Executive Order 11990)

There are no wetlands meeting this definition and therefore the project area will not impact any wetlands (FEIS, Chapter 3, page 422).

National Forest Management Act (NFMA)

Requirements of 36 CFR 219.28, which are part of the NFMA regulations, will be met. Specifically: 1) Harvest will occur only on suitable timberlands; 2) Following commercial thinning activities, none of the action alternatives will require reforestation activities since the stands will remain fully stocked or overstocked; 3) Alternative 2 (modified) includes 119 acres of shelterwood harvesting. Following shelterwood harvest, areas that are understocked and greater than ½ acre in size will be planted to meet direction that areas regeneration harvested will be reforested within 5 year. The National Forest Management Act of 1976 requires the disclosure of any silvicultural prescription that creates an opening larger than 40 acres, using even-aged vegetation management. The project proposed action and alternatives will not create openings greater than 40 acres.

National Historic Preservation Act

State Historic Preservation Office consultation has been conducted under the Programmatic Agreement among the United States Department of Agriculture, Forest Service, Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and Washington State Historic Preservation Officer regarding Cultural Resource Management on National Forests dated June 2004. Identified sites and any newly recorded sites will be avoided / protected from all ground disturbing activities. There will be no effect to any historic property listed in or eligible for listing in the National Register of Historic Places. (FEIS, Chapter 3 page 399).

Prime Farmlands, Rangelands, and Forestlands

Prime Farmlands: The project area is not located in or adjacent to prime farmlands; therefore, there will be no impacts to Prime Farmlands.
Prime Rangelands: The project does not contain prime rangeland because of soils and climate, and none of the proposed activities in the project area will convert rangelands to other uses. Therefore, there will be no impacts on Prime Rangelands.
Prime Forestland: The project will not convert forestlands to other uses. All lands designated as forested will be retained and managed as forested; therefore, there will be no negative impacts on Prime Forestlands.

Public Health and Safety

Public health and safety will be improved by reducing the potential for stand replacement wildfires and felling danger trees along open haul routes within the Crawford Project Area.

Forest Plan Amendment #65 and Determination that the Forest Plan Amendment is Not Significant under NFMA

I have determined that the Forest Plan Amendment is not a significant amendment under the National Forest Management Act implementing regulations [36 CFR 219.10(f)] (1982) and is consistent with the planning rule adopted in November 2000 at 36CFR 219 and subsequently interpreted in an Interpretative Rule at 69 Fed. Reg. 58055 (September

29, 2004). The Forest Service Land and Resource Management Planning Manual (Forest Service Manual 1926.51) lists changes to the land management plan that are not significant can result from:

1. Actions that do not significantly alter the multiple-use goals and objectives for long-term land and resource management. (Forest Plan Level)

2. Adjustments of management area boundaries or management prescriptions resulting from further on-site analysis when the adjustments do not cause significant changes in the multiple-use goals and objectives for long-term land and resource management. (MA area)

3. Minor changes in standards and guidelines

4. Opportunities for additional projects or activities that will contribute to achievement of the management prescription.

I believe Alternative 2 (as modified) to be consistent with all aspects of the Forest Plan, except for one. Within the project area there are three Dedicated Old-Growth areas (DOGs) identified. Two of the three existing DOGs do not currently meet Forest Plan Standards for size and habitat requirements. Replacement Old-Growth areas (ROGs) have not been previously identified for any of the DOG areas. The purpose of this non-significant amendment is to allow changes in Forest Plan management allocations to adjust DOGs and designate ROGs.

Management Area 13 - Dedicated Old Growth

Amendment Summary:

- Amendment: Two of the three existing Dedicated Old Growth (DOG) areas within the project area do not currently meet Forest Plan Standards for size and habitat requirements. Replacement Old-Growth areas have not been identified for any of the DOG areas. To adjust DOG boundaries and locate replacement old growth areas will result in changes in Forest Plan Management Area allocations within the project area. *The amendment will last beyond project duration and will remain in effect until the Forest Plan is amended or revised.*

Amendment determination of significance:

1**.** There are currently 80,831 acres of mapped Dedicated Old Growth (DOG) and Replacement Old Growth (ROG) on the Forest with a MA-13 designation. The Forest Plan describes MA-13 as “being composed of mature/overmature sawtimber (150 years old or older) which provides habitat for wildlife species dependent on mature/overmature forest conditions…..These acres are evenly distributed across the Forest….These acres reflect both designated old growth and old growth replacement, and include only those acres outside of wilderness, research natural areas, semiprimitive areas, and wild and scenic rivers”. The Forest Plan estimated 72,690 acres of MA-13 in the old growth network.

Since 1990, there have been a total of 64 non-significant amendments to the Forest Plan. Of these past amendments, 22 amendments have affected the location of old growth areas. Most non fire related old growth replacements were minor relocation or adjustments to old growth area boundaries to better meet forest plan requirements for old growth habitat. Five of the 21 amendments relocated DOGs or ROGs that were rendered unsuitable due to catastrophic fire, including the recent Thorn Fire Salvage Recovery Project decision. Some of the areas overlap with other management acres due to the Malheur Forest Plan management area hierarchy (MAs are based on hierarchy by priority of management (Malheur Forest Plan, IV-46)) and, as stated above in item 1, some DOG and ROG acres do not count towards the MA-13 acre total. They are however considered as part of the old growth habitat network.

With the Crawford project DOG/ROG relocations, the acres mapped as MA-13 will increase by 577 acres, increasing the total DOG/ROG acres to 81,408 acres, which is more than the Forest Plan estimate of 72,690 acres in 1990. The relocation of DOGs and ROGs will not significantly alter multiple use goals and objectives for long-term land and resource management because of the changes in MAs will not alter the long term relationship between goods and services projected by the Forest Plan nor will it forgo the opportunity to achieve an output in latter years.

2. Forest Plan Management Area Standard #4, pg IV-105, directs inventory and validation of all old-growth areas; and correction of previously dedicated old-growth unit designations that are not meeting management requirement direction where possible. When they are corrected management areas from the Forest Plan change. Adjustment in DOGs and addition of ROG areas will result in an acreage decrease in MA -1 (General Forest), MA-2 (Rangeland), and MA-14 (Visual Corridors); and an increase in MA-13 acres.

Table 3 (below) shows the change in management area allocations that will occur.

Table 3. Changes in Management Areas.

DOG/ROG	**Existing MA-13 (Acres)**	**Proposed MA-13 (Acres)**	**RHCA Over-lap with MA-13 (Acres)**	**Forest Plan Management Allocation Changes (Acres)**		
				MA-1 & 2	**MA-14**	**MA-13**
134 – DOG	382	395	46	–8	–5	13
134 – ROG	0	256	24	–149	–107	256
241 – DOG	169	169	6	0	0	0
241 – ROG	0	85	11	–14	–71	85
335 – DOG	273	317	28	–21	–23	44
335 – ROG	0	179	0	–72	–107	179
Total	824	1401	115	–264	–313	577

Manipulation of DOGs and ROGs will implement direction found at IV-105 in the Forest Plan. Management area changes are small in scale and will not cause changes in multiple use goals and objectives of the Forest Plan.

- The decrease of General Forest (MA-1) by 264 acres from the current total of approximately 543,881 acres is less than a 0.05 percent Forest-wide acreage change.
- The net decrease of 313 acres of Visual Corridor (MA-14) to the approximate 187,307 acres is less than a 0.2 percent forest wide acreage change.
- The increase in a MA-13 (577 acres) allocation from the current total of approximately 80,831acres is about a 0.7 percent Forest-wide acreage change.

There is a relationship between MA acres and the allowable sale quantity (ASQ) under the current Forest Plan; however, the increase or decrease in acres does not mean that there will be a corresponding increase or decrease in ASQ. The Forest Plan does allow scheduled timber harvest in ROGs that "maintain or enhance the capability of timber stands to provide suitable old-growth habitat in future" (Forest Plan, page IV-106). My decision approves commercial thinning in approximately 88 acres of Replacement Old-Growth with an objective of reducing tree densities to increase resiliency of the area for the long-term, while accelerating growth and the development of large trees.

3. There will be no changes to the standards and guidelines for any management area due to this amendment.

4. The amendment is resulting from an opportunity to achieve management prescriptions. Region 6 developed a network of old growth habitat areas to provide blocks of old growth coniferous forest across the landscape designed to support old growth management indicator species populations and allow for dispersal of individuals.

Environmentally Preferable Alternative

I find that Alternative 2 – (Proposed Action) is the environmentally preferable alternative because it moves the project area towards a more resilient historic landscape.

Implementation Date

If no appeals are filed within the 45-day time period, implementation of the decision may occur on, but not before, 5 business days from the close of the appeal filing period. When appeals are filed, implementation may occur on, but not before, the 15th business day following the date of the last appeal disposition.

Administrative Appeal

This decision is subject to appeal pursuant to Forest Service regulations at 36 CFR Part 215. Only individuals or organizations who submitted comments or expressed an interest in the project during the comment period may appeal. Any appeal of this decision must be in writing and fully consistent with the content requirements described in 36 CFR 215.14. A written appeal must be postmarked or received by the Appeal Reviewing Officer (the Regional Forester) within 45 days of the date of publication of the legal notice regarding this decision in the *Blue Mountain Eagle* newspaper.

Send appeals to:

Calvin Joyner, Acting Regional Forester
Appeal Deciding Officer
USDA Forest Service
333 SW 1st Avenue
Portland, Oregon 97204

Send faxes to (503) 808-2255. Appeals may be e-mailed to: appeals-pacificnorthwest-regional-office@fs.fed.us. Electronic appeals must be submitted as part of the actual e-mail message, or as an attachment in Microsoft Word, rich text format or portable document format only. E-mails submitted to e-mail addresses other than the one listed above or in other formats that those listed or containing viruses will be rejected. Any written appeal, including attachments must be postmarked or received (via regular mail, fax, e-mail, hand-delivery, express delivery, or messenger service) within 45 days of the date of publication of the legal notice. The publication date of the legal notice in the Blue Mountain Eagle newspaper is the exclusive means for calculating the time to file an appeal (§215.5 (a)). Those wishing to appeal should not rely upon dates or timeframe information provided by any other source. If there are no appeals, the portion of the project not included in the emergency exemption may be implemented 50 days after the legal notice is published. If an appeal is received, the portions of the project not included in the emergency exemption may not be implemented for 15 days after the appeal decision. For further information regarding these appeal procedures, contact the Malheur Forest Environmental Coordinator Carole Holly at (541) 575-3026.

Contact Person

For additional information concerning this decision contact Ryan Falk, District NEPA Coordinator, Prairie City Ranger District, P.O. Box 337, Prairie City, Oregon 97869 or at (541) 820-3800.

/s/ Doug Gochnour June 5, 2008

Doug Gochnour [**DATE**]
Malheur Forest Supervisor

Crawford Project

Timber Harvest, Fuel Treatments, Road Closure Activities

Final Environmental Impact Statement

Malheur National Forest
Blue Mountain Ranger District
Grant County, Oregon

April, 2008

DOCUMENT STRUCTURE

The U.S. Department of Agriculture (USDA) – Forest Service (FS) has prepared this Final Environmental Impact Statement (FEIS) in compliance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500 – 1508), agency regulations, and all applicable federal and state laws. The document is organized into the following sections:

- *Chapter 1. Purpose of and Need for Action:* This chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2. Alternatives:* This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues (key issues) raised by the public and other agencies. This discussion also includes management requirements and constraints to be used as part of the action alternatives. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences:* This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- *Chapter 5. Lists:* This chapter is divided into three sections:

  R*eferences:* This lists literature cited during the development of the environmental impact statement.

  Glossary: This is a glossary of terms used in this environmental impact statement.

  Index: This provides page numbers by document topic.

- *Appendices:* These provide more detailed information to support the analyses presented in the environmental impact statement.

Crawford Project
And
Proposed Nonsignificant Forest Plan Amendments
Final Environmental Impact Statement
Grant County, Oregon

Lead Agency:	**USDA Forest Service**
Responsible Official:	**Cassius M. Cash, Acting Forest Supervisor** **Malheur National Forest** **P. O. Box 909** **John Day, OR 97845**
For Information Contact:	**Ryan Falk, District NEPA Coordinator** **Prairie City Ranger District** **P.O. Box 337** **Prairie City, OR 97869** **541–820–3800**

This Final Environmental Impact Statement (FEIS) has been completed for Crawford Project. The Interdisciplinary Team (IDT) reviewed all public comments received during the 45-day comment period on the Draft EIS and have incorporated or responded to these concerns in the FEIS. This FEIS has been distributed to individuals who specifically requested a copy of the document and those who submitted comments during the formal DEIS 45-day comment period.

The FEIS can be viewed and downloaded from the internet at www.fs.fed.us/r6/malheur/projects/. In addition, an electronic copy on a CD-ROM is available upon request, by contacting Ryan Falk, using the contact information noted above.

The Record of Decision document for this project is pending and will be mailed to those who request it and/or to those who submitted comments during the DEIS 45-day comment period. If you need more information please contact Ryan Falk, Project Manager, using the contact information noted above.

Abstract

This Final Environmental Impact Statement (FEIS) contains the Forest Service proposal for commercial timber harvest and associated fuel treatments, prescribed burning, adjustments to Dedicated Old-Growth areas (DOGs), and road closure and decommissioning activities within the Crawford Project Area. The FEIS describes the effects of implementing four alternatives: the No Action, the Proposed Action, and two additional action alternatives generated in response to scoping, public comments, and internal Forest Service issues. The project area lies east of the John Day Valley, in northeastern Oregon. The proposed action includes 2,073 acres of commercial thinning and 119 acres of shelterwood harvest, 935 acres of associated precommercial thinning, activity fuels reduction and harvest road use activities. Approximately 8.6 miles of temporary roads would be developed to access the harvest areas. Temporary roads would be decommissioned after use. Around 6,800 thousand board feet (MBF) would be harvested. There would also be 5,300 acres of prescribed burning and 0.7 miles of roads closed and 17.8 miles decommissioned within the Mill Creek Subwatershed. Minor amounts of road closures (0.8 miles) and decommissioning (0.2 miles) would extend into the adjacent Idaho/Summit Creek and Dry Fork Subwatersheds.

The purpose and need for these activities is to: 1) Promote a change in tree species composition, stand densities, and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands; 2) Implement a road system that meets public and management access needs that reduces the risk of sediment reaching streams, and road impacts to aquatic species and wildlife habitat; 3) Adjust Dedicated Old-Growth areas (DOGs), identify Replacement Old-Growth areas (ROGs), and identify Pileated Woodpecker Feeding Areas (PWFAs) as required by the Forest Plan; 4) Capture the economic value of trees to provide wood products and jobs; 5) Accelerate development of future late and old structural (LOS) single-stratum wildlife habitats**;** 6) Reduce fuels by primarily reducing density of standing vegetation, surface fuels, and fuel ladders; and 7) Implement the Highway 26 and Highway 7 Viewshed Corridor Plans.

Two Malheur Forest Plan nonsignificant amendments would be required for big game cover and DOG adjustments. The amount of satisfactory big game cover would fall below standards to allow commercial thinning to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. The other nonsignificant amendment would allow adjustment of DOGs to meet Forest Plan size and habitat requirements; and establishment of Replacement Old-Growth areas (ROGs).

Check the project website for FEIS documents: **www.fs.fed.us/r6/malheur/projects/.**

Crawford Project EIS – Key Acronyms

BMRD	Blue Mountain Ranger District
BMP	Best Management Practices
CEQ	Council on Environmental Quality
DecAID	Decayed Wood Advisor
DBH	Diameter at Breast Height
DOG	Dedicated Old-Growth
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
GIS	Geographic Information System
HEI	Habitat Effectiveness Index
HRV	Historical Range of Variability
IDT	Interdisciplinary Team
LOS	Late and Old Structure (Same as Old Forest)
LWD	Large Woody Debris
MA	Malheur Forest Plan Management Area
MIS	Management Indicator Species
MBF	Thousand Board Feet
NEPA	National Environmental Policy Act of 1969
NFMA	National Forest Management Act of 1976
NFS	National Forest System
OF	Old Forest (Same as Late and Old Structure)
OFMS	Old Forest Multi-Strata (Forest Structural Stage)
OFSS	Old Forest Single-Stratum (Forest Structural Stage)
PACFISH	Interim Strategies for Managing Anadromous Fish Producing Watersheds
PETS	Proposed, Endangered, Threatened, or Sensitive species
PFA	Goshawk Post-Fledgling Area
RHCA	Riparian Habitat Conservation Area
ROG	Replacement Old-Growth
SI	Stand Initiation
SECC	Stem Exclusion Closed Canopy
SEOC	Stem Exclusion Open Canopy
UR	Understory Reinitiation
YFMS	Young Forest Multi-Strata
WA	Watershed Assessment

SUMMARY OF THIS FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)

Introduction

The Malheur National Forest, Blue Mountain Ranger District is proposing the Crawford Project which would treat forested stands, using timber harvest methods to decrease tree density, increase representation of fire-adapted tree species, as well as decrease existing and activity fuel levels. This proposed action would also implement a Road Access Travel Management Plan that would close and decommission roads to improve water quality.

The Crawford Project Area refers to the portion of the Mill Creek Subwatershed within the Malheur National Forest, Blue Mountain Ranger District which is north of U. S. Highway 26. This area is approximately 14,950 acres which is 83% of the subwatershed. Highway 26 is the administrative boundary between the Blue Mountain and Prairie City Ranger Districts. The three major drainages in the project area are Middle Fork John Day River, Crawford, and Mill Creeks. Detailed project maps can be found in **FEIS Appendix B.**

Changes between the DEIS and FEIS

The following changes were made between the DEIS and FEIS. Minor corrections to grammar, spelling, explanations, and paragraph formatting have also been made.

Table S – 1. Changes between the DEIS and the FEIS.

	Chapter 1 Change Items
1.	The proposed activities section received minor clarification edits for road activities.
2.	A vicinity map was added (Figure 1.0)
3.	Activity fuel treatments were clarified for the Proposed Action Alternative.
4.	Minor changes were made in the miles of road maintenance, reconstruction, and road closures.
5.	A nonsignificant Forest Plan amendment was proposed (Alternative 2 – Proposed Action) in the DEIS to commercially thin 70 acres of satisfactory cover. Units classified as satisfactory cover in the DEIS were field reviewed during the summer of 2007. Portions of units 94 and 95 (43 acres) were determine to have less than 50% canopy cover, therefore do not meet the definition of satisfactory cover in the Forest Plan. The Proposed Action Alternative was modified to reflect this updated field information. A nonsignificant Forest Plan amendment to commercially thin 27 acres of satisfactory cover is proposed in the FEIS.
6.	The issue section was modified to include the following: ▪ Additional measures for evaluation were added to (Key Issue #1). ▪ Units of measure were added to each analysis issue. These measures are tracked through the document including in the Comparison of Alternatives Section in Chapter 2. ▪ Issues eliminated from detailed study are listed along with the rationale for their elimination.
	Chapter 2 Change Items
7.	In all action alternatives (Alternatives 2, 3, and 4) the “Road Closure Decommissioning” section was updated to provide additional detail regarding the 2.1 miles of currently closed road that would be

	reopened (1.7 miles in the Mill Creek Subwatershed). Updates include the specific roads that would be reopened and additional rationale why the roads are proposed for reopening.
8.	In all action alternatives (Alternatives 2, 3, and 4) the miles of road maintenance, reconstruction, and closure were updated.
9.	Activity fuel treatments were clarified for Alternatives 2 and 3.
10.	A nonsignificant Forest Plan amendment was proposed (Alternative 2 – Proposed Action) in the DEIS to commercially thin 70 acres of satisfactory cover. Units classified as satisfactory cover in the DEIS were field reviewed during the summer of 2007. Portions of units 94 and 95 (43 acres) were determine to have less than 50% canopy cover, therefore do not meet the definition of satisfactory cover in the Forest Plan. The Proposed Action Alternative was modified to reflect this updated field information. A nonsignificant Forest Plan amendment to commercially thin 27 acres of satisfactory cover is proposed in the FEIS.
11.	Table 2.2: Approximate Acres Treated in Wildlife Connectivity Corridors per Alternative, was added.
12.	Various tables in Chapter 2 were updated.
13.	Additional alternative comparison tables were added at the end of the Chapter.
	Chapter 3 Change Items
14.	Cumulative effects sections were updated to address ongoing or foreseeable future activities that have been completed. New foreseeable future projects in the Mill Creek Subwatershed were added (Wrac Lodgepole and Forest Weeds EIS).
15.	**Forest Vegetation and Wildlife Section** The Forest Vegetation section of the FEIS received minor updates to the following areas: ▪ A footnote on Historic Range of Variation has been added to the tables. ▪ Definitions for short-term, mid-term, and long-term have been added. ▪ Effects to riparian vegetation have been added for Alternatives 3 and 4. ▪ The Consistency with Direction and Regulations has been updated. The wildlife effects section was modified to include a nonsignificant Forest Plan Amendment to commercially thin 27 acres of satisfactory cover with Alternative 2. In the DEIS, 70 acres of commercial thinning was proposed in satisfactory cover (see Chapter 1 above).
16.	**Aquatics and Water Quality Section** The Aquatics and Water Quality Section of the FEIS received minor updates to the following areas: ▪ The affected environment for roads ▪ Water temperature/stream shading effects analysis ▪ Aquatic habitat and water quality cumulative effects analysis ▪ The values in Table AW – 12 were updated
17.	**Fire and Fuels Section** In the Fire and Fuels section on the FEIS, activity fuel treatments were clarified for Alternatives 2 and 3.
18.	**Section "Other Disclosures" was added** ▪ This section discloses consistency with applicable laws. ▪ A section discussing "Inventoried Roadless, Potential Wilderness and Areas with Undeveloped Character" was added. ▪ A consistency discussion on E. O. 13443: Facilitation of Hunting, Heritage and Wildlife Conservation was added.
19.	**Sensitive Plants Section** ▪ Additional analysis was added to the Sensitive Plant section. ▪ Small factual errors were corrected in the Sensitive Plant section. Minor changes were made to effects determinations for some species under action alternatives. These changes were made where impacts to potential habitat could be minimized but not totally avoided.
	Chapter 4 Change Items
20.	The list of preparers and contributors was updated.
	References
21.	The "References Cited or Reviewed" section was updated.

	Glossary
22.	Definitions for "undesirable trees," "non-attainment areas," "issue," "stringer meadows," and "sub-soiling" were added.
	Appendices
23.	A summary table which compares commercial harvest, precommercial thinning, and fuel treatments by alternative was added to Appendix A.
24.	New maps were added to Appendix B: Existing DOGs / ROGs Map, Proposed DOGs / ROGs Map, Connectivity Corridor Map, Soils Map, and Watershed Map.
25.	Tables in Appendix C were updated to summarize road maintenance, reconstruction, road closures, and decommissioning activities by subwatershed.
26.	Appendix D – new foreseeable activities were added and the statuses of ongoing activities were updated in the tables.
27.	New appendices were added, Appendix E- Response to Comments; Appendix F- Best Management Practices; and Appendix G – Summary of Global Climate Change Prevention Act of 1990.

Purpose of and Need for Action

The Crawford Project Area is characterized by dense forested stands dominated by ponderosa pine in the dryer warmer, lower elevation areas, or stands of mixed conifer species in the wetter, cooler higher elevations that include ponderosa pine, grand fir, western larch, and lodgepole pine. These dense stands are dominated by younger small diameter trees. This is a result of intensive railroad logging of the large ponderosa pine that began in the early 1900s. Since this initial timber harvest, there have been several timber sales to thin selected areas or to regenerate isolated timber stands. Extensive precommercial thinning also occurred in the re-grown ponderosa pine stands. The area has a higher road density resulting from past logging activities, however many of the roads were closed to motor vehicles with barriers in the early 1990s. Other major physical features of the project area include two utility line corridors and two major highways.

The needs for the proposed action are derived from the differences between current and desired conditions. Desired conditions are based on Forest Plan direction and management objectives. The proposed action is designed to move resource conditions closer to the desired conditions and address the management direction in the Forest Plan. The BMRD, Malheur National Forest, has developed project proposals, analyzed in this EIS, to support the purposes of this project and meet Forest Plan goals and objectives. This project proposal also follows recommendations made in the Upper Middle Fork John Day River Watershed Assessment (1998) and the Malheur Forest Roads Analysis (2004). It is expected that the projects analyzed in this EIS would be implemented between 2008 and 2013. The **purposes** of this project are to:

- Promote a change in tree species composition, stand densities, and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. To accomplish this objective a site specific, nonsignificant Forest Plan amendment to reduce big game cover is proposed. The rationale for the amendment is further discussed in the description of the proposed action and Table S – 2.
- Implement a road system that meets public and management access needs that reduces the risk of sediment reaching streams, and road impacts to aquatic species and wildlife habitat.
- Adjust Dedicated Old-Growth areas (DOGs), identify Replacement Old-Growth areas (ROGs), and identify Pileated Woodpecker Feeding Areas (PWFAs) as required by the Forest Plan. A site specific, nonsignificant Forest Plan amendment is proposed to adjust

Forest Plan management area allocations. The rationale for the amendment is further discussed in the description of the proposed action and Table S – 2.

- Capture the economic value of trees to provide wood products and jobs.
- Accelerate development of future late and old structural (LOS) single-stratum wildlife habitats.
- Reduce fuels by primarily reducing density of standing vegetation, surface fuels, and fuel ladders.
- Implement the Highway 26 and Highway 7 Viewshed Corridor Plans.

The needs for the proposed action are derived from the differences between current conditions and desired conditions. Desired conditions are based on Forest Plan direction and management objectives. The proposed action is designed to move resource conditions closer to the desired conditions and address the management direction provided by the Forest Plan.

Specific "NEED" statements have been developed. Each statement briefly compares the existing condition and desired conditions to show why the project is being proposed. Within each "Need" statement a link between the desired condition and management direction in the Malheur Forest Plan is provided.

Forest Composition and Density Reduction Need

The desired condition is to move forest vegetation conditions towards the Historic Range of Variability (HRV). A large portion of project area contains warm and hot-dry upland forest biophysical environments. These forest types are a result of factors such as past timber harvest, insect activity, and fire exclusion. The composition of these stands has changed from a forest dominated by ponderosa pine to denser mixed species stands with higher components of fir species. Changes in composition and structure have increased the risk of greater fire severity and insect damage. As identified in the Forest Plan, these risks can be minimized by maintaining stand vigor through the use of integrated pest management such as stocking level control (Forest Plan, Standard # 98, pg IV – 37).

Vegetation structure is a result of management activities, timber harvest, and years of fire suppression. Structural stages within the hot-dry and warm-dry biophysical environments comprise 72% of the biophysical environments in the analysis area and are outside the HRV. In the past, ecosystem interactions included a natural disturbance regime that included frequent low intensity fire that supported a more resilient forest condition. These historic stands were more resilient to fire damage, insects, and disease and supported resistant tree species such as ponderosa pine, growing in a more open condition.

Historically there were fewer younger, dense stands with stem exclusion, open canopies and young forest multi-strata (YFMS) structural stages, and lacked older, more open grown stands of old forest single-stratum (OFSS), and old forest multi-strata (OFMS) structural stages.

Fire intolerant fir species occur more commonly than they did historically. Tree density has increased. A greater number of multi-strata stands are present in more contiguous blocks within the hot-dry and warm-dry upland forest biophysical environments than were present historically. There are few large trees for wildlife habitat, particularly in ponderosa pine forested types. Vegetation is more vulnerable to insects and disease as a result of high tree densities.

The desired condition includes large trees that are well represented across the landscape in hot-dry, warm-dry, and cool-moist upland forest biophysical environments. Fire tolerant ponderosa pine, western larch, and, to a lesser extent, Douglas-fir are the dominant conifer species in areas with flatter terrain and hot-dry growing conditions that represent approximately two-thirds of the analysis area. Within the project area, where they historically occurred, stands with be open and park-like, maintained by low intensity, frequent fire.

Multi-strata structural stage, in hot-dry forests, occurs in a smaller proportion of the project area, occurring only in areas that are left unburned through several fire cycles. Multi-strata structural stage in warm-dry forests would occur in moist areas such as north aspects.

A site specific, nonsignificant Forest Plan amendment is proposed to commercially thin 27 acres of satisfactory big game cover. Thinning activities would reduce satisfactory cover below Forest Plan Standards to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Most treatments would occur in dry forest types (these stands are considered outside the HRV) that are overstocked and likely unsustainable given the increasing risk of uncharacteristically severe fire and insect epidemics. These areas would likely fall out of cover within the next 25 years if not treated. Hiding/security cover patches would be maintained in all proposed units to minimize effects on cover loss.

Road Reduction Need

There is the need to properly locate the road system that provides adequate public and administrative access, while reducing the risk of sediment reaching streams. To meet this objective of reducing sediment, unneeded roads that cross streams or those adjacent to streams are to be decommissioned or closed.

The open road density within the entire Mill Creek Subwatershed (1.8 miles of road per square mile) is within the Forest Plan 1999 desired condition (3.2 miles per square mile) and 2039 desired condition (1.5 miles per square mile) for big game in summer range. The existing road system, the road density, and route location adjacent to streams may pose a sediment risk to threatened fish species.

The desired condition for project area roads is to provide safe and adequate roaded access for forest users while protecting aquatic resources. Roads that are not needed for management will be decommissioned, plus additional roads impacting streams will be closed. Roads which are not decommissioned would be improved so that less maintenance is needed and impacts from road sediment are decreased.

Old-Growth Boundary Adjustment Need

The Forest Plan directs that Dedicated Old-Growth (DOG) and Replacement Old-Growth (ROG) areas are distributed across the landscape to provide for old-growth associated species on a forest-wide basis. A portion of this old-growth, designated as DOG or ROG, contributes to the forest's old-growth network (Forest Plan, Standards # 4, 5, 6, 7, and 8, pgs IV – 105 and 106). DOGs are to be inventoried and validated, with areas not meeting management requirements to be corrected utilizing an interdisciplinary process to develop recommendations for boundary adjustments and unit relocation.

The old-growth network on the Malheur National Forest was first established in the early 1980s. Since then, new field validation and inventory methods have provided better information on habitat conditions and stand delineations.

Within the project area there are three DOG habitats identified. DOG 335 and 241 do not meet Forest Plan Standards for size and habitat. No ROGs have been identified nor have Pileated Woodpecker Feeding Areas (PWFAs) been designated for DOGs 335 and 134. A ROG has not been identified for DOG 241 which is designated to provide American marten habitat. Boundary adjustments are needed to meet habitat requirements for old-growth dependent species. DOG unit boundary adjustments and ROG designations will require a site specific, non-significant Forest Plan amendment.

Timber Production Need

Timber harvest plays an important role in the local economy by providing employment and revenues. There is a need to make wood products available for local, regional, and national needs to provide jobs in the most cost-effective manner, while being sensitive to resource conditions such as the level of soil disturbance.

The Forest Plan includes direction to provide a sustainable flow of timber and associated wood products at a level that will contribute to economic stability and provide an economic return to the public. Wood material in the form of sawlogs and fiber will be utilized in a cost-effective manner, consistent with the various resource objectives and environmental standards (Forest Plan goals 24 –26, IV – 2).

Wildlife Habitat Development Need

The amount, patch size, and distribution of old forest (OF) habitat in the Mill Creek Subwatershed (project area) have declined from historic levels especially in the warm-dry and hot-dry upland forest biophysical environments. Past harvest of large ponderosa pine and fire exclusion has resulted in a loss of the old forest single-stratum (OFSS) forest structure. Species such white-headed woodpecker depend on large, open grown ponderosa pine stands associated with OFSS structure. There is a need to develop historic levels OFSS forest habitat for these species (Upper Middle Fork Watershed Assessment, pgs 5 – 28).

Existing dense, low vigor stands are slowly developing large ponderosa pine stand structures. Stand densities are so high that competition for water, light, and nutrients is slowing and inhibiting growth to the larger tree size. Currently, approximately 3% of stands in the warm-dry biophysical environment are classified as OFSS. Historically 5 to 55% of this structure was estimated to exist. The hot-dry biophysical environment is totally lacking OFSS structure. Approximately 20 to 70% was estimated to exist historically.

The desired condition is to provide sustainable habitat for those wildlife species that prefer OFSS forest structures at historic levels. There is the need to maintain and develop open, park-like stand conditions, where this condition occurred historically, and manipulate vegetation in a manner to encourage the development and maintenance of large diameter trees with open canopy structure.

Fuels Hazard Reduction Need

The historic high frequency/low severity fire regime has changed in the warm and hot-dry upland forest biophysical environments. This fire regime controlled regeneration of fire intolerant species, maintained more open stand structures, maintained lower surface fuel loadings, and maintained low level impacts from insects and disease. Fire suppression and other forest management practices have altered these forest types resulting in a higher composition of fire intolerant species, more vertical and horizontal tree crown and canopy continuity, and higher levels of surface fuels. Reducing horizontal and vertical forested stand continuity and surface fuel loadings will reduce potential wildfire intensity and severity. There is a need for prescribed burning to reduce excess levels of fuels and promote fire tolerant species.

Both the tree density and the proportion of fire intolerant fir species have increased from historical conditions. Due to a lack of periodic fire and insect and disease mortality, surface fuels have increased and are more continuous at these increased loadings across the landscape than historical conditions. High surface fuel loadings increases the potential flame length of a fire thereby increasing the chance of a surface fire moving into the crowns.

The past harvest of large ponderosa pine trees and the absence of periodic fire have resulted in dense, younger, often multi-layered stands composed of more fir trees and less pines and larches than historically occurred. Smaller understory trees and the lower branches of larger fir trees provide “ladder fuels” enabling wildfire to move into the tree crowns and increasing the probability for an active crown fire.

The denser tree stands provide a continuous path for crown fire to spread across long distances. Fire behavior and severity are dependent on the properties of the surface, ladder and canopy fuel quantities, and continuity both horizontally and vertically.

Desired condition would be multi-strata and single-stratum structural stages with ladder fuels in dry, upland forest types occurring in smaller proportion, where several fire cycles have been missed. Fire tolerant ponderosa pine, western larch, and to a lesser extent, Douglas-fir are the dominant conifer species in the dry upland forest with large trees well represented. Surface fuel loadings are reduced and not continuous and this part of the project area is maintained by low intensity, frequent fire. These conditions reduce the probability of crown fire that is not characteristic of the project area; improve conditions for successful fire suppression when needed, and improve the ability of forest stands to survive wildfire.

Viewshed Corridor Plan Implementation Need

The Crawford Project Area is part of Highway 26 and Highway 7 visual corridors that cross the Malheur National Forest. In management of these areas, the Forest Plan recommends a Corridor Viewshed Plan be completed outlining the existing and desired scenic conditions, as well as possible management opportunities. Viewshed corridor plans have been completed for both the Highway 26 (2000) and Highway 7 (1995) visual corridors. There is a need to implement the recommendations in these plans and move towards the desired condition identified in the Forest Plan. Specific recommendations in the Highway 7 plan include the use of thinning to improve stand health and tree vigor, and the reduction of tree stocking to promote the growth of large diameter trees. The Highway 26 Viewshed Plan recommends the use of thinning and prescribed fire to create more diverse distribution of trees in all diameters, and opening stands to accelerate growth of small and medium diameter pine trees.

Proposed Action

The proposed action is an alternative developed early in the NEPA planning process to accomplish stated purposes, needs, and goals based on the best information available at the time.

It is the first alternative offered and is used to identify issues and develop other alternatives for further study.

Activity Descriptions and Objectives

Commercial Thinning and Precommercial Thinning Treatments

The proposal would decrease tree density by commercial thinning approximately 2,073 acres of predominantly fire intolerant species such as grand fir. Reducing selected tree densities would reduce the chance of extensive wildfire, change the species mix, and encourage growth of larger tree structure, moving the area toward a more resilient forest condition. Trees less than commercial size (generally 9 inches in diameter or less) would be cut as a post-harvest treatment to remove the suppressed understory and reduce the stocking level. This precommercial thinning would include approximately 935 acres. Thinning treatments would include some existing wildlife connectivity corridors linking late and old structural habitat (LOS). More trees would be retained in connectivity corridors to maintain a denser stand structure for wildlife movement between LOS habitats. A site specific, nonsignificant Forest Plan amendment is proposed to commercially thin 27 acres of satisfactory cover. Thinning activities would reduce satisfactory cover below Forest Plan standards to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Approximately 8.6 miles of temporary roads would be constructed in several short segments to facilitate commercial harvest.

Shelterwood and Reforestation Treatments

The proposal includes shelterwood harvest on 119 acres; these treatments are not in LOS stands. This prescription would remove undesirable trees from the middle and understory, thin desirable trees where they are over stocked, and reforest the resulting understocked areas. "Undesirable trees" is defined as: trees that, dependent on species or tree condition (insect, disease, damage,) are not desirable for future management. Where suitable trees are available, a minimum of 20 trees per acre would be left to provide structural variety and future snag recruitment. Following the shelterwood harvest, there would be small Douglas-fir and grand fir trees remaining that are undesirable for future management. These small trees would be removed and non-stocked areas greater than ½ acre in size would be reforested with early seral species such as ponderosa pine and western larch tree seedlings. Planted areas would be monitored for growth and survival. Prior to planting, fuels created by the harvest and the cutting non-commercial sized trees would be treated by grapple piling to reduce the fire hazard.

Fire and Fuel Treatments

All fire and fuel treatments address the need to reduce fuels and potential fire severity. There are several methods used to treat fuels. Those proposed with this project include commercial harvest, precommercial thinning, yarding tops attached, grapple piling, hand piling, burning piles, and prescribed fire. Yarding tops attached occurs during the harvest operations and brings material to the landing where it is piled and burned later if not utilized by some means. Grapple piling is done by a track excavator on slopes less than 35%. Piles are then burned when the potential for fire spread is minimal. Hand piling is primarily used on slopes greater than 35%

with moderate to high fuel loads. Piles are also burned when the potential for fire spread is minimal.

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. Within the 5,300 acres, not all acres would be burned and there are different objectives for areas with resource concerns. Burning would be accomplished in the spring and fall seasons when weather and moisture conditions are appropriate and after much of the mechanical work is completed. These burn operations would be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fit to the grazing systems being used on the affected allotments to minimize impacts to the permittee's ranch operations.

Adjustments of Dedicated Old-Growth and Additions to Replacement Old-Growth

A nonsignificant Forest Plan amendment would be required to adjust the Dedicated Old-Growth areas (DOGs) within the Crawford Project Area to allow for re-delineation and incorporation of suitable late and old structure (LOS) habitats within these DOGs.

The designation of Replacement Old-Growth areas (ROGs) would incorporate suitable LOS or older structure stands to provide suitable replacement areas for the associated DOGs. Pileated woodpecker feeding areas would also be delineated as appropriate to provide suitable foraging habitat for Pileated woodpeckers.

Road Activities

The overall objective is to reduce road related impacts to water quality and fish habitat. An estimated 17.7 miles of road (currently closed to motorized vehicle travel) and 0.3 miles (currently open roads to motor vehicles) would be decommissioned.

The decommissioned roads would be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, drainage provided for the road surface, and a culvert will be removed and disposed of. Many of these roads are within sensitive areas such as riparian habitat conservation areas (RHCAs).

The proposal includes approximately 1.5 miles of new road closure (0.7 in the Mill Creek Sub-watershed and 0.8 in the Idaho/Summit Creek Subwatershed). The new road closures would be gated or signed and would restrict yearlong use to motorized vehicles.

The desired condition is to provide a road system that is safe, affordable, has minimal ecological impacts, and meets immediate and projected long-term public and resource management needs. The desired condition is largely based on Forest Plan, Malheur Forest Road Analysis, and the Crawford Roads Analysis. The general Forest Plan direction for transportation system management states: "Roads will be planned, designed, constructed and maintained to the minimum level necessary to meet integrated land management objectives."

Further details of the proposed action (analyzed in this document as "Alternative 2") are discussed later in the alternatives section along with descriptions of all alternatives considered or analyzed.

Proposed Forest Plan Amendments

The list of proposed Forest Plan amendments is noted in Table S – 2.

Table S – 2. List of Proposed Forest Plan Amendments.

FP Item #	Description of Proposed Forest Plan Amendment
Wildlife 1	**Forest Wide Standard – Satisfactory Cover** • Existing Standard: **Forest-Wide Standard #28, pg IV-27, - The elk cover standard (satisfactory cover) for summer range areas in the Middle Fork John Day Watershed is 12%.** • Need: To address the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Some stands providing satisfactory cover habitat are located in dry forest types. These stands are considered outside the historic range of variation (HRV), overstocked, and likely unsustainable given the risk of severe fire and insect epidemics. • Amendment: Allow reduction of satisfactory cover below Forest Plan Standards within Mill Creek Subwatershed. This amendment would apply only for the duration of, and to those actions proposed for the site-specific project called Crawford Project. • See Effects Analysis in Wildlife section. • ***This amendment would be needed for Alternative 2.***
Wildlife 2	**MA-13 – Dedicated Old-Growth** • Existing Standard: **Management Area Standard #4, pg IV-105, - Inventory and validate all old-growth areas. Correct previously dedicated old-growth unit designations that are not meeting management requirement direction where possible.** • Need: Within the project area there are three Dedicated Old-Growth areas (DOGs) identified. Two of the three existing DOGs do not currently meet Forest Plan Standards for size and habitat requirements. Replacement Old-Growth areas (ROGs) have not been identified for any of the DOG areas. • Amendment: Allow changes in Forest Plan management allocations to adjust DOGs and designate ROGs. This amendment is permanent until the Forest Plan is amended or revised. • See Purpose and Need for Action and Effects Analysis in Wildlife section. • ***This amendment would be needed for Alternatives 2, 3, and 4.***

Issues

Internal and external scoping identified the following significant issues (key issues). These issues were then used to develop the action alternatives and project design measures. Issues were separated into significant issues (key issues) and analysis issues. A definition of each issue group is discussed below:

<u>Significant issues</u> otherwise known as key issues for the Crawford Project came from the public, other agencies, organizations and businesses, and Forest Service Resource Specialists. Issues are defined as a point of discussion, debate, or dispute about environmental effects. Key issues are used to formulate alternatives, prescribe design measures, and analyze environmental effects. Issues are "significant" due to the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict (40 CFR 1508.27).

Significant issue effects cannot be reduced by normal Best Management Prescriptions (BMPs) or Design Measures.

<u>Analysis issues</u> are defined as those directly or indirectly caused by implementing the proposed action; however, the effects could be reduced with normal BMPs and Design Measures and an alternative was usually not developed to address these analysis issues. However, these analysis issues would be tracked in the relevant resource area effects in Chapter 3 and in the Comparison of Alternatives section at the end of Chapter 2.

<u>Issues Eliminated from Detailed Study</u> are identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulations, Forest Plan, or other higher level

decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence.

There were a total of 18 issues identified, with two significant issues and 16 analysis issues. Issues are discussed in detail in FEIS Chapter 1. The significant (key issues) are noted in Table S – 3.

Key Issues

Table S – 3. List of Key Issues.

Key Issue Topic	Key Issue Statement and Issue Indicator (s)
1. Effects of road construction, commercial timber harvest, and prescribed burning on soil, water quality, and listed aquatic species habitat.	There is a concern that the proposed ground disturbing activities associated with road construction, commercial timber harvest, and prescribed burning could degrade water quality and impact soil productivity. These ground disturbing activities may also indirectly impact habitat for aquatic species including listed and sensitive aquatic species. Aquatic species of concern present within the project include summer steelhead, Chinook salmon, and redband trout. There is also historic bull trout habitat. Adverse soil impacts to soils could include detrimental soil compaction, soil displacement, sediment increases, impact to soil organisms, decrease of mycorrhizae fungi, and soil nutrient losses. Proposed harvest activities combined with past impacts including, past timber harvest and ongoing grazing may cumulatively affect water quality, including 303(d) listed streams. • Alternatives 3 and 4 were developed to address this key issue. Alternative 3 minimizes temporary road construction. Alternative 4 does not include any commercial timber harvest activities. • Measures or elements for evaluation: 1. Miles of temporary road constructed 2. Miles of temporary road constructed in RHCAs 3. Miles of log haul, road maintenance, and reconstruction in RHCAs 4. Equivalent Roaded Area 5. Acres of timber harvest 6. Detrimental Disturbed Soil Standard of <20% by unit 7. Fish Biological Evaluation/Biological Assessment (BE/BA) determinations by fish species 8. Prescribed burning affects on sediment and temperature
2. Effects of commercial thinning on satisfactory big game cover	Commercial thinning is proposed on approximately 27acres identified as satisfactory big game cover. Currently satisfactory cover is 2.5% of the Mill Creek Subwatershed, below the Forest Plan Standard of 12%. These forested areas provide some of cover habitat available for big game species (elk) in the project area. Thinning these acres would degrade the satisfactory cover by decreasing the tree density which in turn reduces the average canopy closure needed to maintain this standard. This thinning reduces the cover percentage further below Forest Plan Standards to approximately 2.4%. • Alternatives 3 and 4 were developed to address this key issue. Alternative 3 excludes commercial harvest in areas identified as satisfactory cover. Alternative 4 does not propose commercial timber harvest activities. • Measures or elements for evaluation: 1. Acres of commercial thinning in satisfactory cover. 2. Percent marginal cover, satisfactory cover, and total cover post-project. Comparison to Forest Plan Standard.

Alternatives Considered in Detail

The Forest Service developed four alternatives: the No Action, the Proposed Action, and two other action alternatives generated in response to issues raised by the public and internal Forest Service (FS). The four alternatives considered in detail for this analysis are listed below.

Alternatives are discussed in detail in FEIS Chapter 2. Project design measures and Best Management Practices are listed in FEIS Chapter 2, Tables 2.4 to 2.23, and Appendix F.

Alternative 1 – No Action Alternative

The purpose of this alternative is to allow current processes to continue, along with associated risks and benefits, in the Crawford Project Area. The No Action Alternative is required by NEPA. In this document the No Action Alternative means the proposed project (which includes all activities identified in the proposed action) would not take place at this time. Alternative 1 is designed to represent the existing condition. It serves as a baseline to compare and describe the differences and effects between taking no action and implementing action alternatives.

Alternative 2 – Proposed Action

This alternative was designed to meet the purpose and need for action and was developed from the recommendations in the Upper Middle Fork John Day Watershed Assessment and management direction in the Malheur Forest Plan. The rationale for development is described previously in the proposed action section.

The following are Alternative 2 activities descriptions.

Timber Harvest

- Commercial Thinning – 2,073 acres
- Shelterwood Harvest – 119 acres

There are two different harvest prescriptions that would be implemented with the alternative, commercial thinning and shelterwood harvest. Both harvest prescriptions would be completed using ground based harvest systems. The commercial thinning prescription promotes ecologically appropriate compositional and structural conditions. It increase resiliency and promotes development of structural and wildlife habitat conditions currently lacking across the area and watershed as a whole. A nonsignificant Forest Plan amendment is proposed to commercially thin 27 acres of satisfactory cover. Thinning activities would reduce satisfactory cover below Forest Plan Standards to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands.

Road Use during Timber Harvest

- Temporary road construction – 8.6 miles. Temporary roads would be constructed in several short segments ranging from a few hundred feet to approximately a mile in length. All roads would be located outside of RHCAs and most (6.3 miles) would be located more than 500 feet away from streams
- Road reconstruction – 10.9 miles
- Road maintenance – 32.5 miles

Precommercial Thinning

- Precommercial thinning – 935 acres

Following timber harvest, areas with remaining high density would be thinned by further removal of small diameter trees (generally less than 9 inches in diameter) to achieve desired stand conditions. The precommercial thinning prescription is recommended where the small trees to be cut are not merchantable saw log sized material. The objective is to reduce ladder fuels by reducing the amount of live or dead fuels, and increasing tree growth.

Reforestation

- Conifer Planting – 119 acres

Following the shelterwood harvest, areas that are understocked and greater than ½ acre in size would be planted with early seral (ponderosa pine and western larch) conifer tree seedlings.

Activity Fuels Treatments

- Yard tops attached – 441 acres
- Hand pile – 147 acres
- Grapple pile – 822 acres
- Yard tops attached and Hand pile – 11 acres
- Yard tops attached and Grapple pile – 55 acres
- Prescribed burning – 563 acres (within harvest and precommercial thinning units)
- Hand pile and Prescribed burning – 16 acres (hand pile is in visual area)
- No Treatment – 138

Prescribed Fire

- Prescribed burning – 5,300 acres

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. These acres include the activity fuels prescribed burning listed above. Within the 5,300 acres, not all acres would be burned and there are different objectives for areas with resource concerns. Burning would be accomplished in the spring and fall seasons when weather and moisture conditions are appropriate and after much of the mechanical work is completed.

Road Closures and Decommissioning

- Gated or signed closures – 1.5 miles (0.7 Mill Creek Subwatershed, 0.8 Idaho/Summit Creek Subwatershed)
- Decommissioning – 18.0 miles (17.8 Mill Creek Subwatershed, 0.2 Dry Fork Subwatershed)
    - Closed roads – 17.7 miles (17.5 Mill Creek Subwatershed, 0.2 Dry Fork Subwatershed)
    - Currently open roads – 0.3 miles (0.3 Mill Creek Subwatershed)
- Opening of closed roads – 2.1 miles (1.7 Mill Creek Subwatershed, 0.4 Dry Fork Subwatershed)

The new road closures would be gated or signed and would restrict yearlong use to motorized vehicles. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. Over 98% of these roads are already closed. The decommissioned roads would be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, drainage provided for the road surface, and a culvert would be removed from a decommissioned road. Conifers will be planted on decommissioned road segments located in RHCAs where conditions will support establishment and growth. Only decommissioned roads will be removed from the Forest Road Transportation System. Approximately 2.1 miles of road currently closed would be reopened. This consists of two road segments that were closed in the early 1990s to reduce big game disturbance. Monitoring has identified some problems associated with the closures. In both cases, damage to nearby environmentally sensitive areas can be reduced by reopening the road segments, which are not in environmentally sensitive areas.

Old-Growth Adjustments

Alternative 2 would require a nonsignificant Forest Plan amendment to adjust three Dedicated Old-Growth areas (DOGs) and delineate three new Replacement Old-Growth areas (ROGs) within the Crawford Project Area. The DOG adjustment is needed to better delineate suitable wildlife habitat. Currently, no ROGs have been allocated to be managed as replacement areas for associated DOGs.

Alternative 3

Alternative 3 responds to the two key issues of: 1) Proposed ground disturbing activities associated with road construction, commercial timber harvest, and prescribed burning could degrade water quality, and impact soil productivity and habitat for aquatic species; and 2) Thinning could degrade the satisfactory cover by decreasing the tree density which in turn reduces the average canopy closure needed to maintain this standard. See Chapter 1 of the FEIS for full issue descriptions.

Alternative 3 minimizes temporary road construction to less than 0.1 miles (500 feet) for each road. The average skidding was increased in the some of the harvest units in response to decreasing the length of the temporary roads. With this reduction in access, approximately 1/3 of the harvest areas in Alternative 2 were dropped due to high logging costs. Without longer temporary access roads, skidding distances made harvest not viable in these areas.

Alternative 3 excludes harvest in those areas identified as satisfactory cover to maintain the existing tree density needed to maintain this Forest Plan cover standard. Portions of six of the commercial thinning areas were dropped from harvest.

The following are Alternative 3 activity descriptions.

Commercial Harvest

The proposed harvest in this alternative has been reduced by approximately 30% from Alternative 2. The treatment units common to Alternative 2 have the same harvest prescriptions as previously described.

- Commercial thinning – 1,506 acres
- Shelterwood harvest – None

The commercial thinning prescriptions and objectives are the same as those described in Alternative 2.

Road Use during Harvest

The amount and type of road reconstruction and road maintenance is very similar to Alternative 2. The number of miles of temporary road construction was reduced by approximately 83% compared to Alternative 2. The location and description of the reconstruction, maintenance, and temporary road construction activities common to Alternative 2 is the same as previously described.

- Temporary road construction – 1.5 miles
- Road reconstruction – 10.9 miles
- Road maintenance – 29.2 miles

Precommercial thinning

- Precommercial thinning – 666 acres

The precommercial thinning treatment areas and activity descriptions are generally the same as described for Alternative 2. Those acres dropped from commercial harvest would not be pre-commercially thinned.

Activity Fuels Treatments

- Yard tops attached – 276 acres
- Hand pile – 140 acres
- Grapple pile – 631 acres
- Prescribed burning – 327 acres (within harvest and precommercial thinning units)
- Hand pile and prescribed burning – 6 acres (hand pile would be in visual areas)
- No Treatment - 133

Again the activity fuels treatment is much the same as described for Alternative 2. Since harvest levels were reduced in Alternative 3, the amount of activity fuels treatments were reduced accordingly.

Prescribed Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as Alternative 2.

Old-Growth Adjustments

The delineation of three new ROGs and adjustment of three DOGs are the same as described in Alternative 2.

Alternative 4

Alternative 4 was developed is in response to the Key Issue #1: Proposed ground disturbing activities associated with road construction, commercial timber harvest, and prescribed burning could degrade water quality, and impact soil productivity and habitat for aquatic species.

Alternative 4 does not include any timber harvest activities or temporary road construction activities. The alternative does include precommercial thinning to reduce stand density of smaller trees, and prescribed burning.

The following are Alternative 4 activity descriptions.

Commercial Harvest/Road Use

There is no commercial harvest, temporary road construction, road maintenance, or reconstruction activities proposed in this alternative.

Precommercial Thinning

- Precommercial thinning – 795 acres

The precommercial thinning treatments are the same as described in Alternative 2.

Activity Fuels Treatments

- Hand piling – 146 acres
- Grapple piling – 649 acres

Again the activity fuels treatment is much the same as described for Alternative 2 except there is no commercial harvest associated with fuels treatment. The description of each of following fuels treatment can be found in the narrative for Alternative 2.

Prescribed Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as Alternative 2.

Old-Growth Adjustments

The delineation of three new ROGs and adjustment of three DOGs are the same as described in Alternative 2.

Affected Environment and Environmental Consequences

The Crawford Project Area lies within the Mill Creek Subwatershed, which makes up a portion of the Middle Fork John Day River Watershed which is part of the John Day River System. The project area is largely forested. The lower elevations and south facing slopes are generally ponderosa pine. Other tree species include western larch, Douglas-fir, lodgepole pine, and grand fir in the upper elevations and northerly slopes. These stands are generally young and even-aged, densely stocked stands due to the nature of past harvests. There is low structural diversity and a lack of larger diameter trees and snags. Approximately 72% of these forested stands are located in either hot-dry or warm-dry upland biophysical environments. Existing detrimental soil impacts due to past ground based harvest average 6%. The Forest Plan Standard for detrimental impacts is 20% or less. The watershed is important to rebuilding and sustaining populations of bull trout and steelhead, both listed as critically threatened species, under the Endangered Species Act (ESA). Steelhead habitat is present in the project area.

The environmental consequences of implementing this project, by alternative, are described in detail in Chapter 3 of the FEIS; however, at the end of Chapter 2, there are a series of alternative comparison tables that provide a concise summary of the effects of the alternatives by the purpose and need, the significant issues, and the resource areas affected (e.g. Wildlife, Recreation). These tables are repeated here in this FEIS Summary section.

Table S – 4. Comparison of Alternatives: Purpose and Need (Vegetation Activities, Transportation, Old-Growth Adjustments, Economics, LOS Development, Visuals).

Comparison /Purpose and Need	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
1. Vegetation Restoration				
▪ Commercial Thinning (acres)	0	2,073	1,506	0
▪ Precommercial Thinning (acres)	0	935	666	795
▪ Shelterwood Harvest (acres)	0	119	0	0
▪ Planting Conifers (acres)	0	119	0	0
▪ Tractor Harvest (acres)	0	2,192	1,506	0
2. Road System				
Road Activities from Timber Harvest ▪ Temporary Road Construction (miles)	0	8.6	1.5	0
▪ Road Reconstruction (miles)	0	10.9	10.9	0
▪ Road Maintenance (miles)	0	32.5	29.2	0
Road Restoration Road Closures (Gate or Sign) (miles)	0	1.5*	1.5*	1.5*
▪ Decommissioning (miles)	0	18.0**	18.0**	18.0**
▪ Decommissioning (RHCA) (miles)	0	5.8	5.8	5.8
▪ Open Closed Road (miles)	0	2.1***	2.1***	2.1***
3. Adjust Dedicated Old-Growth/ Identify Replacement Old-Growth				
▪ Additional ROGs designated	0	three new	three new	three new
▪ Adjustment of DOGs	0	3	3	3
4. Capture Economic Value				
▪ Volume Harvested (MBF)	0	6,800	4,300	0
5. Development of Future LOS - Old Forest Single-Stratum (OFSS)				
Warm Dry/Hot-Dry Bio. Environments ▪ Old Forest Single-Stratum (50 years)	10%/8%	21%/46%	16%/44%	10%/8%
6. Fire and Fuels Treatments				
▪ Percent Change in Areas with High to Extreme Crown Fire Potential (percentages are based on a 5,700 acres landscape within the project area)	0%	28%	19%	13%
▪ Prescribed burning (acres)	0	5,300	5,300	5,300
Activity Fuel Treatments with Harvest and Precommercial Thinning Activities ▪ Yard tops attached (acres)	0	441	276	0
▪ Hand pile (acres)	0	147	140	146
▪ Grapple pile (acres)	0	822	631	649
▪ Yard tops attached and hand pile (acres)	0	11	0	0
▪ Yard tops attached and grapple pile (acres)	0	55	0	0
▪ Prescribed burning (acres)	0	563	327	0
▪ Hand pile and prescribed burning (acres)	0	16	6	0
7. Visual Corridor				

Comparison /Purpose and Need	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
▪ Foreground Treatments (Commercial)	0	461	238	0

* 0.7 miles - Mill Creek Subwatershed, 0.8 miles – Idaho/Summit Subwatershed
** 17.8 miles – Mill Creek Subwatershed, 0.2 miles – Dry Fork Subwatershed
*** 1.7 miles – Mill Creek Subwatershed, 0.4 Dry Fork Subwatershed

Table S – 5. Acres of Commercial Harvest Treatment by Alternative within Forest Plan Management Areas.

Management Area	Alt. 1	Alt. 2	Alt. 3	Alt. 4
1 – General Forest	0	402	296	0
13 – DOG	0	88 (ROG)	50 (ROG)	0
14 – Visual	0	461 – Foreground 1,390 – Middle-ground	238 – Foreground 987 – Middle-ground	0

Note: These acres do not total the number of harvest acres shown in Table S – 4. The management areas overlap. For example, an area identified as DOG can also be within the visual foreground.

Table S – 6. Road Density Summary: Existing and Proposed (Mill Creek Subwatershed ONLY).

Status	Existing	Proposed (Alternatives 2, 3, & 4)
Open (Miles)	50.7	51.4
Closed to Motorized Vehicles (Miles	62.8	44.0
New Decommissioning (Taken off road system)		17.8*
Open Road Density (Miles per sq. Mile)	1.8	1.8

* Majority of roads proposed for decommissioning are already closed (0.3 miles of open road are proposed for decommissioning). (Road density: Mill Creek Subwatershed – 17, 846 ac or 17,835/640 = 27.87 sq mi Existing: 50.7/27.87 = 1.82 and Proposed: 51.1/27.87 = 1.8)

Table S – 7. Proposed Changes for Management Area 13 (All Action Alternatives).

DOG/ROG	Existing MA-13 (Acres)	Proposed MA-13 (Acres)	RHCA Overlap with MA-13 (Acres)	Forest Plan Management Allocation Changes (Acres)		
				MA-1 & 2	MA-14	MA-13
134 – DOG	382	395	46	–8	–5	13
134 – ROG	0	256	24	–149	–107	256
241 – DOG	169	169	6	0	0	0
241 – ROG	0	85	11	–14	–71	85
335 – DOG	273	317	28	–21	–23	44
335 – ROG	0	179	0	–72	–107	179
Total	824	1401	115	–264	–313	577

Table S – 8. Comparison of Alternatives by Issue and Measurement.

Issue	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1. Effects of road construction, commercial timber harvest, and prescribed burning on soil, water quality, and listed aquatic species habitat				
▪ Temporary road construction - miles	0	8.6	1.5	0
▪ Temporary road constructed in RHCAs - miles	0	0	0	0
Road Activities In RHCAs (all stream				

categories) -miles ▪ Log haul ▪ Maintenance ▪ Reconstruction	 0 0 0	 5.6 4.0 0.7	 5.5 4.8 0.7	 0 0 0
▪ Equivalent Roaded Acres - percent	2007 - 7.3% 2012 - 6.4%	2007 - 9.0% 2012 - 7.9%	2007 - 8.6% 2012 - 7.5%	2007 - 7.3% 2012 - 6.4%
▪ Timber harvest - acres	0	2,192	1,506	0
▪ Detrimentally disturbed soils – percent (standard not to exceed 20%)	No Impacts	No units exceed 20% threshold	No units exceed 20% threshold	No units exceed 20% threshold
▪ Effects determination by fish species	No Impacts	See Table S – 10	See Table S – 10	See Table S – 10
▪ Prescribed burning affects on sediment and temperature	No Impacts	No Measurable Increase	No Measurable Increase	No Measurable Increase
2. Effects of commercial thinning on satisfactory big game cover				
▪ Commercial thinning in satisfactory cover - acres	0	27	0	0
▪ Cover post project– percent Marginal cover % (Standard 5%) Satisfactory cover % (Standard 12%) Total cover (Standard 20%)	 47.5 2.5 50	 42.0 2.4 44.4	 43.3 2.5 45.8	 45.8 2.5 48.3
3. Effects of under burning on calving/ fawning areas				
▪ Impacts on calving/fawning	No Impacts	Limited Short-term Impacts	Limited Short-term Impacts	Limited Short-term Impacts
4. Impacts of thinning on connectivity corridors				
▪ Acres treated by commercial harvest and precommercial thinning (PCT)	0	257	187	177
▪ % treated by Harvest and PCT	0%	7%	5%	5%
▪ Comparison to Forest Plan Standard	Meets or exceeds FP Standard	Meets or exceeds FP Standard	Meets or exceeds FP Standard	Meets or exceeds FP Standard
5. Effects of thinning and prescribed burning on neotropical migrant bird species				
Dry Forest Habitats	No Impact	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts
Riparian Woodlands and Shrubland Habitats	No Impact	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts
Shrub-Steppe Habitats	No Impact	No Impact	No Impact	No Impact
6. Effects on threatened, endangered species and FS sensitive wildlife species				
▪ Wildlife BE determinations for TES species	No Impacts	See Table S – 9	See Table S – 9	See Table S – 9
7. Effects of harvest and burning activities multi-strata old-growth dependent species				
▪ Acres treated with harvest and PCT in Old Forest Multi-Strata (OFMS) and Young Forest Multi-Strata (YFMS)	0	418	248	135
▪ % OFMS in 50 years	29%	28%	29%	29%
▪ Impacts on multi-strata associated management indicator species (MIS) o Pileated woodpecker, American	No Impact	Limited Short-term Impacts, Long-term	Limited Short-term Impacts, Long-term	Limited Short-term Impacts, Long-term

Marten, three-toed woodpecker and northern goshawk		Beneficial Impacts	Beneficial Impacts	Beneficial Impacts
8. Effects of harvest and burning activities on white headed woodpecker habitat (OFSS)				
▪ OFMS to OFSS conversion - acres	0	6	1	0
▪ OFSS Maintenance - acres	0	17	14	6
▪ OFSS Development - acres	0	2,130	1,452	750
▪ % OFSS in 50 years	15%	27%	24%	15%
▪ Impacts to white headed woodpecker	No Impact	Long-term Beneficial Impacts	Long-term Beneficial Impacts	Long-term Beneficial Impacts
9. Effects on snag retention and primary cavity excavator species				
▪ Post harvest snag densities	No Impact	Minimal decrease from existing	Minimal decrease from existing	Minimal decrease from existing
▪ Post prescribed fire snag densities	No Impact	Minimal Increase	Minimal Increase	Minimal Increase
▪ DecAID Advisory tool Results-Tolerance Levels	No change	No Change or Minimal Increase	No Change or Minimal Increase	No Change or Minimal Increase
▪ Snag density (comparison to Forest Plan Standard)	No Impact-Currently Below standard	Below standard	Below standard	Below standard
10. Smoke impacts to local communities				
▪ Smoke emission	No Impact	Meets State Requirements	Meets State Requirements	Meets State Requirements
▪ Impacts to local communities (Austin and Bates)	No Impact	Short-Term Impacts	Short-Term Impacts	Short-Term Impacts
11. Tree mortality caused by under-burning				
▪ Estimated tree mortality by diameter class – percent 10 inches or greater 5-10 inches 5 inches or less	No Impact	 Less than 10% Less than 15% Less than 35%	 Less than 10% Less than 15% Less than 35%	 Less than 10% Less than 15% Less than 35%
12. Burning effects on down wood and soil nutrients				
▪ Comparison to Forest Plan down wood Standards	No Impact – Currently below standards	Minimal Short-term Impact-Remain below standards	Minimal Short-term Impact-Remain below standards	Minimal Short-term Impact-Remain below standards
13. Effects to public access				
▪ Open road density – miles/sq. mile	1.8	1.8	1.8	1.8
▪ Comparison to Forest Plan Standard	Meets Standards	Meets Standards	Meets Standards	Meets Standards
14. Effects on visual quality				
▪ Visual Quality Objective – Highways 7 and 26 (Retention Standard)	No Impact	Meets Retention	Meets Retention	Meets Retention
15. Effects on grazing permittee operations				
▪ Rest period after burning	No Impact	One growing season	One growing season	One growing season
▪ Change in forage	No Impact	Mid to long-term increase	Mid to long-term increase	Mid to long-term increase
16. Effects of invasive/noxious weeds				
▪ Miles of temporary road	0	8.6	1.5	0
▪ Miles of road reconstruction	0	10.9	10.9	0

▪ Invasive/noxious weeds within harvest units - acres	0	41.5	41.5	0
▪ Invasive/noxious weeds within prescribed burning units - acres	0	31.1	31.1	31.1
▪ Grapple piling - acres	0	877	631	649
▪ Risk of spread (combined activities)	No Impact	Minimal risk of spread	Minimal risk of spread	Minimal risk of spread
17. Fall burning impacts to recreation (hunting)				
▪ Recreation analysis	No Impact	Limited Short-term impact	Limited Short-term impact	Limited Short-term impact
18. Effects to local economy				
▪ Present net value $$ returned	0	183,201	87,624	0

Table S – 9. Comparison of Alternatives: Listed and Sensitive Wildlife Species.

Species	Status	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Gray Wolf	S	NI	NI	NI	NI
Northern Bald Eagle	S	NI	NI	NI	NI
North American Lynx	T	NE	NE	NE	NE
American Peregrine Falcon	S	NI	NI	NI	NI
California Wolverine	S	NI	NI	NI	NI
Pygmy Rabbit	S	NI	NI	NI	NI
Pacific Fisher	S	NI	NI	NI	NI
Western Sage Grouse	S	NI	NI	NI	NI
Gray Flycatcher	S	NI	NI	NI	NI
Bobolink	S	NI	NI	NI	NI
Upland Sandpiper	S	NI	NI	NI	NI
Tricolored Blackbird	S	NI	NI	NI	NI
Bufflehead	S	NI	NI	NI	NI

E = Endangered, T = Threatened, S = Sensitive. NE = No Effect, NAE = No Adverse Effect, NLAA = May Effect, Not Likely to Adversely Affect, LAA = May Effect, Likely to Adversely Affect, BE = Beneficial Effect, BI= Beneficial Impact, NI = No Impact, MIIH = May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.

Table S – 10. Comparison of Alternatives: Listed and Sensitive Fisheries and Aquatic Species.

Species	Status	Alt 1	Alt 2	Alt 3	Alt 4
Redband trout	S	MIIH	MIIH (BI)	MIIH (BI)	MIIH (BI)
Malheur mottled sculpin	S	NI	NI	NI	NI
Columbia spotted frog	S	NI	MIIH (BI)	MIIH (BI)	MIIH (BI)
Westslope cutthroat trout	S	NI	NI	NI	NI
Columbia River Basin Bull Trout	T	NLAA	NLAA	NLAA	NLAA
Mid Columbia River Steelhead	T	LAA	LAA (BE)	LAA (BE)	LAA (BE)
Steelhead Designated Critical Habitat	T	LAA	LAA(BE)	LAA(BE)	LAA(BE)
Spring Chinook Salmon	S	MIIH	MIIH (BI)	MIIH (BI)	MIIH (BI)
Spring Chinook Salmon	EFH	NAE	NAE	NAE	NAE

Table S – 11. Comparison of Alternatives: Sensitive Plant Species: Summary of Effects Determination Statements.

Sensitive Species	Occurrence in Project Area	Habitat Status Within Project Area	Alt 1 (No Action)	Alt 2, Alt 3, and Alt 4
Achnatherum hendersonii **Henderson's ricegrass**	**Not Found**	**Present**	**NI**	**MIIH**
Achnatherum wallowensis **Wallowa ricegrass**	**Not Found**	**Present**	**NI**	**MIIH**
Astragalus diaphanus var. diurnus South Fork John Day milkvetch	Not Found	Not Present	NI	NI
Astragalus tegetarioides Deschutes milkvetch	Not Found	Not Present	NI	NI
Botrychium ascendens **upswept moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium crenulatum **crenulate moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium lanceolatum **lance-leaf moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium minganense **Mingan moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium montanum **mountain moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium pinnatum **pinnate moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Calochortus longebarbatus var. peckii long-bearded sego lily	Not Found	Not Present	NI	NI
Camissonia pygmaea dwarf evening primrose	Not Found	Not Present	NI	NI
Carex backii **Back's or Cordilleran sedge**	**Not Found**	**Present**	**NI**	**MIIH**
Carex idahoa **Idaho sedge (formerly C. parryana)**	**Not Found**	**Present**	**NI**	**MIIH**
Carex interior **inland sedge**	**Suspected**	**Present**	**NI**	**MIIH**
Cypripedium fasciculatum **clustered lady's- slipper**	**Suspected**	**Present**	**MIIH**	**MIIH**
Dermatocarpon luridum silverskin lichen	Not Found	Not Present	NI	NI
Leptogium burnetiae var. hirsutum hairy skin lichen	Not Found	Not Present	NI	NI
Listera borealis **northern twayblade**	**Not Found**	**Present**	**MIIH**	**MIIH**
Lomatium erythrocarpum redfruit desert parsley	Not Found	Not Present	NI	NI
Lomatium ravenii Raven's lomatium	Not Found	Not Present	NI	NI
Luina serpentina colonial luina	Not Found	Not Present	NI	NI
Mimulus evanescens vanishing monkeyflower	Not Found	Not Present	NI	NI
Pellaea bridgesii **Bridge's cliff-brake**	**Not Found**	**Present**	**NI**	**NI**
Phacelia minutissima **least phacelia**	**Not Found**	**Suspected**	**NI**	**MIIH**
Pleuropogon oreganus Oregon semaphore grass	Not Found	Not Present	NI	NI

Sensitive Species	Occurrence in Project Area	Habitat Status Within Project Area	Alt 1 (No Action)	Alt 2, Alt 3, and Alt 4
Thelypodium eucosmum arrow-leaved thelypody	Not Found	Not Present	NI	NI
NI = No Impact. MIIH = May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal Listing or cause a loss of viability to the population or species.				

Identification of the Preferred Alternative

Alternative 2, with associated project design measures and monitoring items, is the Agency Preferred Alternative.

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CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Introduction

The Malheur National Forest, Blue Mountain Ranger District (BMRD) is proposing the Crawford Project that would treat forested stands, using timber harvest methods to decrease tree density, increase representation of fire-adapted tree species, as well as decrease existing and activity fuel levels. The connected actions of log hauling associated with timber harvest would require constructing temporary roads, and maintaining and reconstructing existing roads. This proposed action would implement a Road Access Travel Management Plan that would close and decommission roads.

Past timber harvest and lack of fire have left many of the forested stands overstocked with a composition of species that cannot be sustained in the long-term. Many of the roads constructed during past harvest activities are contributing sedimentation into nearby streams. The activities proposed to remedy these problems include commercial thinning and shelterwood timber harvest, precommercial thinning, activity fuel treatments, prescribed burning, road improvements and maintenance, and closing or decommissioning roads. These activities would occur over the next 5 years.

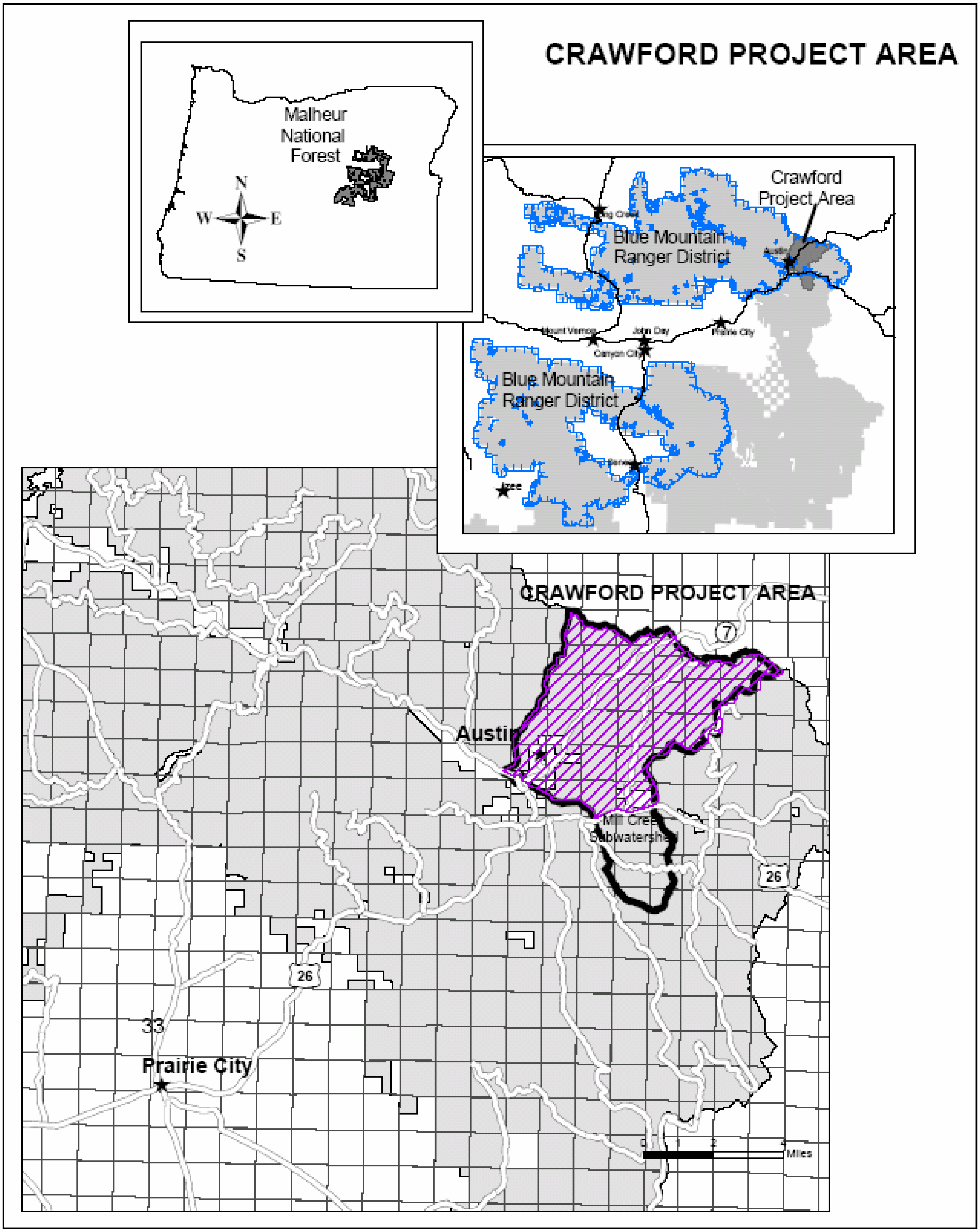
The Crawford Project proposes to adjust areas to be managed for Dedicated Old-Growth (DOG) as designated in the Malheur Forest Plan (Forest Plan) Management Area (MA) 13. These adjustments would more fully meet the criteria for old-growth habitat as prescribed by the Forest Plan. A nonsignificant Forest Plan amendment would be necessary to implement this change.

The Crawford Project Area refers to the portion of the Mill Creek Subwatershed within the Malheur National Forest, BMRD that is north of U. S. Highway 26. This area is approximately 14,950 acres (See Figure 1.1) which is 83% of the subwatershed. Highway 26 is the administrative boundary between the Blue Mountain and Prairie City Ranger Districts. The three major drainages in the project area are Middle Fork John Day River, Crawford Creek, and Mill Creek.

The legal description of the project area is: T.10S., R.35E., Sections 34 – 36; T.10S., R.35 ½ E., Sections 33 – 36; T.11S., R.35E., Sections 1 – 4, 9 – 16, 21 – 28, & 35; and T.11S., R.35 ½ E., Sections 1 – 4, 9 – 11, 14 – 16, 21, & 28. See Vicinity Map on the following page.

The Crawford Vegetation Management Environmental Assessment (EA) was completed in November, 2001. A Decision Notice and Finding of No Significant Impacts (FONSI) were signed by Bonnie Wood, Malheur Forest Supervisor on April 26, 2002. This decision was appealed and then reviewed by the Appeal Deciding Officer, Richard Sowa. This review revealed that the analysis of cumulative effects was not sufficient to support the decision. The Forest Supervisor was directed to withdraw the decision.

Figure 1.0. Vicinity Map of the Project Area.



A Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) was published in the Federal Register on October 9, 2003 for the Crawford Timber Sale (Crawford Project). The Crawford Project and the Crawford Timber Sale are the same analysis. The original Crawford Vegetative Management EA and this EIS are intended to address many of the same needs and public comments. Some of the activities in the original EA have been removed from the proposed actions in this EIS, including precommercial thinning that is outside of harvest units, planting hardwoods, conifer removal from hardwood areas and meadows, cutting hardwoods to stimulate reproduction, caging shrubs, fencing to protect hardwoods, and slashing junipers to create barriers to hardwoods. These activities are not connected to the proposed harvest and road activities in this analysis. These activities would need to be addressed in future environmental analysis but are not foreseeable at this time.

All public comments received during the analysis process were considered. They include:

- Comments received during initial scoping efforts. These comments were used to develop significant key issues in November, 2001 Environmental Assessment (EA).
- Public comments received during 30-day comment periods (November, 2001 EA).
- Appeal points on the November, 2001 Crawford EA and April 26, 2002 Decision Notice.
- Comments received on the October 9, 2003 Notice of Intent to Prepare and EIS.
- Comments received on the November, 2006 Crawford Project Draft Environmental Impact Statement.

Modifications were made from the 2001 EA to the 2007 FEIS to address internal and public comments. They include:

- Forest watershed and subwatershed boundaries have been adjusted since the original Crawford Analysis was started. The original EA analysis boundary overlaps portions of five subwatersheds: Mill Creek, Idaho Creek/Summit Creek, Dry Fork, Clear Creek, and Bridge Creek. The EIS project area was refined to include a portion of the Mill Creek Subwatershed. The newly mapped Mill Creek Subwatershed boundary contains the majority of the proposed activities from the original EA.
- Partial Removal and Regeneration Salvage treatment methods proposed in the 2001 EA are not proposed in the 2007 FEIS.
- To address the public issue regarding new road construction, construction of new system roads was removed from proposed actions in the EIS. Various amounts of temporary road construction are proposed in the alternatives considered. All temporary roads would be decommissioned after use.
- The original Crawford EA proposed skyline logging on steeper slope areas. In the 2007 FEIS only ground-based harvest is proposed. Slopes proposed for ground-based harvest are generally less than 35% with some small segments greater than 35%.

Changes from Draft to Final EIS for this Chapter

The following changes were made between the DEIS and FEIS. Minor corrections to grammar, spelling, explanations, and paragraph formatting have also been made.

Table 1.1. Chapter 1 Changes between the DEIS and the FEIS.

	Change Item
1.	The proposed activities section received minor clarification edits for road activities.
2.	A vicinity map was added.
3.	Activity fuel treatments were clarified for the Proposed Action Alternative.
4.	Minor changes were made in the miles of road maintenance, reconstruction, and road closures.
5.	A nonsignificant Forest Plan amendment was proposed (Alternative 2 – Proposed Action) in the DEIS to commercially thin 70 acres of satisfactory cover. Units classified as satisfactory cover in the DEIS were field reviewed during the summer of 2007. Portions of units 94 and 95 (43 acres) were determine to have less than 50% canopy cover, therefore do not meet the definition of satisfactory cover in the Forest Plan. The Proposed Action Alternative was modified to reflect this updated field information. A nonsignificant Forest Plan amendment to commercially thin 27 acres of satisfactory cover is proposed in the FEIS.
6.	The issue section was modified to include the following: ▪ Additional measures for evaluation were added to (Key Issue #1). ▪ Units of measure were added to each analysis issue. These measures are tracked through the document including in the Comparison of Alternatives Section in Chapter 2. ▪ Issues eliminated from detailed study are listed along with the rationale for their elimination.

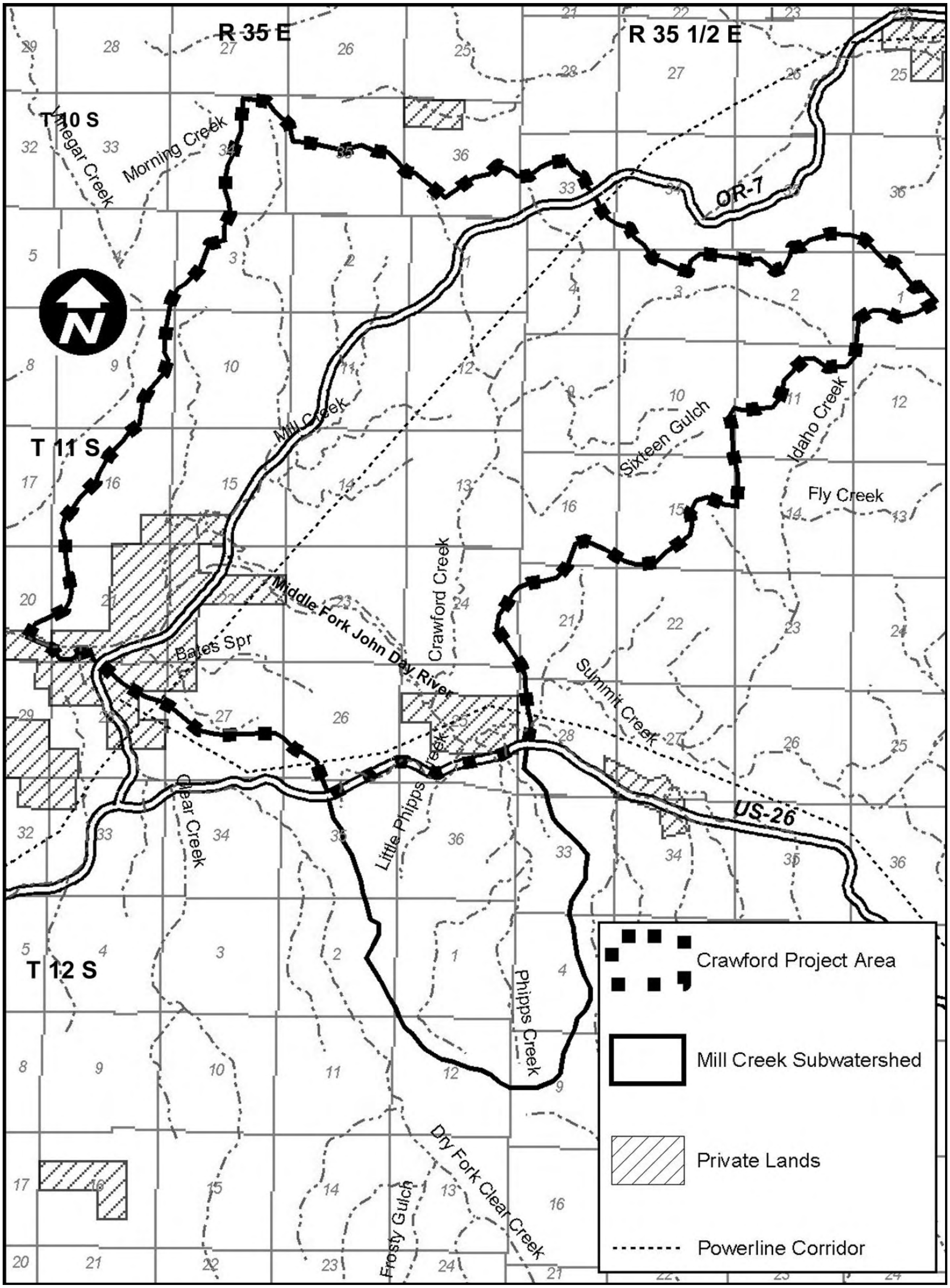
Purpose of and Need for Action

The Crawford Project Area is characterized by dense forested stands dominated by ponderosa pine in the dryer, warmer, lower elevation areas, or stands of mixed conifer species in the wetter, cooler, higher elevations that include ponderosa pine, grand fir, western larch, and lodgepole. These dense stands are dominated by younger small diameter trees. This is a result of intensive railroad logging of the large ponderosa pine that began in the early 1900s. Since this initial timber harvest, there have been several timber sales to thin selected areas or to regenerate isolated timber stands. Extensive precommercial thinning also occurred in the regrown ponderosa pine stands. The area has a higher road density resulting from past logging activities, however many of the roads were closed to motor vehicles with barriers in the early 1990s. Other major physical features of the project area include two utility line corridors and two major highways.

This action is needed in order to comply with the goals and objectives outlined in the 1990 Malheur National Forest Land and Resource Management Plan (Forest Plan) as amended, which guides natural resource management activities and establishes management standards for lands administered by the Malheur National Forest.

The project area is primarily allocated to Management Area (MA) 1 – General Forest and MA–14 – Visual Corridors in the Forest Plan (see later section in Chapter 1 for additional information). The Regional Forester's Eastside Forest Plan Amendment 2 modified the objectives for these Management Areas, especially MA–1. While MA–1 is still to be managed for the commercial production of sawtimber and forage for domestic livestock (within Forest-Wide Standards and Guidelines for all resources), the Regional Forester's Amendment shifted the focus toward promoting and maintaining late and old structural (LOS) or old forest (OF) characteristics that include large diameter, open-canopy structure.

Figure 1.1. Map of the Crawford Project Area.



MA–1 areas are to be managed with an objective of creating a healthy forest condition through control of stocking levels, species mix, and protection from insects, disease, and other damage while moving forest stands toward structural conditions that are within the Historic Range of Variability (HRV). HRV refers to structural forest conditions that are based on pre-settlement conditions. Moving forest stands toward the HRV is desirable because such conditions provide the most sustainability over the long-term. Sustainability refers to the ability of forested systems to withstand or resist rapid and widespread structural change due to fire, insects, and disease.

The BMRD, Malheur National Forest, has developed project proposals, analyzed in this EIS, to support the purposes of this project and meet Forest Plan goals and objectives. This project proposal also follows recommendations made in the Upper Middle Fork John Day River Watershed Assessment (1998) and the Malheur Forest Roads Analysis (2004). It is expected that the projects analyzed in this EIS would be implemented between 2008 and 2013. The **purposes** of this project are to:

- Promote a change in tree species composition, stand densities, and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. To accomplish this objective a nonsignificant Forest Plan amendment to reduce big game cover is proposed. The rationale for the amendment is further discussed in the description of the proposed action.
- Implement a road system that meets public and management access needs that reduces the risk of sediment reaching streams, and road impacts to aquatic species and wildlife habitat.
- Adjust Dedicated Old-Growth (DOGs) areas, identify Replacement Old-Growth (ROGs) areas, and identify pileated woodpecker feeding areas (PWFAs) as required by the Forest Plan. A site specific, nonsignificant Forest Plan amendment is proposed to adjust Forest Plan management area allocations.
- Capture the economic value of trees to provide wood products and jobs.
- Accelerate development of future late and old structural (LOS) single-stratum wildlife habitats.
- Reduce the fire fuels by primarily reducing density of standing vegetation, surface fuels, and fuel ladders.
- Implement the Highway 26 and Highway 7 Viewshed Corridor Plans.

The needs for the proposed action are derived from the differences between current conditions and desired conditions. Desired conditions are based on Forest Plan direction and management objectives. The proposed action is designed to move resource conditions closer to the desired conditions and address the management direction provided by the Forest Plan.

Specific “NEED” statements have been developed for each of the seven purposes stated above. Each statement briefly compares the existing condition and desired conditions to show why the project is being proposed. Within each “Need” statement a link between the desired condition and management direction in the Malheur Forest Plan is provided.

Forest Composition and Density Reduction Need

The desired condition is to move forest vegetation conditions towards the Historic Range of Variability (HRV). A large portion of project area contains warm and hot-dry upland forest biophysical environments. These forest types are a result of factors such as past timber harvest, insect activity, and fire exclusion. The composition of these stands has changed from a forest dominated by ponderosa pine to denser mixed species stands with higher components of fir species. Changes in composition and structure have increased the risk of greater fire severity and insect damage. As identified in the Forest Plan, these risks can be minimized by maintaining stand vigor through the use of integrated pest management such as stocking level control (Forest Plan, Standard # 98, pg IV – 37).

Vegetation structure is a result of management activities, timber harvest, and years of fire suppression. Structural stages within the hot-dry and warm-dry biophysical environments comprise 72% of the biophysical environments in the analysis area and are outside the HRV. In the past, ecosystem interactions included a natural disturbance regime that included frequent low intensity fire that supported a more resilient forest condition. These historic stands were more resilient to fire damage, insects, and disease and supported resistant tree species such as ponderosa pine, growing in a more open condition.

Table 1.2. Existing Upland Forest (UF) Structural Stages.

Biophysical Environment		Structural Stages (percent)						
		Stand Initiation (SI)	Stem Exclusion Open Canopy (SEOC)	Stem Exclusion Closed Canopy (SECC)	Understory Reinitiation (UR)	Young Forest Multi–Strata (YFMS)	Old Forest Single Stratum (OFSS)	Old Forest Multi–Strata (OFMS)
Hot–Dry UF	Current Condition	(0%)	40%	0%	3%	40%	(0%)	17%
	Historical Range of Variation	5–15%	5–20%	0–5%	0–5%	5–10%	20–70%	5–15%
Warm–Dry UF	Current Condition	(1%)	20%	36%	17%	19%	(3%)	(4%)
	Historical Range of Variation	5–15%	5–20%	1–10%	1–10%	5–25%	5–55%	5–20%
Cool–Moist UF	Current Condition	(0%)	15%	(3%)	32%	(11%)	0%	39%
	Historical Range of Variation	1–10%	0–5%	5–25%	5–25%	40–60%	0–5%	10–30%
Cool–Dry UF	Current Condition	(0%)	0%	(0%)	53%	(0%)	(0%)	47%
	Historical Range of Variation	5–30%	0–5%	5–35%	5–20%	5–20%	1–10%	1–20%
Cold–Dry UF	Current Condition	1%	9%	14%	36%	(1%)	5%	34%
	Historical Range of Variation	1–20%	0–5%	5–20%	5–25%	10–40%	0–5%	10–40%

Note: Shaded boxes are outside the historic range of variability (HRV). Percents in brackets are below HRV.

Historically there were fewer younger, dense stands with stem exclusion, open canopies and young forest multi-strata (YFMS) structural stages, and lacked older, more open grown stands of old forest single-stratum (OFSS), and old forest multi-strata (OFMS) structural stages.

Fire intolerant fir species occur more commonly than they did historically. Tree density has increased. A greater number of multi-strata stands are present in more contiguous blocks within the hot-dry and warm-dry upland forest biophysical environments than were present historically. There are few large trees for wildlife habitat, particularly in ponderosa pine forested types. Vegetation is more vulnerable to insects and disease as a result of high tree densities.

The desired condition includes large trees that are well represented across the landscape in hot-dry, warm-dry, and cool-moist upland forest biophysical environments. Fire tolerant ponderosa pine, western larch, and, to a lesser extent, Douglas-fir are the dominant conifer species in areas with flatter terrain and hot-dry growing conditions that represent approximately two-thirds of the analysis area. Within project area, where they historically occurred, stands with be open and park-like, maintained by low intensity, frequent fire.

Multi-strata structural stage, in hot-dry forests, occurs in a smaller proportion of the project area, occurring only in areas that are left unburned through several fire cycles. Multi-strata structural stage in warm-dry forests would occur in moist areas such as north aspects.

A site specific, nonsignificant Forest Plan amendment is proposed to commercially thin 27 acres of satisfactory big game cover. Thinning activities would reduce satisfactory cover below Forest Plan Standards to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Most treatments would occur in dry forest types (these stands are considered outside the HRV) that are overstocked and likely unsustainable given the increasing risk of uncharacteristically severe fire and insect epidemics. These areas would likely fall out of cover within the next 25 years if not treated. Hiding/security cover patches would be maintained in all proposed units to minimize effects on cover loss. These treatments will reduce satisfactory cover to 2.4% in the Mill Creek Subwatershed, which is below the Forest Plan Standard of 12%. In a 2003 letter to the Eastside Forests, the Regional Office provided direction encouraging Forests to use site specific Forest Plan amendments to move the landscape towards HRV (USDA FS June 11, 2003). For further discussion see the Forest Vegetation and Terrestrial Wildlife sections in Chapter 3 and Table 2.3.

Road Reduction Need

There is the need to change out the transportation system in the area so that it offers a more efficient, properly located road system that provides adequate public and administrative access, while reducing the risk of sediment reaching streams. To meet this objective of reducing sediment some unneeded roads, that cross streams or are adjacent to streams, would be decommissioned or closed.

The open road density within the entire Mill Creek Subwatershed (1.8 miles of road per square mile) is within the Forest Plan 1999 desired condition (3.2 miles per square mile) and 2039 desired condition (1.5 miles per square mile) for big game in summer range. The existing road system, the road density, and route location adjacent to streams may pose a sediment risk to threatened fish species.

The Forest Plan states that there is a need to minimize the density of open roads in riparian areas (Forest Plan, Standard # 41, pg IV – 67). Interim Strategies for Managing Anadromous Fish Producing Watersheds (PACFISH) standards state that roads not needed for future management activities should be closed or decommissioned (PACFISH, Standard RF – 3c).

The desired condition for the project area roads would be to provide safe and adequate roaded access for forest users while protecting aquatic resources. Most roads that are impacting streams or are not needed for future management activities would be closed or decommissioned. Roads which are not decommissioned would be improved so less maintenance is needed and impacts from road sediment are decreased.

Old-Growth Boundary Adjustment Need

The Forest Plan directs that Dedicated Old-Growth (DOG) and Replacement Old-Growth (ROG) areas are distributed across the landscape to provide for old-growth associated species on a forest-wide basis. A portion of this old-growth, designated as DOG or ROG, contributes to the forest's old-growth network (Forest Plan, Standards # 4, 5, 6, 7, and 8, pgs IV – 105 and 106). DOGs are to be inventoried and validated, with areas not meeting management requirements to be corrected utilizing an interdisciplinary process to develop recommendations for boundary adjustments and unit relocation.

The old-growth network on the Malheur National Forest was first established in the early 1980s. Since then, new field validation and inventory methods have provided better information on habitat conditions and stand delineations.

Within the project area there are three DOG habitats identified. DOG 335 and 241 do not meet Forest Plan Standards for size and habitat. No ROGs have been identified nor have Pileated Woodpecker Feeding Areas (PWFAs) been designated for DOGs 335 and 134. A ROG has not been identified for DOG 241 which is designated to provide American marten habitat. Boundary adjustments are needed to meet habitat requirements for old-growth dependent species.

ROGs may not currently have all the characteristics of old-growth. They are managed to achieve those characteristics so that when a DOG area no longer meets the needed habitat requirements, the ROG area can take its place.

DOG unit boundary adjustments and ROG designations will require a nonsignificant Forest Plan amendment. The proposed action description in Chapter 1 provides more detailed information regarding the proposed amendment and a map (Figure 1.3).

Timber Production Need

Timber harvest plays an important role in the local economy by providing employment and revenues. There is a need to make wood products available for local, regional, and national use to provide jobs in the most cost-effective manner, while being sensitive to resource conditions such as the level of soil disturbance.

The Forest Plan includes direction to provide a sustainable flow of timber and associated wood products at a level that will contribute to economic stability and provide an economic return to the public. Wood material in the form of sawlogs and fiber will be utilized in a cost-effective manner, consistent with the various resource objectives environmental standards (Forest Plan goals pgs 24 –26, IV – 2).

Wildlife Habitat Development Need

The amount, patch size, and distribution of old forest (OF) habitat in the Mill Creek Subwatershed (project area) have declined from historic levels especially in the warm-dry and hot-dry upland forest biophysical environments (Table 1.2). Past harvest of large ponderosa pine and fire exclusion has resulted in a loss of the old forest single-stratum (OFSS) forest structure. Species such white-headed woodpecker depend on large open grown ponderosa pine stands associated with OFSS structure. There is a need to develop historic levels of OFSS forest habitat for these species (Upper Middle Fork Watershed Assessment, pgs 5 – 28).

Existing dense, low vigor stands are slowly developing large ponderosa pine stand structures. Stand densities are so high that competition for water, light, and nutrients is slowing and inhibiting growth to the larger tree size. Currently, approximately 3% of stands in the warm-dry biophysical environment are classified as OFSS. Historically 5 to 55% of this structure was estimated to exist. The hot-dry biophysical environment is totally lacking OFSS structure. Approximately 20 to 70% was estimated to exist historically (Table 1.2).

The desired condition is to provide sustainable habitat for those wildlife species that prefer OFSS forest structures at historic levels. There is the need to maintain and develop open, park-like stand conditions where this condition occurred historically and manipulate vegetation in a manner to encourage the development and maintenance of large diameter trees with open canopy structure (Regional Forester's Eastside Forest Plan Amendment 2, pg 8).

Fuels Hazard Reduction Need

The historic high frequency/low severity fire regime has changed in the warm and hot-dry upland forest biophysical environments**.** This fire regime controlled regeneration of fire intolerant species, maintained more open stand structures, maintained lower surface fuel loadings, and maintained low level impacts from insects and disease. Fire suppression and other forest management practices have altered these forest types resulting in a higher composition of fire intolerant species, more vertical and horizontal tree crown and canopy continuity, and higher levels of surface fuels. Reducing horizontal and vertical forested stand continuity and surface fuel loadings will reduce potential wildfire intensity and severity. There is a need for prescribed burning to reduce excess levels of fuels and promote fire tolerant species (Upper Middle Fork John Day Watershed Assessment, pgs 5 – 19).

Both the tree density and the proportion of fire intolerant fir species have increased from historical conditions. Due to a lack of periodic fire and insect and disease mortality, surface fuels have increased and are more continuous at these increased loadings across the landscape than historical conditions. High surface fuel loadings increases the potential flame length of a fire thereby increasing the chance of a surface fire moving into the crowns.

The past harvest of large ponderosa pine trees and the absence of periodic fire have resulted in dense, younger, often multi-layered stands composed of more fir trees and less pines and larches than historically occurred. Smaller understory trees and the lower branches of larger fir trees provide "ladder fuels" enabling wildfire to move into the tree crowns and increasing the probability for an active crown fire.

The denser tree stands provide a continuous path for crown fire to spread across long distances. Fire behavior and severity are dependent on the properties of the surface, ladder and canopy fuel quantities and continuity both horizontally and vertically.

The desired condition would be multi-strata and single-stratum structural stage with ladder fuels in dry upland forest types to occur in smaller proportion where several fire cycles have been missed. Fire tolerant ponderosa pine, western larch, and to a lesser extent, Douglas-fir are the dominant conifer species in the dry upland forest with large trees well represented. Surface fuel loadings are reduced and not continuous and this part of the project area is maintained by low intensity, frequent fire. These conditions reduce the probability of a crown fire that is not characteristic of the project area; improve conditions for successful fire suppression when needed, and improve the ability of forest stands to survive wildfire.

Viewshed Corridor Plan Implementation Need

The Crawford Project Area is part of the Highway 26 and Highway 7 visual corridors that cross the Malheur National Forest. In management of these areas, the Forest Plan recommends a

Corridor Viewshed Plan be completed outlining the existing and desired scenic conditions, as well as possible management opportunities. Viewshed corridor plans have been completed for both the Highway 26 (2000) and Highway 7 (1995) visual corridors. There is a need to implement the recommendations in these plans and move towards the desired condition identified in the Forest Plan. Specific recommendations in the Highway 7 plan include the use of thinning to improve stand health and tree vigor, and the reduction of tree stocking to promote the growth of large diameter trees. The Highway 26 viewshed plan recommends the use of thinning and prescribed fire to create more diverse distribution of trees in all diameters, and opening stands to accelerate growth of small and medium diameter pine trees.

Management Areas and Objectives

Relationship to the Forest Plan

This FEIS tiers to the Malheur National Forest Land and Resource Management Plan Final Environmental Impact Statement and Record of Decision (1990) and incorporates by reference the accompanying Land and Resource Management Plan (Forest Plan (1990), as amended. Amendments to the Forest Plan include, but are not limited to, the Regional Forester's Eastside Forest Plan Amendment 2, Interim Strategies for Managing Anadromous Fish Producing Watersheds (PACFISH), and the Pacific Northwest Region Final Environmental Impact Statement for the Invasive Plant Program, 2005. Forest Plan amendments are those analyses documented in the R6 2005 Invasive Plan FEIS and ROD; and environmental assessments for PACFISH and Eastside Screens. The Forest Plan, as amended, contains Forest-wide Standards and Guidelines as well as Standards and Guidelines for specific management areas.

Regional Forester's Eastside Forest Plan Amendment 2

Regional Forester's Eastside Forest Plan Amendment 2 (1995) provides Forest-wide Standards and Guidelines that contain direction for the development of timber sales. Amendment 2 changed standards for vegetation management (ecosystems), maintaining and enhancing late and old structure (LOS) for wildlife habitat, snag and down logs, goshawk habitat, connectivity of old forest, and riparian habitat.

Management Areas

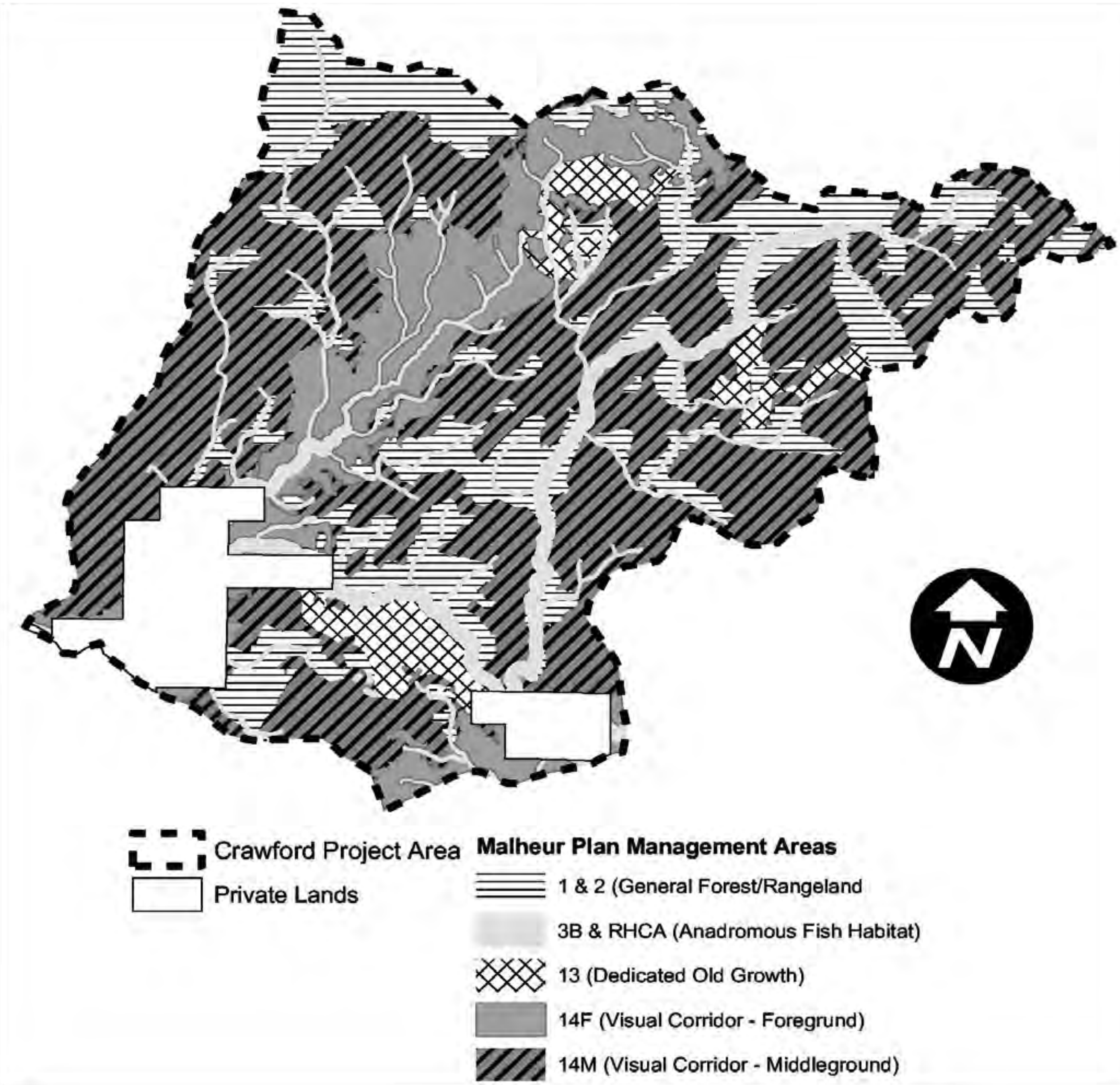
The Crawford Project Area includes approximately 14,950 acres of National Forest lands that are allocated in the Forest Plan, as amended; to management areas (see Figure 1.2). Management area designations overlap; when a specific segment of land falls under the goals or standards of two or more management areas, acres are assigned to the management area with more restrictive standards. Figure 1.2 on the following page is a description of management areas in the Crawford Project Area.

Land Allocations and Forest Plan Goals

Goals for this area are identified within the Forest Plan. Goals for these management areas have been amended since the Record of Decision was signed in 1990.

General Forest — MA–1 – 2,950 acres (19%) Emphasize timber production on a sustained yield basis while providing for other resources and values. Develop equal distribution of age classes to optimize sustained timber production. Manage at levels and intensities consistent with the schedules described in this Plan to provide for other multiple uses and resources.

Figure 1. 2. Malheur Forest Plan Management Areas within the Crawford Project Area.



Rangeland — MA–2 (the acreage is combined with MA–1) Emphasize forage production on non-forest areas on a sustained yield basis while providing for other resources and values.

Anadromous Riparian Areas — MA– 3B / RHCA – 1,621 acres (11%) Manage riparian areas to protect and enhance their value for wildlife, anadromous fish habitat, and water quality. Manage timber, grazing, and recreation to give preferential consideration to anadromous fish on that portion of the management area suitable for timber management, grazing, or recreation. Design and conduct management in all riparian areas to maintain or improve water availability and beneficial uses. Within riparian areas, low intensity, prescribed fire may be used as a tool to mimic natural conditions that have existed in these near stream areas for centuries prior to relatively recent fire exclusion. Low intensity prescribed fire will be allowed to back into approximately 122 acres of Category 1, 19 acres of Category 2, and 512 acres of Category 4 Riparian Habitat Conservation Areas (RHCAs) where conditions are more typical of upland than riparian ecosystems. However, prescribed fire will be excluded from approximately 265 acres of Category 1 and 4 RHCAs where riparian hardwoods are exhibiting improvement.

PACFISH introduced Riparian Habitat Conservation Areas (RHCAs) as an interim management area that overlays and supersedes the Forest Plan direction for managing anadromous riparian areas**.** RHCAs are portions of watersheds where riparian dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs include established riparian corridors, wetlands, intermittent streams, and perennial streams that help maintain the integrity of aquatic ecosystems by:

- Influencing the delivery of coarse sediment, organic matter, and woody debris into streams.
- Providing root strength for channel stability.
- Shading the stream; and protecting water quality.

Old-Growth Habitat – MA–13 — 721 acres (5%) Provide suitable habitat for old-growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities. Dedicated Old-Growth (DOG) is the term used when referring to areas chosen to manage for old- growth characteristics for old-growth dependent species. Replacement Old-Growth areas (ROGs) are chosen to provide future old-growth habitat if current designated stands no longer meet old-growth characteristics. Old-growth *management indicator species*[1] are pileated woodpecker and American marten.

Visual Corridor – MA–14 — 8, 463 acres (57%) Manage corridor viewsheds with primary consideration given to their scenic quality and the growth of large diameter trees. Visual quality objectives of retention, partial retention, and modification will be applied for other uses and resources. Visual Corridor plans have been developed for Highway 7 and Highway 26 as required by the Forest Plan.

Minimum Level Management – MA–16 — Non-forest and low productivity forest lands; provide the minimum management necessary to provide for resource protection and management of adjacent lands.

Other Ownership – Approximately 1,195 acres (8%) within the project area is in private ownership (see Figure 1.1). No activities are proposed on private lands, but conditions and actions on private lands are considered for cumulative effects.

Proposed Action

The proposed action is an alternative developed early in the NEPA planning process to accomplish stated purposes, needs, and goals based on the best information available at the time. It is the first alternative offered and is used to identify issues and develop other alternatives for further study. Alternative 2 described below and in Chapter 2, is a part of the activities included in the proposed action that was mailed to interested parties during public scoping in 1999.

[1] Species identified in the Malheur National Forest Land and Resource Management Plan (Forest Plan) that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.

Modifications to the original proposed action in this analysis have been made since the public scoping in 1999. This analysis now focuses only on the commercial harvest, precommercial thinning, prescribed burning, and road closure related activities identified in the original project in the Mill Creek Subwatershed (formerly identified as the Crawford and Mill Subwatersheds in 1999). Originally a small amount of harvest activities were proposed within four other adjacent subwatersheds in the Upper Middle Fork John Day Watershed. These changes were made to focus the analysis process. Additional modifications to the original proposed action include:

- Partial Removal and Regeneration Salvaged treatment methods are no longer proposed.
- Construction of new system roads was removed from proposed action. Temporary road construction is proposed, with all temporary roads being decommissioned after use.
- The original proposed action included skyline logging on steeper slope areas. Skyline harvest is no longer proposed. Ground-based harvest is proposed on slopes generally less than 35% with some small segments greater than 35%.

Why was this Proposal Developed?

The Interdisciplinary Team (IDT) developed this proposal following guidelines given by the Blue Mountain District Ranger. The goal of this project is to move vegetation towards a status closely resembling historical conditions while protecting or enhancing soil productivity and water quality. Road closure/decommissioning activities were proposed in order to protect water quality to decrease movement of sediment into streams. Road reconstruction and additional road maintenance was proposed to facilitate harvest activities while protecting other resources.

The Crawford IDT was also directed to consider recommendations described in the *Upper Middle Fork Watershed Analysis Report, Crawford Roads Analysis*, and the *Malheur Forest Roads Analysis* to implement restorative watershed activities, and to include a sub-forest scale roads analysis (per direction given in Forest Service Manual 7700).

Proposed Activities

The action proposal includes commercial thinning, shelterwood harvest, reforestation, small tree thinning (precommercial thinning), prescribed fire treatments, road closure and decommissioning projects. Nonsignificant Forest Plan amendments to reduce satisfactory cover below Forest Plan Standards, and to allocate and adjust old-growth management areas are proposed. Connected actions include transportation system improvements and use, temporary road construction, and fuels treatments associated with commercial thinning (slash disposal). On-going actions authorized by previous or concurrent decisions in and near the project area include: fire suppression rehabilitation, road management, invasive/noxious weed prevention, invasive/ noxious weed control, and grazing management.

Specifically the **Proposed Action** includes:

Commercial Harvest – 2,073 acres commercial thinning; 119 acres of shelterwood harvest; harvest volume of 6,800 thousand board feet (MBF); the harvest method would be ground based skidding systems. Existing roads used for log haul would be maintained (32.5 miles) or reconstructed (10.9 miles). No new specified road construction is proposed in association with any of the management activities included in this alternative. Approximately 8.6 miles of temporary road would be constructed for access. Temporary roads would be constructed in several short segments ranging from a few hundred feet to approximately a mile in length.

Temporary roads will be closed and subsoiled following logging. No temporary roads would be located within RHCAs and the majority (6.3 miles) would be located more than 500 feet from streams. A nonsignificant Forest Plan amendment is proposed to commercially thin 27 non-contiguous acres of satisfactory cover. Thinning activities would reduce satisfactory cover below Forest Plan Standards; this is needed to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands.

Reforestation Planting – 119 acres; remove undesirable trees that are less than commercial size, treat activity fuels, and plant understocked areas that are larger than ½ an acre with early seral tree species.

Precommercial Thinning – 935 acres of high density, multi-storied mixed conifer stands would be thinned.

Road Activities – Within the Mill Creek Subwatershed, 0.7 miles of open road would be closed to motorized vehicles with gates; 17.8 miles would be decommissioned. Minor amounts of road closures (0.8 miles) and decommissioning (0.2 miles) would extend into the adjacent Idaho/Summit Creek and Dry Fork Subwatersheds.

Approximately 2.1 miles (1.7 Mill Creek Subwatershed, 0.4 Dry Fork Subwatershed) of road currently closed would be reopened (see Appendix B, ATM Plan West map). This consists of two road segments that were closed in the early 1990s to reduce big game disturbance to help meet FP standards/objectives for open road densities in summer range. Monitoring has identified some problems associated with the closures. In both cases, damage to nearby environmentally sensitive areas can be reduced by reopening the road segments, which are not in environmentally sensitive areas. For the 7000255 segment a nearby unauthorized road is located in a meadow area and the public has been consistently driving around the attempted blockage causing rutting and meadow damage. The proposal is to decommission the unauthorized road and reopen the 7000255 segment, which would remove the incentive to drive around the blockage. For the 2600237 / 2600235 segment, closure forced use of a 2600237 road segment located in a riparian area. Use of the riparian road is causing resource damage and sediment concerns. The proposal is to decommission the riparian 2600237 segment and re-opening the stable upland 2600237 / 2600235 segment for public access.

Old-Growth Adjustment – Pileated Woodpecker Feeding Areas (PWFA) would be established. Three new ROGs designated and adjustment of the three existing DOGs; a nonsignificant Forest Plan amendment would be required to designate and adjust these areas.

Activity Fuels Reduction – 441 acres of yarding tops attached, 147 acres of hand piling, and 822 acres of grapple piling, 11 acres of yarding tops attached and hand piling, 55 acres of yarding tops attached and grapple piling, 563 acres of prescribed burning, and 16 acres of hand piling and prescribed burning would follow the completion of the commercial harvest or precommercial thinning activities. Additional acres of underburning would occur in commercial and precommercial thinning units to treat natural fuels (approximately 1,200 acres).

Prescribed Burning – 5,300 acres of low intensity prescribed burning. This includes 1,200 acres of underburning in commercial and precommercial thinning units, and 4,100 acres outside of mechanically treated units.

Further details of the proposed action (analyzed in this document as "Alternative 2") are presented in Chapter 2, along with descriptions of all alternatives considered or analyzed.

The proposed action helps move the project area towards desired conditions described in the Forest Plan. The proposals include design features or measures to make them consistent with the Forest-wide Standards and Guidelines of the Forest Plan. This EIS documents the site-specific implementation of the Forest Plan.

Activity Description and Objectives

Commercial Thinning and Precommercial Thinning Treatments

The proposal would decrease tree density by cutting predominantly fire intolerant species such as grand fir. Reducing selected tree densities would reduce the chance of extensive wildfire, change the species mix, and encourage growth of larger tree structure, moving the area toward a more resilient forest condition. Trees less than commercial size (generally 9 inches in diameter or less) would be cut as a post-harvest treatment to remove the suppressed understory and reduce the stocking level. Thinning treatments would include some existing wildlife connectivity corridors linking late and old structural habitat (LOS). More trees would be retained in connectivity corridors to maintain a denser stand structure for wildlife movement between LOS habitats.

Dry Forest Pine, Douglas-Fir Sites

The Dry Forest Pine sites in the Crawford Project Area are low in large trees (greater than 21 inch dbh) as compared to historic conditions. Stands are densely stocked and the growth of large diameter trees will be slow due to competition for moisture in the soil. There are also large numbers of small and mid size trees that presently occupy the understory of the site. These sites have a high basal area stocking which is made up of mostly small and mid diameter trees. The stand density (greater than 120 square feet basal area) exceeds historic stand densities, which averaged less than 50 square feet of basal area. These forested areas are at increased risk to insects, diseases and catastrophic fire.

The objective of the Crawford Project is to manage these sites to a condition more reflective of historic conditions, and to emphasize a shift to large diameter single-stratum trees of the appropriate species mix for the environment. In general, this would be achieved by removing the smaller diameter trees and retaining the larger diameter trees greater than 21 inch diameter at breast height (dbh). The basal area objectives are approximately 50 square feet per acre. Trees would be removed with a variable spacing to leave a range of patchy stand conditions with small openings to leave patches 2 to 5 acres in size. Table 2.4 in Chapter 2, Design Measures Section, shows the variable spacing that would be applied. The overall result would be a dry forest stand with larger average size trees, average basal area that reflects the historic condition, and stand structures that have a variability of spacing across the landscape. Trees greater than 21 inches dbh would not be removed. Stand structures would provide habitat for species dependent on open, mature ponderosa pine such as the white-headed woodpecker. This would meet the purpose and need by addressing species composition and structure of the vegetation to develop a trend toward more resilient historical vegetative conditions, while addressing the old forest single-stratum structure (OFSS) need for wildlife habitat.

Dry Forest Mixed Conifer Sites

The Dry Forest Mixed Conifer sites in the Crawford Project Area, are low in large trees (greater than 21 inch dbh), and have a high-level of late seral species (fir species), and dense understory, as compared to historic conditions. Some of the larger trees have achieved 21 inch diameter as a result of previous treatments. Stands are now densely stocked and growth of large diameter trees would continue to decline as competition for moisture in the soil increases. There are also large numbers of small and mid size trees that presently occupy the understory of the site. In addition these sites have a high basal area, which is made up of mostly small and mid diameter trees. The stand density (greater than 120 square feet basal area) exceeds historic stand densities, which averaged less than 80 square feet of basal area. These forested areas are at risk of increasing susceptibility to insects, diseases and severe wildfire.

The objective of the Crawford Project is to manage these sites to a condition that meets historic conditions (historic range of variation), and to emphasize a shift to large diameter single-stratum trees. In general, this would be achieved by removing the smaller diameter trees with variable density thinning, emphasizing retaining early seral species of pine and larch, and retaining the larger diameter trees. The basal area objectives are 65 square feet per acre and trees would be removed to leave a range of stand conditions. Table 2.4 in Chapter 2, Design Measures Section, shows the variable spacing that would be applied in dry forest mixed conifer sites.

The overall result from the harvest would be Dry Forest Mixed Conifer sites with larger average size trees, average basal area that is in the historic range of variability, species composition that are earlier seral and less fire susceptible and trees that have variability of spacing across the landscape. Trees greater than 21 inches dbh would not be removed. This would meet the purpose and need by addressing species composition and structure of vegetation to develop a trend toward more resilient historical vegetative conditions to reduce future fuel loadings. By decreasing density, remaining tree vigor and growth would be improved and trees would more likely retain full crowns. Treatments address the need to increase old forest single-stratum structural stage by reducing the understory and increasing tree growth rates. Treatments would favor the retention of early seral, fire tolerant species by removing late seral species. This would increase early seral species representation across the landscape. This action addresses the need to change species composition and increase the representation of early seral species.

Shelterwood and Reforestation Treatments

The proposal includes shelterwood harvest on 119 acres. This treatment is not proposed in any LOS stands. This prescription would remove undesirable trees from the middle and understory, thin desirable trees where they are over stocked, and reforest the resulting understocked areas. Undesirable trees are those that dependent on species or tree condition (insect, disease, damage) are not desirable for future management. Where suitable trees are available, a minimum of 20 trees per acre would be left to provide structural variety and future snag recruitment. Following the shelterwood harvest, there would be small Douglas-fir and grand fir trees remaining that are undesirable for future management. These small trees would be removed and non-stocked areas greater than ½ acre in size would be reforested with early seral species such as ponderosa pine and western larch tree seedlings. Planted areas would be monitored for growth and survival. Prior to planting, fuels created by the harvest and the cutting non commercial sized trees would be treated by grapple piling to reduce the fire hazard.

Fire and Fuel Treatments

All fire and fuel treatments address the need to reduce fuels and potential fire severity. There are several methods used to treat fuels. Those proposed with this project include commercial harvest, precommercial thinning, yarding tops attached, grapple piling, hand piling, burning piles, and prescribed fire. Yarding tops attached occurs during the harvest operations and brings material to the landing where it is piled and burned later if not utilized by some means. Grapple piling is done by a track excavator on slopes less than 35%. Piles are then burned when the potential for fire spread is minimal. Hand piling is primarily used on slopes greater than 35% with moderate to high fuel loads. Piles are also burned when the potential for fire spread is minimal.

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. Within the 5,300 acres, not all acres would be burned and there are different objectives for areas with resource concerns. Burning would be accomplished in the spring and fall seasons when weather and moisture conditions are appropriate and after much of the mechanical work is completed. These burn operations would be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fit to the grazing systems being used on the affected allotments to minimize impacts to the permittee's ranch operations.

Adjustments of Dedicated Old-Growth and Additions to Replacement Old-Growth

A nonsignificant Forest Plan amendment would be required to adjust the DOGs within the Crawford Project Area to allow for re-delineation and incorporation of suitable LOS habitats within these DOGs.

The designation of ROGs would incorporate suitable LOS or older structure stands to provide suitable replacement areas for the associated DOGs. PWFAs would also be delineated as appropriate to provide suitable foraging habitat for Pileated woodpeckers. See Appendix B for maps of proposed and existing DOGs, ROGs and PWFAs.

Table 1.3. DOG Adjustments and New ROG Delineation.

DOG # ROG #	Label on Map (App B)	Exiting (Acres)	Proposed (Acres)	Species Designation
DOG 134 ROG 134 Pileated Feeding Area	03134PW 03134PWRF 03134PWFA	382 0 0	395 256 83	Pileated Woodpecker
DOG 241 ROG 241	03241MM 03241MMRO	169 0	169 85	American Marten
DOG 335 ROG 335 Pileated Feeding Area	03335PP 03335PPRF 0335PPFA	273 0 0	317 179 154	Pileated Woodpecker, American Marten

Road Activities

The overall objective is to reduce road related impacts to water quality and fish habitat. To meet this objective, a number of roads currently closed to motorized vehicles would be decommissioned. The decommissioned roads would be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded (using native seed) and mulched (using weed free straw or hay), providing drainage for the road surface, and removing and disposing of a culvert. Many of these roads are within sensitive areas such as riparian habitat conservation areas.

The desired condition is to provide a road system that is safe, affordable, has minimal ecological impacts, and meets immediate and projected long-term public and resource management needs. The desired condition is largely based on Forest Plan, Malheur Forest Road Analysis, and the

Crawford Roads Analysis. The general Forest Plan direction for transportation system management states: "Roads will be planned, designed, constructed and maintained to the minimum level necessary to meet integrated land management objectives."

The Crawford Roads Analysis focused on recommendations for moving the areas transportation system towards desired conditions, as identified in the Upper Middle Fork John Day Watershed Analysis and in the Malheur Forest Roads Analysis (December 2004). Some roads, located in RHCAs that contribute to environmental impacts, not identified in the Forest Roads Analysis as needed for the Forest Transportation System, will be closed or decommissioned.

Many of the roads proposed for closures or decommissioning are potentially creating sediment that is being delivered into adjacent streams. About 5.8 miles of road would be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek. There is a need to minimize the effects of runoff and precipitation intercepted by road surfaces. Many of the roads causing the sediment problems are lacking adequate drainage structures or are not being maintained to design specifications. Decommissioned roads will be hydrologically disconnected from the drainage network and removed from the transportation system. The remainders of the roads to be decommissioned are outside of RHCAs and would be removed due to resource concerns, wildlife security, and decreases in funding to maintain roads. No funding has been available to improve the conditions of these roads for the last several years and while funding was projected to decrease, recent communication from the Regional Office indicates that funding may be available in the near future to address road conditions and decisions.

Approximately 2.1 miles (1.7 Mill Creek Subwatershed, 0.4 Dry Fork Subwatershed) of road currently closed would be reopened (see Appendix B, ATM Plan West Map). This consists of two road segments that were closed in the early 1990s to reduce wildlife disturbance. Monitoring has identified some problems associated with the closures. In both cases, damage to nearby areas can be reduced by reopening the road segments. For the 7000255 segment a nearby closed road is located in a meadow area and the public has been consistently driving around the established closure causing rutting and meadow damage. The proposal is to reopen the 7000255 segment, which would remove the incentive to drive around the closure. For the 2600237/2600235 segment, closure forced use of a 2600237 road segment located in a riparian area. Use of the riparian road is causing resource damage and sediment concerns. The proposal is to close the riparian 2600237 segment and re-opening the stable upland 2600237/2600235 segment for public access.

Decision Framework

Through this analysis the Forest Supervisor must decide:

- Which actions best implement the recommendations of the Upper Middle Fork John Day Watershed Assessment?
- How quickly to move the forest toward a more resilient condition (within or trending toward the Historic Range of Variability), and by which methods?
- Which recommendations from the *Malheur National Forest Roads Analysis* and *Crawford Roads Analysis* best reduce sediment risk while maintaining necessary access?
- What actions are most appropriate to reduce fire hazard, and crown fire potential?
- If the selected alternative is consistent with the Forest Plan and other applicable laws.

- If there is reasonable expectation that anticipated funding is adequate to complete any required monitoring evaluation of the project.

The proposed management activities are generally designed to be consistent with the Forest Plan (Malheur National Forest Land and Resource Management Plan, 1990); however, nonsignificant Forest Plan amendments would be needed to commercially thin approximately 27 acres of satisfactory big game cover habitat, and to adjust DOGs boundaries and ROGs.

Public Involvement

Public comments were received after four separate scoping requests. The original analysis began in the fall of 1993, and was called the Flat Analysis. Two scoping efforts were initiated during this season: during November, 1993 to alert hunters to the imminent project and in late October, 1993, to alert the general public. However, the analysis was delayed because of higher priority projects until April 1999, when it was renamed the Crawford Vegetation Management Project.

When the analysis resumed, the Upper Middle Fork John Day Watershed Report and its recommendations were included to define the purpose and need for the project. The formal scoping package was mailed to the public on May 21 and June 17, 1999.

These letters and correspondence are filed in the Crawford Project Record.

Additional public comments on the Crawford Project were received in 2000 and 2001 during comment periods on two different versions of the Crawford Vegetation Management Project EA. The comment letters and Forest Service response to these comments are in the project record.

A Decision Notice and FONSI were signed by Bonnie Wood, Malheur Forest Supervisor on April 26, 2002. This decision was appealed and then reviewed by the Appeal Deciding Officer, Richard Sowa. This review revealed that the analysis of cumulative effects was not sufficient to support the decision. The Forest Supervisor was directed to withdraw the decision.

Following the withdrawal of the decision, a Notice of Intent (NOI) was published in the Federal Register on October 9, 2003. The NOI asked for public comment on the scope of the analysis by November 15, 2003. One comment was received from Doug Heiken, Oregon Natural Resources Council (ONRC). Additional comments were provided by ONRC on January 31, 2006.

The project has been listed in the Malheur National Forest Schedule of Proposed Activities (SOPA) beginning in the winter of 2003 and subsequent quarterly SOPAs through the spring of 2008.

The analysis work on the Crawford Project was resumed in 2005. This delay was the result of Forest Planning Teams needing to work on high priority fire recovery projects. A Project Initiation Letter (letter of direction) was issued from the Blue Mountain District Ranger to the Team Leader and Interdisciplinary Team (IDT) on June 21, 2005. The District Ranger stated in this letter that there had already been substantial previous public comments received on past analysis projects in the Crawford Area. He felt this public involvement was adequate to continue the analysis without additional scoping. He directed the IDT to review all previous public comments received to date on the Crawford Project and past projects. After this review he asked the IDT to recommend any proposed changes to the key issues for his approval. To meet this direction, the IDT met in December 2005 to review the following:

- Comments received during initial scoping efforts. These comments were used to develop significant key issues in November, 2001 Environmental Assessment (EA),
- Public comments received during 30-day comment periods (November, 2001 EA),
- Appeal points on the November, 2001 Crawford EA and April 26, 2002 Decision Notice,
- Comments received on the October 9, 2003 Notice of Intent to Prepare an EIS.

Recommended refinements and changes to key issues were then approved by the District Ranger at later meetings. Notes from these meetings are available in the project record. Further discussion of Key Issues can be found in the section below.

Public comments received on the November, 2006 Draft Environmental Impact Statement are listed and addressed in Appendix E.

Coordination with Other Governments and Agencies

Tribal consultation is ongoing with three American Indian Tribes with ceded lands or traditional use areas in the Crawford Project Area (The Burns Paiute Tribe, The Confederated Tribes of the Umatilla Indian Reservation, and The Confederated Tribes of the Warm Springs Reservation of Oregon). The government-to-government consultation is being conducted under the terms of specific agreements with the individual tribes and includes regular contact and meetings as appropriate.

The Confederated Tribes of the Warm Springs Reservation provided comments on the initial Flat Planning Area scoping on December 23, 1997. When the project was renamed the Crawford Vegetation Management Project, a pre-scoping letter was sent to Tribal agencies on April 26, 1999, before the general public, in accordance with management direction. Comments were received by letter from the Burns Paiute Tribe on December 10, 2001, and The Confederated Tribes of the Warm Springs Reservation of Oregon on October 13, 2000.

Tribal interests also provided comments on the November 28, 2001 Crawford Environmental Assessment. Both the Burns Paiute Tribe and The Confederated Tribes of Warm Springs provided comments. From 2000 through 2002 several letters and phone calls took place between interested Tribes and the Forest Service.

Concurrent with the Notice of Intent (NOI) to publish an Environmental Impact Statement (EIS), letters were mailed on October 1, 2003 to The Confederated Tribes of Warm Springs, The Confederated Tribes of the Umatilla, and The Burns Paiute Tribe. The letter informed the three tribes that the Forest Service was starting to work on the project again and therefore would like to continue consultation. The letter summarized changes to the proposed action that would be made from the original EA and the proposed action in the EIS and provided a copy of the NOI.

The DEIS was mailed to tribal leaders and program managers of The Confederated Tribes of Warm Springs, The Confederated Tribes of the Umatilla Indian Reservation, and The Burns Paiute Tribe. No comments were received from any of the Tribes during formal DEIS notice and comment period.

Coordination has also occurred with Federal, State, and local government officials (see also Chapter 4). The National Oceanic and Atmospheric Administration-Fisheries (NOAA), and U.S. Fish and Wildlife Service have been kept informed of proposed activities. See details of listed species consultation in Chapter 3. Information has been provided to and exchanged with state agencies. Retired Grant County Judge Dennis Reynolds was provided with information on the proposal and was offered the opportunity to have the county be a cooperating agency, while he was in office.

Issues

Scoping is used to identify issues that relate to the effects of the proposed action. An issue is an unresolved conflict or public concern over a potential effect on a physical, biological, social, or economic resource as a result of implementing the proposed action and alternatives to it. An issue is not an activity; instead, the projected effects of the proposed activity create the issue. Issues are generated by the public, other agencies, organizations, and Forest Service resource specialists and are in response to the proposed action. Issues provide focus for the analysis of environmental effects and may influence alternative development, including development of project design measures and any additional mitigation measures. In this document issues are tracked and are used to display differing effects of the proposed action and alternatives.

The issues were separated into three groups for the purpose of this analysis: Significant issues (Key Issues), Analysis Issues, and Issues Eliminated from Detailed Study. The Council for Environmental Quality (CEQ) NEPA regulations give guidance (40 CFR Sec. 1501.7) to "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)." A definition of each issue group is discussed below:

Significant issues, otherwise known as key issues, for the Crawford Project came from the public, other agencies, organizations and businesses, and Forest Service Resource Specialists. Issues are defined as a point of discussion, debate, or dispute about environmental effects. Key issues are used to formulate alternatives, prescribe mitigation measures, and analyze environmental effects. Issues are "significant" because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict (40 CFR 1508.27).

Significant issue effects cannot be reduced by normal Best Management Prescriptions (BMPs) or Design Measures.

Analysis issues are defined as those directly or indirectly caused by implementing the proposed action; however, the effects could be reduced with normal BMPs and Design Measures and an alternative was usually not developed to address these analysis issues. However, these analysis issues would be tracked in the relevant resource area effects in Chapter 3 and in the Comparison of Alternatives section at the end of Chapter 2.

Issues Eliminated from Detailed Study are identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulations, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence.

The environmental consequences of the proposal are disclosed in Chapter 3 for each resource affected by the key issues and analysis issues. Each issue has indicators to allow members of the public and the Responsible Official to determine how well issues are addressed by the alternatives. A discussion of all issue groups, specific issues and the indicator(s) for each issue is given in Tables 1.4 and 1.5.

Key Issues

Table 1.4. List of Key Issues.

Key Issue Topic	Key Issue Statement and Issue Indicator (s)
1. Effects of road construction, commercial timber harvest, and prescribed burning on soil, water quality, and listed aquatic species habitat.	There is a concern that the proposed ground disturbing activities associated with road construction, commercial timber harvest, and prescribed burning could degrade water quality and impact soil productivity. These ground disturbing activities may also indirectly impact habitat for aquatic species including listed and sensitive aquatic species. Aquatic species of concern present within the project include summer steelhead, Chinook salmon, and redband trout. There is also historic bull trout habitat. Adverse soil impacts to soils could include detrimental soil compaction, soil displacement, sediment increases, impact to soil organisms, decrease of mycorrhizae fungi, and soil nutrient losses. Proposed harvest activities combined with past impacts including, past timber harvest and ongoing grazing may cumulatively affect water quality, including 303(d) listed streams. • Alternatives 3 and 4 were developed to address this key issue. Alternative 3 minimizes temporary road construction. Alternative 4 does not include any commercial timber harvest activities. • Measures or elements for evaluation: 1. Miles of temporary road constructed 2. Miles of temporary road constructed in RHCAs 3. Miles of log haul, road maintenance, and reconstruction in RHCAs 4. Equivalent Roaded Area 5. Acres of timber harvest 6. Detrimental Disturbed Soil Standard of <20% by unit 7. Fish Biological Evaluation/Biological Assessment (BE/BA) determinations by fish species 8. Prescribed burning affects on sediment and temperature
2. Effects of commercial thinning on satisfactory big game cover	Commercial thinning is proposed on approximately 27acres identified as satisfactory big game cover. Currently satisfactory cover is 2.5% of the Mill Creek Subwatershed, below the Forest Plan Standard of 12%. These forested areas provide some of cover habitat available for big game species (elk) in the project area. Thinning these acres would degrade the satisfactory cover by decreasing the tree density which in turn reduces the average canopy closure needed to maintain this standard. This thinning reduces the cover percentage further below Forest Plan Standards to approximately 2.4%. • Alternatives 3 and 4 were developed to address this key issue. Alternative 3 excludes commercial harvest in areas identified as satisfactory cover. Alternative 4 does not propose commercial timber harvest activities. • Measures or elements for evaluation: 1. Acres of commercial thinning in satisfactory cover. 2. Percent marginal cover, satisfactory cover, and total cover post-project. Comparison to Forest Plan Standard

Analysis Issues

Table 1.5. List of Analysis Issues.

Analysis Issue Topic	Analysis Issue Statement and Issue Indicator (s)
1. Effects of under-burning on calving/ fawning areas	There is a concern that underburning would impact elk calving/deer fawning areas. • A design measure to protect calving and fawning areas has been developed (see Chapter 2). • Measures or elements for evaluation: 1. Wildlife analysis for big game (impacts to calving and fawning)

2. Impacts of thinning on connectivity corridors	There is the concern that thinning young trees in connectivity corridors will degrade this habitat. • Harvest prescriptions were modified in connectivity habitat to maintain a denser forested stand following harvest. A minimum of 25% of each stand within connectivity corridors will remain untreated. See design measures, Table 2.4. • Measures or elements for evaluation: 1. Acres treated, 2. Percent treated by activity, 3. Comparison to Forest Plan Standard.
3. Effects of thinning and prescribed burning on neotropical migrant bird species	Many populations of neotropical migratory bird species are considered in decline (Saab and Rich 1998, Altman 2000, Sharp 1996). Habitat loss is considered the primary factor for population declines. There is an issue that commercial thinning and prescribed burning activities could contribute to further population decline. • Measures or elements for evaluation: 1. Wildlife analysis – impacts to landbirds including neotropical migrant bird species habitats (dry forests, riparian woodlands and shrublands, and shrub-step habitats).
4. Effects on Threatened and Endangered species and FS Sensitive Species	Terrestrial Threatened and Endangered and FS Sensitive species and their habitats could be affected by proposed activities, including Canada lynx, gray wolf, and bald eagle. • Measures or elements for evaluation: 1. Wildlife BE determinations and analysis for TES species.
5. Effects of harvest and burning activities on multi-strata old-growth dependent species	There is an issue that proposed harvest and burning activities could adversely affect the habitat of old-growth dependent species. Alterations in habitat components (canopy cover, understory density and structure) in these areas have the potential to alter the value for multi-strata associated species such as pileated woodpecker, American marten, three-toed woodpecker, and northern goshawk. • Measures or elements for evaluation: 1. Treatment acres in OFMS and young forest multi-strata (YFMS) 2. Percent old forest multi-strata (OFMS) in 50 years 3. Wildlife analysis impacts to multi-strata associated management indicator species.
6. Effects of timber harvest on white headed woodpecker habitat	Timber harvest could impact old-growth ponderosa pine forests which are white headed woodpecker habitat. • Measures or elements for evaluation: 1. Acres OFMS Converted to old forest single-stratum OFSS 2. Acres OFSS treated (will maintain as OFSS) 3. Acres treated that will develop OFSS in the future 4. Percent OFSS in 50 years 5. Wildlife analysis impact determination to white-headed woodpecker.
7. Effects on snag retention and primary cavity excavator species	Logging could impact snag numbers and primary cavity excavator species habitat. • Measures or elements for evaluation: 1. Post harvest snag density 2. Post prescribed fire snag densities 3. DecAID advisory tool results (tolerance levels) 4. Comparison to Forest Plan Standards.
8. Smoke impacts to local communities	There is a concern that smoke from prescribed burning would impact the local communities of Austin/Bates and Unity. • Design measures were developed to address this analysis issue and reduce the impacts of smoke to local communities. • Measures or elements for evaluation: 1. Smoke Emission. 2. Impacts to local communities.
9. Tree mortality caused by underburning	There is a concern that large tree mortality could be induced from underburning. • Design measures to lessen tree mortality have been developed. • Measures or elements for evaluation: 1. Estimated tree mortality by diameter class.

10. Burning effects on down wood and soil nutrients	There is a concern that prescribed burning would reduce the amount of large wood needed for wildlife habitat and soil nutrients. • Design measures to retain down wood have been developed (Tables 2.5 and 2.8). • Measures or elements for evaluation: 1. Comparison to Forest Plan Standard.
11. Effects on public access	The existing road system is currently being utilized by recreationists, hunters, firewood cutters, and range permittees. There is a concern that road closures would impact these uses. Roads provide access for those with disabilities. • Measures or elements for evaluation: 1. Open road density pre and post project, 2. Comparison to Forest Plan Standard.
12. Effects on Visual Quality	There is an issue that proposed harvest, temporary road construction, and burning activities would impact visual quality along Highway 7 and 26. • Design measures to lessen the visual effects along the highways have been developed (Table 2.11). • Measures or elements for evaluation: 1. Visual quality objective (VQO).
13. Effect on grazing permittee operations	There is an issue that the grazing permittee's operations would be adversely impacted (including rest needs after burning). • Design measures to lessen the effect to the grazing permittee have been developed (Table 2.15). • Measures or elements for evaluation: 1. Rest period after burning, 2. Change in forage.
14. Effects of invasive/noxious weeds	Proposed activities could increase the magnitude and distribution of invasive/noxious weeds. Commercial thinning, including the construction of temporary roads, could increase the risk of invasive/noxious weeds due to ground disturbing activities. Prescribed burning has the potential also to increase distribution of invasive/noxious weeds in areas where the ground vegetation is burned off and mineral soil is exposed. • A number of design measures to limit invasive/noxious weed establishment have been developed (Table 2.13). • Measures or elements for evaluation: 1. Miles of temporary road 2. Miles of road reconstruction 3. Invasive/noxious weeds within harvest units - acres 4. Invasive/noxious weeds within prescribed burning units - acres 5. Grapple piling - acres 6. Risk of spread (combined activities)
15. Fall burning impacts to recreation (hunting)	There is an issue that fall recreation (primarily hunting) will be impacted from burning activities. These impacts include dense odorous smoke near dispersed camping areas and active burning that will displace hunters and other recreationists from the affected dispersed campsites. • Measures or elements for evaluation: 1. Recreation analysis – impacts fall recreation.
16. Effects to Local Economy	There is an issue that the National Forest System lands need to support local community economics. This includes family income, business stability, and well being of the community. The commercial thinning should provide green timber to support the local economy. These impacts are discussed in Chapter 3, in the Social/Economic effects section. • Measures or elements for evaluation: 1. Present Net Value $$ Returned.

Issues Eliminated From Detailed Study

Table 1.6. List of Issues Eliminated from Detailed Study.

Issue Topic	Issue Statement and Rationale for Elimination
1. Effects of toxic poisoning of gophers and chemical herbicides	Toxic poisoning of gophers and chemical herbicides should be excluded. • Modifications were made from the 2001 EA to the 2007 FEIS. The proposed action no longer includes poisoning gophers or using chemical herbicides for reforestation actions.
2. Existing road impacts to water quality, aquatic species, and wildlife	Concerns were raised that existing roads will continue to impact water quality, aquatic species, and wildlife. Several native surface roads are located in riparian areas containing listed fish species. • Reducing existing road impacts to water quality and aquatic species is part of the stated purpose and need. Road closure, road decommissioning, and road reconstruction activities are proposed to address this purpose and need.
3. Effects on inventoried roadless areas	There is an issue that the Crawford Project may affect roadless, contiguous roadless or non-inventoried roadless areas greater than 1,000 acres. • As part of the Land and Resource Management Planning process (LRMP 46 CFR 219.27 (c)) the 1990 Malheur Forest Plan identified areas of at least 5,000 acres, without developed and maintained roads, and substantially natural conditions. These areas were called Inventoried Roadless Areas (IRAs). The IRAs for the Malheur National Forest can be found in Appendix C of the LRMP Final Environmental Assessment. • On 1/12/2001, the Department of Agriculture adopted the Final Roadless Area Conservation Rule (RACR), intended to protect and conserve inventoried roadless areas on National Forest System lands. Since adoption of the 2001 RACR, the term IRA has been defined to refer to areas identified in the set of maps published for the 2000 FEIS for that rule. The IRAs identified in the 1990 Malheur National Forest LRMP, Appendix C were included in the Final EIS RACR. • There are no IRAs within or adjacent to the Crawford Project Area, therefore, the proposed treatments are consistent with management direction regarding IRAs in the Malheur Forest Plan (1990).
4. Effects on potential Wilderness	The Malheur National Forest, in coordination with the Umatilla and Wallowa-Whitman National Forests, is involved in a tri-forest plan revision process, referred to as the Blue Mountain Forest Plan Revision. This process started in 2005 and there have been several reiterations of Forest wilderness potential inventory following the inventory criteria outlined in FSH 1909.12 Chapter 71. Existing inventoried roadless areas (IRAs) served as a starting point for the inventory. In order to be consistent with the other forests, the Malheur made the following assumptions: forest roads would be buffered at a distance of 300 feet and past timber harvest activities would not meet potential wilderness inventory criteria. A potential wilderness area is an area that qualifies for placement on the potential wilderness inventory if it meets criteria as outlined in Forest Service Handbook 1909.12, Chapter 71. This inventory of potential wilderness is not a land designation, nor does it imply any particular level of management direction or protection in association with the evaluation of these potential wilderness areas. It is completed with the express purpose of identifying all lands that meet the criteria for being evaluated for wilderness suitability and possible recommendation to Congress for wilderness study or designation. • During the Forest Plan Revision inventory process, maps were consulted to determine which areas met the potential wilderness inventory criteria. Areas with wilderness potential were inventoried in 2005, 2006, and 2007. Within the Crawford Project Area, no area was identified that met wilderness potential criteria as outlined in Forest Service Handbook 1909.12, Chapter 71. • For a project specific review, the Crawford Project Area was again reviewed for

	areas that met the potential wilderness inventory criteria, with the use of GIS generated maps, following guidelines in FSH 1909.12, Chapter 71. Due to the extent and location of forest roads and the amount of past harvest in the project area, the determination of "no areas identified that met wilderness potential criteria" was substantiated since the acres affected by the Crawford Project do not contain land of 5000 acres or more that do not contain forest roads, the acres cannot be preserved due to physical terrain and natural conditions, they do not contain acres that are self-contained ecosystems, nor are they contiguous to existing wilderness. Since there are no areas that meet the criteria, the Crawford Project would not remove any potential wilderness from inventory. • Although there is no potential wilderness meeting Forest Service criteria within the Crawford Project Area, since the start of the Blue Mountain Forest Plan Revision in 2005 public comments and proposals for wilderness have been received by the Blue Mountain Revision Team. One potential wilderness proposal by Oregon Wild, referred to in their proposal as the Upper Middle Fork John Day River, included a block of land within the Crawford Project Area.
5. Effects on areas with undeveloped character	Areas with undeveloped character include large areas without roads or other developments that may have special characteristics unique to that general area. • The Crawford Project Area was reviewed for areas of undeveloped character using GIS generated maps. Similar to the discussion in the Potential Wilderness section, due to the extent and location of forest roads and the amount of past harvest in the project area, there are no undeveloped areas within or adjacent to the Crawford Project that provide high quality or undisturbed soil, water, and air; sources of public drinking water; diversity of plant and animal communities; habitat for threatened, endangered, proposed, candidate, and sensitive species; and for those species dependent on large, undisturbed areas of land; primitive, semi-primitive non-motorized, and semi-primitive motorized classes of dispersed recreation; reference landscapes; natural appearing landscapes with high scenic quality; traditional cultural properties and sacred sites; nor other locally identified unique characteristics. • The project also meets low density recommendations identified by the Road Density Analysis Task Team Final Report (01/30/2002).
6. Effects of Livestock Grazing	Reduce the impacts of livestock grazing to allow establishment of ecological processes that will allow streams to recover. • Changes in livestock grazing will not be considered in this analysis however, the effects of grazing will be considered in the cumulative effects analysis. It is anticipated that after an area is prescribed burned, livestock grazing would resume after a rest period of one full growing season in accordance with the Forest's Post Fire Interim Grazing Guidelines (2003). See Table 2.15.

Laws and Regulations

This EIS adheres to the following legal requirements and coordination, and regulations:

Magnuson–Stevens, Fishery Conservation and Management Act, Public Law 94–265 as amended through October 11, 1996:

This Act governs the conservation and management of ocean fishing. It establishes exclusive U.S. management authority over all fishing within the exclusive economic zone, all anadromous fish throughout their migratory range except when in a foreign nation's waters and all fish on the Continental Shelf. Foreign fishing within these areas is prohibited unless conducted pursuant to a governing international fishery agreement and permit, and only if the foreign nation extends reciprocity to U.S. fishing vessels. The Act also establishes eight Regional Fishery Management

Councils responsible for the preparation of fishery management plans to achieve the optimum yield from U.S. fisheries in their regions

The Preservation of American Antiquities Act of 1906:

This Act makes it illegal to "appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated."

The National Historic Preservation Act of 1966, as amended:

This Act requires Federal agencies to consult with State and local groups before nonrenewable cultural resources, such as archaeological sites and historic structures, are damaged or destroyed. Section 106 of this Act requires Federal agencies to review the effects project proposals may have on the cultural resources in the project area.

The Endangered Species Act of 1973, as amended:

The purposes of this Act are to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section." The Act also states "It is further declared to be the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act."

The Migratory Bird Treaty Act of 1918:

The purposes of this Act are to establish an international framework for the protection and conservation of migratory birds. The Act makes it illegal, unless permitted by regulations, to "pursue, hunt, take, capture, purchase, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird" (16 USC 703). The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada). Later amendments implemented treaties between the United States and Mexico, Japan, and the Soviet Union (now Russia).

The National Environmental Policy Act (NEPA) of 1969, as amended:

The purposes of this Act are "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality" (42 U.S.C. Sec. 4321). The law further states "it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans" [42 U.S.C. Sec. 4331(a)]. NEPA establishes the format and content requirements of environmental analysis and documentation, such as the Crawford Project.

The National Forest Management Act (NFMA) of 1976:

This Act guides development and revision of National Forest Land Management Plans and has several sections to it ranging from required reporting the Secretary must submit annually to Congress to preparation requirements for timber sale contracts. There are several important sections within the act, including Section 1 (purpose and principles, Section 19 (fish and wildlife resource), Section 23 (water and soil resource), and Section 27 (management requirements).

The Clean Water Act, as amended in 1977 and 1982:

The primary objective of this Act is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental national goals: 1). Eliminate the discharge of pollutants into the nation's waters; and 2). Achieve water quality levels that are fishable and swimmable. This Act establishes a non-degradation policy for all federally proposed projects.

The Clean Air Act, as amended in 1990:

The purposes of this Act are "to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population; to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to State and local governments in connection with the development and execution of their air pollution prevention and control programs; and to encourage and assist the development and operation of regional air pollution prevention and control programs."

Multiple Use Sustained – Yield Act of 1960:

The Multiple Use – Sustained Yield Act of 1960 requires the Forest Service to manage National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be re-established and grown in again if the productivity of the land is not impaired.

Treaty with the Walla Walla, Cayuse, and Umatilla Tribes, June 9, 1855, and Treaty with the Tribes of Middle Oregon, June 25, 1855:

These treaties established "That the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians, and at all other usual and accustomed stations, in common with citizens of the United States, and of erecting suitable house for curing the same; also the privilege of hunting, gathering roots and berries, and pasturing their stock on unclaimed lands, in common with citizens, is secured to them." All actions to be taken must fully consider and comply with Native American treaty rights.

The project area falls within lands ceded by The Confederated Tribes of the Warm Springs Reservation and within lands that have an overlap of use with the Umatilla Tribes. These tribes have reserved rights to anadromous fish, and Federal court decisions have specifically established that the tribes have treaty rights to an equitable share of the Columbia Basin fishery resource (CRITFC 1995, Vol I, pgs 4–1 – 4–3).

Public law 92–488:

This law recognizes the Burns Paiute Tribe and their reservation. As a Federally recognized tribe, the Burns Paiute Tribe retains rights of inherent sovereignty. The project area is within the traditional and current use area of the Burns Paiute Tribe.

Migratory Bird E. O. 13186:

On January 10, 2001, President Clinton signed an Executive Order (E.O. 13186) titled "Responsibilities of Federal Agencies to Protect Migratory Birds." This E.O. requires that *"environmental analysis of Federal actions, required by NEPA or other established environmental review processes, evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern."*

Natural or Depletable Resource Requirements and Conservation Potential:

The Crawford Project has been designed to conform to applicable laws and regulations pertaining to natural or depletable resources, including minerals and energy resources. Regulations of mineral and energy activities on the National Forest, under the U.S. Mining Laws act of 1872 and the Mineral Leasing Act of 1920, are shared with the Bureau of Land Management. The demand for access to National Forest System lands for the purpose of mineral and energy exploration and development is expected to increase over time.

Environmental Justice:

On February 11, 1994, President Clinton signed Executive Order 12898. This order directs each Federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. On the same day, the President also signed a memorandum emphasizing the need to consider these types of effects during NEPA analysis. On March 24, 1995, the Department of Agriculture completed an implementation strategy for the executive order. Where Forest Service proposals have the potential to disproportionately and adversely affect minority or low-income populations, these effects must be considered and disclosed (and mitigated to the degree possible) through the NEPA analysis and documentation (see Environmental Justice, Chapter 3).

Prime Farmland, Rangeland, and Forestland:

All alternatives are in accordance with the Secretary of Agriculture Memorandum 1827 for prime farmland, rangeland, and forestland. "Prime" forestland is a term used only for non-Federal land, which would not be affected by proposed alternatives. Regardless of the alternative selected, National Forest System lands would be managed with sensitivity to adjacent private and public lands.

Floodplains and Wetlands (E. O. 11988 and 11990):

The purpose of these 1977 orders are to "…avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development…" and similarly "…avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands…" Wetlands that meet the Jurisdictional Definition (Corps of Engineers) are found in the Crawford Timber Sale Area. These areas will be mapped as described in the Mitigation and avoided during harvest and fuel treatments.

Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended):

This Act directed the Secretary of Agriculture to prepare a Renewable Resources Assessment and updates. These assessments include "an analysis of present and anticipated uses, demand for, and supply of the renewable resources, with consideration of the international resource situation, and an emphasis of pertinent supply, demand and price relationships trends." The USDA Forest Service Forest Inventory and Analysis unit provides updates for this assessment.

Executive Order 12962 (aquatic systems and recreational fisheries):

This 1995 Order's purpose is to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. It requires federal agencies to evaluate the effects of federally funded actions on aquatic systems and document those effects relative to the purpose of this order.

Executive Order 13112 (invasive species):

This 1999 Order requires Federal agency whose actions may affect the status of invasive species to identify those actions and within budgetary limits, "(i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species… (iii) monitor invasive species populations… (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded;… (vi) promote public education on invasive species…and (3) not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species…unless, pursuant to guidelines that it has prescribed, the agency has determined and made public…that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

Executive Order 13287 (preserve America):

This 2003 Order's intent is to preserve America's heritage through "actively advancing the protection, enhancement, and contemporary use of the historic properties owned by the Federal Government…The Federal Government shall recognize and manage the historic properties in its ownership as assets that can support department and agency missions while contributing to the vitality and economic well-being of the Nation's communities and fostering a broader appreciation for the development of the United States and its underlying values…"

Consumers, Civil Rights, Minorities, and Women:

All Forest Service actions have potential to produce some form of impacts, positive or negative, on the civil rights of individuals or groups, including minorities and women. An analysis of this potential impact is required by Forest Service Manual and Forest Service Handbook direction (see Socio-Economics, Chapter 3).

Facilitation of Hunting, Heritage and Wildlife Conservation (E. O. 13443):

The purpose of this 2007 Order is to direct Federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and the Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat. Federal agencies shall evaluate the effects of agency actions on trends in hunting participation; consider the economic and recreational values of hunting in agency actions; manage wildlife and wildlife habitats on public lands in a manner that expands and enhances hunting opportunities; and work collaboratively with State Governments to manage and conserve game species and their habitats.

CHAPTER 2. ALTERNATIVES

Introduction

Chapter 2 describes the proposed action and alternatives to the proposed action, including the No Action Alternative. This chapter also describes the measures necessary to mitigate environmental effects, identifies management requirements, develops monitoring plans, and shows a summary comparison of the alternatives as they relate to key issues and the purpose and need for action. Maps (labeled as figures) of alternatives considered in detail are included in a Map Section at the end of this FEIS. In the Map Section, figures that compare action alternatives were organized consecutively to make visual comparisons easy.

The Crawford Project FEIS incorporates information and relies on direction provided by the Malheur Forest Plan, as amended. All alternatives have been designed to adhere to State and Federal laws and regulations.

This chapter is divided into four major sections:

Alternative Development Process,
Alternatives Considered but Eliminated from Detailed Study,
Alternatives Considered in Detail, and
Comparison of Alternatives.

The affected environment and environmental consequences of implementing alternatives for the Crawford Project Analysis Area can be found in Chapter 3. The project record is referenced throughout this document and contains additional documentation and analysis.

Changes from Draft to Final EIS for this Chapter

The following changes were made between the DEIS and FEIS. The listing does not include corrections, explanations, or grammar and spelling corrections.

Table 2.1. Chapter 2 Changes between the DEIS and the FEIS.

	Change Items
1.	In all action alternatives (Alternatives 2, 3, and 4) the "Road Closure Decommissioning" section was updated to provide additional detail regarding the 2.1 miles of currently closed road that would be reopened (1.7 miles in the Mill Creek Subwatershed). Updates include the specific roads that would be reopened and additional rationale why the roads are proposed for reopening.
2.	In all action alternatives (Alternatives 2, 3, and 4) the miles of road maintenance, reconstruction, and closure were updated.
3.	Activity fuel treatments were clarified for Alternatives 2 and 3.
4.	A nonsignificant Forest Plan amendment was proposed (Alternative 2 – Proposed Action) in the DEIS to commercially thin 70 acres of satisfactory cover. Units classified as satisfactory cover in the DEIS were field reviewed during the summer of 2007. Portions of units 94 and 95 (43 acres) were determined to have less than 50% canopy cover, therefore do not meet the definition of satisfactory cover in the Forest Plan. The Proposed Action Alternative was modified to reflect this updated field information. A nonsignificant Forest Plan amendment to commercially thin 27 acres of satisfactory cover is proposed in the FEIS.
5.	Table 2.2: Approximate Acres Treated in Wildlife Connectivity Corridors per Alternative, was added.
6.	Various tables in Chapter 2 were updated.

7.	Additional alternative comparison tables were added at the end of the Chapter.

Alternative Development Process

This chapter of the FEIS describes in detail four alternative ways to manage land and resources in the Crawford Project Area. These alternatives were developed from public scoping comments and review by the project Forest Service interdisciplinary team (IDT). Public participation to review and comment on proposed activities began in April 1999 and continues with this FEIS. This initial 1999 project was identified as the Crawford Vegetation Management Project and was later renamed the Crawford Project. The proposed action was revised in 2005 using the Forest Supervisor's specific direction detailed in the Project Initiation Letter.

Based on comments received from the public and other agencies, direction given by Forest leadership, and through incorporating Forest Plan amendments, existing State and Federal laws, and Forest Service interim direction, the range of options/differences between alternatives is limited. The alternatives were designed to stay within the framework of ecological stewardship and the Malheur Forest Plan.

All the action alternatives described in the FEIS were developed with some common themes. All action alternatives would:

- Change the species composition and structure of the vegetation to develop a trend toward more resilient historical vegetative conditions (HRV),
- Implement a roads system that meets public and management access needs, while reducing the risk of sediment reaching streams while providing safe and adequate roaded access in the project area,
- Adjust Dedicated Old-Growth and Replacement Old-Growth boundaries to meet Forest Plan Standards, including Regional Forester's Eastside Forest Plan Amendment 2 which provides additional direction for protection of old-growth on and above the DOG/ROG network,
- Capture economic value of trees removed in meeting the purpose and need items above (Alternatives 2 and 3),
- Provide some level of employment to the local community,
- Reduce the effects of roads on wildlife and water quality,
- Apply water quality Best Management Practices (BMPs) in the design and implementation of the alternatives to protect water quality,
- Avoid effects on sensitive areas such as heritage sites and sensitive plant sites by not proposing harvest in those areas,
- Reduce future fuel hazards, and
- Implement visual corridor plans for Highway 7 and Highway 26.

Each action alternative analyzed in detail discloses environmental effects associated with its implementation, thereby facilitating a comparison of alternatives. This comparison of effects along with projected environmental consequences, detailed in Chapter 3, provides the Responsible Official with information needed to make an informed choice between alternatives.

Alternatives Considered but Eliminated from Detailed Study

Through the National Environmental Policy Act (NEPA) interdisciplinary process and public scoping, several alternatives may be investigated before settling upon those to be pursued through full analysis. Alternatives may be found to be beyond the scope of the project, impractical, or may require amendments that deciding officials do not wish to pursue with this action. The following are descriptions of alternatives considered but eliminated from detailed study and rationale for why they were not analyzed.

Designate Larger ROGs

The interdisciplinary team (IDT) considered developing alternatives that included set asides of new or larger DOGs and ROGs areas than those specified in the Forest Plan. Current research indicates that acreage sizes for old-growth in the Forest Plan may not be adequate for the species for which they are designated (American marten and pileated woodpecker). The designation of these areas would have required an additional Forest Plan amendment. Rather than address changes indicated by current research on a project-by-project basis, this issue is better dealt with in a future Forest Plan revision since it affects management area allocations and the entire old-growth network on the forest. Regional Forester's Eastside Forest Plan Amendment 2 provides additional direction for the protection of old-growth on and above the DOG/ROG network.

Require Winter Logging

The interdisciplinary team considered restricting ground skidding to frozen soil or snow covered conditions. Skidding under these conditions could lessen soil and visual impacts. Acknowledging the potential benefits of winter logging, this alternative was eliminated for several reasons. This alternative would have been more costly and potentially would have made commercial thinning uneconomical. Winter logging would conflict with snowmobile use on those portions of haul roads identified as snowmobile routes. Field soil surveys identified that the existing detrimental soil conditions range from 0 to 14%, with an average of 6%. This is well below the Forest Plan threshold of 20%. With proposed design measures in place (See Table 2.7) expected impacts of additional ground skidding would still maintain total soil disturbance below the Forest Plan threshold.

Prohibit Temporary Road Construction Adjacent Highway 7

The proposed construction of two temporary roads adjacent to Highway 7 would be visible in the foreground area for the short-term along the highway. To eliminate the need for these roads, an alternative was considered to either use a skyline system to bring the logs to upslope roads or build new spurs down into these same areas. This alternative was considered early in the process but was dropped from further consideration. The option to skyline yard these areas would require rigging cables across the highway which is a major operational and safety constraint. Bringing the access roads from existing upslope roads would require many more miles of road that would pose even a greater effect on the visual corridor.

Eliminate RHCA Log Haul

Log haul on existing roads within RHCAs has the potential to temporally increase sediment delivery into streams. Constructing new haul roads outside of RHCAs was considered to avoid this impact. Constructing new haul roads would potentially have a greater impact on soil and water quality, than utilizing existing roads in RHCAs with required protection measures to reduce potential impacts such as watering of the road surface to reduce dust, and maintenance or reconstruction of log haul roads to decrease the risk of sedimentation.

Construct New System Roads rather than Temporary Roads

Logging road access is needed into many of the proposed harvest areas. Either new system roads (specified roads) or temporary roads could be built into these areas to permit economically efficient timber harvest. The alternative to include the construction of new system roads was dismissed since they are more expensive to construct and are not needed for management activities for a long period of time. Construction of temporary roads was considered a better option since they would be decommissioned after use to reduce soil, water, and wildlife impacts.

Retain Current Motorized Vehicles Access

Public comments have requested that all current motorized vehicle access be maintained, stating the rationale that road closures limit public access to those individuals with physical limitations. An alternative to retain all existing drivable roads in an open status was considered but eliminated from detailed study for the following reasons. Approximately 1.5 miles of road currently open to public motorized vehicle access is proposed for closure. An additional 18.0 miles of road decommissioning is proposed to reduce road related impacts to water quality and fish habitat. Most of the roads proposed for decommissioning (approximately 17.7 miles) are currently closed to motorized vehicle travel. Approximately 2.1 miles (1.7 Mill Creek Sub-watershed, 0.4 Dry Fork Subwatershed) of road, currently closed, would be reopened (see Appendix B, ATM Plan West map). This consists of two road segments that were closed in the early 1990s to reduce big game disturbance to help meet FP standards/objectives for open road densities in summer range. Monitoring has identified some problems associated with the closures. In both cases, damage to nearby environmentally sensitive areas can be reduced by reopening the road segments, which are not in environmentally sensitive areas. For the 7000255 segment a nearby unauthorized road is located in a meadow area and the public has been consistently driving around the attempted blockage causing rutting and meadow damage. The proposal is to decommission the unauthorized road and reopen the 7000255 segment, which would remove the incentive to drive around the blockage. For the 2600237 / 2600235 segment, closure forced use of a 2600237 road segment located in a riparian area. Use of the riparian road is causing resource damage and sediment concerns. The proposal is to decommission the riparian 2600237 segment and re-opening the stable upland 2600237 / 2600235 segment for public access. The roads proposed for closure and decommissioning would have minimal impact on the primary access needs and uses in the area. These include hunting, grazing permittee access, winter recreation, firewood cutting, and power line maintenance.

Relocate FS 2620 Road to Reduce Impacts to Fish Habitat (Main Crawford Creek Road)

An alternative was considered to relocate FS Road 2620 outside of the RHCA to reduce impacts to fish habitat. This alternative was eliminated from detailed study for two primary reasons. The

Malheur Roads Analysis (Appendix A) identified FS Road 2620 as a part of the minimum primary road system for the Malheur National Forest. Minimum primary roads have high recreation or other resource values. Relocation of the road would require a very complex and costly analysis. Line officer direction was given to the interdisciplinary team to not consider closure of the road at this time. FS Road 2620 would be maintained during log haul to minimize impacts from use.

Increase Timber Harvest

Additional harvest areas were identified in the 2001 Crawford Proposed Action. These included stands on steeper slopes exceeding 35% (approximately 150 acres) and areas where road access is very limited (approximately 600 acres). In both areas, average forest stand diameters are very small, 7 to 9 inches dbh. These areas were dropped for harvest consideration primarily due to logging economics. The cost of skyline yarding the steeper slopes and construction of long temporary or specified roads made commercial thinning economically unfeasible at this time. These areas also provide valuable security habitat for big game species, and potential connectivity habitat for wide ranging carnivores.

Alternatives Considered in Detail

The alternatives were developed based on varying responses to the key issue discussed in Chapter 1, with actions that respond to meeting purpose and need and design features and mitigation requirements related to the issues and public concerns. Four alternatives were considered, fully developed, and analyzed. These are:

- Alternative 1 – No Action,
- Alternative 2 – Proposed Action,
- Alternative 3 – Alternative to the proposed action. In this alternative, temporary road construction lengths would not exceed 1/10 of a mile or approximately 500 feet. The average skidding distances would be increased to reduce the amount of temporary road needed. Alternative 3 addresses public concerns relating to water quality and soil, and impacts from new road construction (including temporary roads). By restricting the length of temporary roads allowed for harvest access, it was necessary to delete some harvest units requiring very long and uneconomical skidding distances. Alternative 3 excludes harvest in areas designated as satisfactory big game cover. Portions of six commercial harvest units included in Alternative 2 are located in satisfactory cover and were deleted from Alternative 3. Actions proposed in Alternative 2 for road closures, road decommissioning, prescribed burning, and Dedicated Old-Growth adjustment activities are the same in this alternative; and
- Alternative 4 – Alternative to the proposed action. In this alternative no commercial thinning or temporary road construction would occur, instead only the small trees would be precommercially thinned in those units identified in Alternative 2 for commercial thinning. This is in response to public comments that expressed concerns that logging activities would further degrade water quality, and impact soil productivity and habitat for aquatic species. Proposed road closure/decommissioning, prescribed burning, and old-growth re-adjustment activities identified in the proposed action are the same.

The following major features are described, particularly as they differentiate the alternatives. The management requirements, constraints, and mitigation and monitoring are combined for the three action alternatives at the end of the chapter.

- Commercial Harvest
- Road Use during Harvest
- Precommercial thinning
- Activity Fuels Treatments
- Prescribed Burning
- Road Closures and Decommissioning
- Old-Growth Adjustment
- Management Requirements, Constraints, and Mitigation Measures
- Monitoring

Alternative 1 – No Action Alternative

Purpose and Design:

The No Action Alternative is required by NEPA. In this document the No Action Alternative means the proposed project (which includes all activities identified in the proposed action) would not take place at this time. Alternative 1 is designed to represent the existing condition. It serves as a baseline to compare and describe the differences and effects between taking no action and implementing action alternatives.

Ongoing management practices and activities such as motorized access travel management, road maintenance, dispersed recreation, invasive/noxious weed management, fire protection, and livestock grazing would be allowed to continue in the project area.

Description of Specific Features:

Commercial Harvest/Road Use
- None

Precommercial thinning
- None

Activity Fuels Treatment
- None

Prescribed Fire
- None

Road Closures and Decommissioning
- No Change from existing situation of open and closed roads

Old-Growth Adjustments
- No change from the existing allocations.

Alternative 2 – Proposed Action

Purpose and Design:

This alternative was designed to meet the purpose and need for action and was developed from the recommendations in the Upper Middle Fork John Day Watershed Assessment and management direction in the Malheur Forest Plan. The development rationale is included in Chapter 1.

The following are Alternative 2 activity descriptions. Specific design measures and monitoring requirements are listed at the end of Chapter 2. A listing of each harvest unit can be found in Appendix A and a map of the harvest units and road closure/decommissioning in Appendix B.

Activity Descriptions:

Commercial Harvest

- Commercial Thinning – 2,073 acres
- Shelterwood Harvest – 119 acres

There are two different harvest prescriptions that would be implemented with the alternative, commercial thinning and shelterwood harvest. Both harvest prescriptions would be completed using ground based harvest systems. The commercial thinning prescription promotes ecologically appropriate compositional and structural conditions in order to increase resiliency and promote development of structural and wildlife habitat conditions currently lacking across the area and watershed as a whole. Commercial thinning would harvest merchantable tree in immature forest stands by thinning from below to reduce stocking levels to enhance tree growth and to allow for the reintroduction of fire. This treatment would thin small/medium size trees (7 to 20.9 inch dbh). An additional objective in mixed species stands would be to select for retention of ponderosa pine and western larch. It's designed to reduce the competition among trees for sunlight, water, and nutrients resulting in more vigorous, healthier forest stands. Trees would be left at a varied spacing, with the density varying as much as 50% across the stands. Table 2.4 in Chapter 2, Design Measures Section, shows the variable spacing that would be applied in dry forest types and dry forest mixed conifer sites. In addition, 5 to 15% of the understory will be left in unthinned patches from 2 to 5 acres in size for wildlife cover.

A portion of the commercial thinning areas are located within wildlife connectivity corridors. The objective is to reduce stocking in these stands while retaining sufficient trees per acre to provide denser forest stands than the surrounding area for security. To meet Forest Plan wildlife connectivity standards, fewer trees would be thinned to retain a higher density and clumps of trees would also be designated. Specifically, the canopy cover is to be left in the upper 1/3 of the site potential.

Table 2.2. Approximate Acres Treated with Commercial Harvest and Precommercial Thinning in Wildlife Connectivity Corridors per Alternative.

Alternative 1 No Action-Acres Treated	Alternative 2- Preferred Alternative	Alternative 3	Alternative 4
0	257	187	177

Commercial thinning would also occur in approximately 88 acres of Replacement Old-Growth. The objective of thinning is to reduce stocking to increase resiliency of the area for the long-term and accelerate growth and the development of large trees. Instead of rigidly thinning from below, the objective will be to thin trees from each size class to encourage the development of a multi-storied stand. All trees that are over 21 inch dbh will be retained to provide structural diversity, regardless of their condition.

Commercial and precommercial thinning would occur in approximately 61 acres of Late and Old Structures. Acres treated would enhance the LOS, and there would be no net loss of LOS. Five acres of old forest multi-strata (OFMS) are included as small pieces in several units that are predominately comprised of young forest structure. Five acres of OFMS in the hot-dry biophysical environment would be converted to old forest single-stratum (OFSS) after thinning. The hot-dry biophysical environment is currently above HRV in the OFMS structure and below HRV in the OFSS structure

Commercial thinning to improve the sustainability of the multi-structure on 39 acres of OFMS (unit 78) is proposed in the cool-dry biophysical environment. The cool-dry biophysical environment is currently within HRV. Approximately 17 acres of OFSS would be commercially thinned to reduce the understory and maintain the OFSS structure. This would occur in the warm-dry biophysical environment. The acres are small pieces of several units.

Other than those treatments described above all other proposed thinning and shelterwood treatments are located in non LOS stands and are designed to manipulate vegetation towards appropriate late and old structure in the future.

A nonsignificant Forest Plan amendment is proposed to commercially thin 27 acres of satisfactory cover. The area is already below Forest Plan standards for satisfactory cover. Thinning activities would further reduce satisfactory cover below standards to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Most of the treatments would occur in dry forest types. These stands are considered outside the historic range of variation (HRV), i.e., overstocked and likely unsustainable given the increasing risk of uncharacteristically severe fire and insect epidemics. These areas would likely fall out of cover within the next 25 years if not treated. Hiding/security cover patches would be maintained in all proposed units to minimize effects.

The shelterwood harvest would remove less desirable trees from the middle and understory, thin desirable trees where they are over stocked, and reforest the resulting understocked areas. Shelterwood harvest would occur outside of late and old structures (LOS). The intent is still to maintain and/or enhance LOS components in the stands subject to timber harvest as much as possible.

Both the commercial thinning and shelterwood treatments would include the following design features:

- All trees 21 inches and larger in dbh would be retained, except where they present a safety hazard or operational constraint such as in the construction of temporary roads and landings during logging operations.
- There will be no net loss of old forest structures (OF) only a change in the types of OF structure. This includes converting very small amounts of OFMS to OFSS where ecologically appropriate.
- Existing snags 12 inches or larger in dbh will be retained except where they present a safety hazard.
- No harvest activities would occur within RHCAs.

Road Use during Harvest

- Temporary road construction – 8.6 miles. Temporary roads would be constructed in several short segments ranging from a few hundred feet to approximately a mile in length. All temporary roads would be located outside of RHCAs.
- Road reconstruction – 10.9 miles.

- Road maintenance – 32.5 miles.

In order to accomplish timber harvest activities, road reconstruction, temporary road construction, and road maintenance would occur to provide adequate access for harvest and to meet safety and resource protection needs. Appendix C identifies each road proposed for log haul under Alternative 2.

Most of the National Forest System land in the project area is roaded with the majority of the roads being Maintenance Level 1 and 2 (native surface or gravel). All of the roads will need some work done to meet maintenance standards. This work will range from simple maintenance to reconstruction. None of this work would be done in a stream. The culvert work would be on a ditch relief culvert, not a stream culvert.

On most roads, the roadway surface is either rutted or has rill erosion, or both, which is caused by water running down the roadway or rutting made by the passage of a vehicle. This allows sedimentation to filter into adjacent streams.

Road surface maintenance needs include blading to reshape the surface. Most roads in the project area will need this work done. Other maintenance items needed, includes brushing areas where there is vegetation encroaching on the road and seeding those areas where the soil has been disturbed by maintenance activities. Road maintenance and reconstruction activities may include rock haul.

The following examples of work can be performed as maintenance in any contracts:

- Blading and shaping the road surface including existing drainage dips, grade sags, and waterbars,
- Repair of a damaged culvert,
- Placing rock in some existing drainage dips and grade sags,
- Placing rock in wet areas of road,
- Brushing of small trees and shrubs along the edge of the road,
- Removal of hazard trees, and
- Watering of roads to reduce dust during log haul (dust abatement).

The following work is classified as maintenance under the definition listed in the Federal Register and is examples of the work that would be listed as reconstruction in any contracts that are issued.

- Constructing new drainage dips,
- Constructing new waterbars,
- Constructing new outlet ditches,
- Placing geotextile on existing road surface,
- Placing fill material in ruts in road,
- Repair or replacing existing cattle guards, and
- Removing small trees and stumps.

Temporary roads would also be needed to support timber harvest. All temporary roads would be decommissioned after use. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. This will include subsoiling and seeding as necessary.

Precommercial Thinning

- Precommercial thinning – 935 acres

Following timber harvest, areas with remaining high density would be thinned by further removal of small diameter trees (generally less than 9 inches in diameter) to achieve desired stand conditions. The precommercial thinning prescription is recommended where the small trees to be cut are not merchantable saw log sized material. The objective is to reduce ladder fuels by reducing the amount of live or dead fuels, and increasing tree growth.

Reforestation

- Conifer Planting – 119 acres

Following the shelterwood harvest, areas that are understocked and greater than ½ acre in size would be planted with early seral (ponderosa pine and western larch) tree seedlings.

Activity Fuels Treatments

- Yard tops attached – 441 acres
- Hand pile – 147 acres
- Grapple pile – 822 acres
- Yard tops attached and hand pile – 11 acres
- Yard tops attached and grapple pile – 55 acres
- Prescribed burning – 563 acres
- Hand pile and prescribed burning – 16 acres (hand pile is in visual area)
- No treatment - 138

The activity fuels treatments in Alternative 2 include yard tops attached, hand piling, grapple piling, and prescribed burning. Yarding tops attached is done during the logging operations and brings tree tops to a landing, where they are piled and burned or allowed to be used commercially as chips or firewood. Grapple piling is done with a grapple on a low ground pressure (less than 8 pounds per square inch [psi]) track excavator on slopes less than 35%. Grapple piling is used in areas with moderate to high fuel loads. Piles are burned when sufficient fuel moisture is achieved to minimize fire spread. Grapple machines minimize ground disturbance and compaction. Hand piling is primarily used on slopes greater than 35% with moderate to high fuel loads. Piles are burned when sufficient fuel moisture is achieved to minimize fire spread. Prescribed burning is used in areas with light fuel loads. No treatment is recommended when fuels loads are very light. The acres of prescribed burning above are reflected in the 5,300 acres of prescribed burning below. Additional acres of underburning, to those listed above, would occur in commercial and precommercial thinning units to treat natural fuels (approximately 1,200 acres). These acres are reflected in the 5,300 acres of prescribed burning discussed below.

Prescribed Fire

Prescribed burning – Approximately 5,300 acre perimeter which includes:

- Excluding fire from approximately 753 acres
    - 450 acres of DOG (including 03134PW and a portion of 03335PP)
    - 14 aspen sites of approximately 27 acres
    - 11 research plots (approximately 11 acres)

    - 265 acres of RHCA (Category 1 and 4)
- Allowing fire to back into approximately 1,100 acres (RHCAs, non-forested stands)
- Lighting approximately 3,400 acres

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. There are two burning objectives as described below. Burning would be accomplished in the spring and fall seasons when weather and moisture conditions are appropriate and after much of the mechanical work is completed. Multiple prescribed burning entries may be needed to reduce the ladder and surface fuels to reach the desired fuel composition, which has increased beyond historical conditions, and allow for future management of natural ignitions. Ignition would be by hand or would be by ATVs. The prescribed fire perimeter is comprised of roads and all other interior control lines would primarily be roads. An estimated 1.5 miles of hand line may be used as a control line around and adjacent to private lands and to tie road to road. Hand line, in addition to that described, may be needed to exclude fire from aspen, Dedicated Old-Growth (DOG), research plots or identified RHCAs, if roads are not used. (See Appendix B for a map of the prescribed burning area.)

Within the 5,300 acre burn boundary, approximately 67% is within the warm-dry plant association group and approximately 9% is within the hot-dry plant association group. This 76% (warm-dry and hot-dry plant association groups) of the burn area is fire regime 1, historically seeing low intensity, frequent fire. The other stands are within the cold-dry plant association group (approximately 10%), cool-dry plant association group (approximately 3%), and non-forest (approximately 10%). Under this alternative, approximately 1,200 acres would be thinned prior to burning inside of commercial and precommercial thinning units. The remaining 4,100 acres of prescribed burning would occur outside of mechanically treated units.

No more than 3,000 acres would be burned using prescribed fire during any one year. Burning would occur in three grazing allotments (see Table RL – 3. Prescribed Burning Acres by Allotment) and be limited during any one year to one grazing pasture. The recovery of vegetation, including forage production and species diversity, would be monitored after prescribed burning to ensure the areas are ready to support livestock grazing on a sustainable level. These burn operations would be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fitted to the grazing systems being used on the affected allotments to minimize impacts to the permittee's operations. It is anticipated that after an area is burned, live-stock grazing will resume after a rest period of one full growing season in accordance with the Forest's Post Fire Interim Grazing Guidelines (2003). Following this rest a District IDT will determine if forage recovery and species diversity is sufficient to resume grazing. (See Table 2.15).

During project implementation, underburning will adhere to the Oregon Smoke Management Plan and the State implementation Plan of the Clean Air Act. (See Table 2.17).

General Burning Objectives

The objectives of utilizing prescribed fire are to reduce surface fuels, reduce litter depth, and increase canopy base height. Prescribed fire is not being utilized to change the structural stage of any the stands. Some tree mortality is expected and acceptable in forested stands. Acceptable mortality ranges are as follows:

- Trees 0 – 5 inch dbh, tree mortality is expected to range from 5 to 15%.

- Trees 5 – 10 inch dbh, tree mortality is expected to range from 5 to 10%.
- Trees 10 – 20+ inches and larger dbh, tree mortality is expected to range from 1 to 5%.

These mortality levels are based on averages over the whole burning area and recognize the fact that fire is a relatively inexact tool and that there would be some localized areas where mortality reaches 100%. Mortality patches should be kept to less than 2 acres wherever possible and preferably to the ¼ to ½ acre size that was thought to exist under historic conditions (Agee, 1993).

Methods used to exclude fire include but are not limited to the use of roads as control lines, fire line construction, or using water to wet-line.

RHCAs, Replacement Old-Growth (ROG), late and old structure (LOS), and satisfactory cover burning objectives:

- RHCAs – approximately 653 acres
  - 122 acres of Category 1
  - 19 acres of Category 2
  - 512 acres of Category 4
- ROG – 340 acres
- Late and old structure – 425 acres
- Satisfactory cover – 135 acre

Within the RHCAs identified to let fire back into, ROGs, late and old structure stands, and satisfactory cover stands, the objective of utilizing prescribed fire is to reduce surface fuels and litter depth. Prescribed fire is not being utilized to change the structural stage or canopy cover of the stands in these identified areas. Some tree mortality is still expected and acceptable in these forested stands but is less than in the general forest. Acceptable mortality ranges are as follows:

- Trees 0 – 10 inch dbh, acceptable tree mortality is up to 5%.
- Trees 10 inches and larger dbh, acceptable tree mortality is up to 2%

Also within the 5,300 acres, lighting would not occur but fire would be allowed to back into approximately 500 acres of non-forested stands and into RHCAs. The non-forested acres typically have minimal fuel loads which are discontinuous and therefore rarely burn. Past district experience has shown that when fire is allowed to back into RHCAs the effects are dependent on the existing vegetation. As soon as vegetative species and moisture regimes within the RHCA change and become more shaded with more moisture and higher humidity, the fire would not burn, so riparian vegetation is rarely affected. Shrubs and conifers providing streamside shade and riparian vegetation are rarely affected because they do not burn with enough intensity to cause mortality.

Approximately 340 acres of ROG are within the 5,300 acres. Prescribed fire in this area would also minimize loss of snags and large down wood.

Approximately 425 acres of late and old structure (LOS) are within the 5,300 acres and not within the DOG. Methods to protect large trees can include raking the litter and bark accumulation away from the base of the tree, not burning areas where concentrations of large trees exist, and burning when duff moistures under the larger trees is 120% or greater which has been determined to not cause damage to the base of the tree (Scott, 2002).

Approximately 135 acres providing satisfactory cover are within the 5,300 acres. Much of the identified satisfactory cover is also LOS. Underburning in these areas would retain multi-storied stand characteristics and high canopy closures. After implementation, these areas would still meet the requirements of satisfactory cover. Emphasis would be placed on minimizing under-story tree mortality to less than 5% since the understory is currently providing big game security cover. If moisture conditions or other burn parameters for meeting the acceptable mortality limits can not be met in any given year, the burn boss may decide to exclude fire from these 178 acres. This is acceptable, although surface fuels won't be reduced in these stands. (See Table 2.5).

Road Closures and Decommissioning

- Gated closures – 1.5 miles (0.7 Mill Creek Subwatershed, 0.8 Idaho/Summit Creek)
- Decommissioning – 18.0 miles (17.8 Mill Creek Subwatershed, 0.2 Dry fork Subwatershed)
    - Closed roads – 17.7 miles (17.5 Mill Creek Subwatershed, 0.2 Dry Fork Subwatershed)
    - Currently open roads – 0.3 miles (0.3 Mill Creek Subwatershed)
- Opening of closed roads – 2.1 miles (1.7 Mill Creek Subwatershed, 0.4 Dry Fork Subwatershed)

The new road closures would be gated or signed and restrict yearlong use to motorized vehicles. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. Over 90% of these roads are already closed. The decommissioned roads would be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, drainage provided for the road surface, and a culvert will be removed from the decommissioned road. Conifers will be planted on decommissioned road segments located in RHCAs where conditions will support establishment and growth. These roads will be removed from the Forest Road Transportation System.

Proposed decommissioning activities will also include removal of one culvert on Forest Service Road (FSR) 2620156, ripping/subsoiling and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use and ensure that proper drainage occurs over time.

Approximately 2.1 miles of road currently closed would be reopened (see Appendix B, ATM Plan West Map). This consists of two road segments that were closed in the early 1990s to reduce wildlife disturbance. Monitoring has identified some problems associated with the closures. In both cases, damage to nearby environmentally sensitive areas can be reduced by reopening the road segments, which are not in environmentally sensitive areas. For the 7000255 segment a nearby unauthorized road is located in a meadow area and the public has been consistently driving around the attempted blockage causing rutting and meadow damage. The proposal is to decommission the unauthorized road and reopen the 7000255 segment, which would remove the incentive to drive around the blockage. For the 2600237 / 2600235 segment, closure forced use of a 2600237 road segment located in a riparian area. Use of the riparian road is causing resource damage and sediment concerns. The proposal is to decommission the riparian 2600237 segment and re-opening the stable upland 2600237 / 2600235 segment for public access.

Table 2.26 displays the miles of road proposed for closure in the Mill Creek Subwatershed. Additional maps and summary information regarding road closures and decommissioning can be found in Appendix B and Appendix C.

Old-Growth Adjustments

Alternative 2 would require a nonsignificant Forest Plan amendment to adjust three DOGs and delineate three new ROGs within the Crawford Project Area (see Appendix B for map). The DOG adjustment is needed to better delineate suitable wildlife habitat (see Table 1.3 and Table 2.27). Currently, no ROGs have been allocated to be managed as replacement areas for associated DOGs (see Table 1.3 and Table 2.27).

Proposed Forest Plan Amendments

This proposed action would require two Forest Plan Amendments. Forest Plan amendments relate to satisfactory cover and old-growth area adjustments. Proposed amendments are noted in Table 2.3.

Table 2.3. List of Proposed Forest Plan Amendments.

FP Item #	Description of Proposed Forest Plan Amendment
Wildlife 1	Forest Wide Standard – Satisfactory Cover • Existing Standard: Forest-Wide Standard #28, pg IV-27, – The elk cover standard (satisfactory cover) for summer range areas in the Middle Fork John Day Watershed is 12%. • Need: To address the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Some stands providing satisfactory cover habitat are located in dry forest types. These stands are considered outside the historic range of variation (HRV), overstocked, and likely unsustainable given the risk of severe fire and insect epidemics. • Amendment: Allow reduction of satisfactory cover below Forest Plan Standards within Mill Creek Subwatershed. This amendment would apply only for the duration of, and to those actions proposed for the site-specific project called Crawford Project. • See Effects Analysis in Wildlife section. • This amendment would be needed for Alternative 2.
Wildlife 2	MA-13 – Dedicated Old-Growth • Existing Standard: Management Area Standard #4, pg IV-105, - Inventory and validate all old-growth areas. Correct previously dedicated old-growth unit designations that are not meeting management requirement direction where possible. • Need: Within the project area there are three Dedicated Old-Growth areas (DOGs) identified. Two of the three existing DOGs do not currently meet Forest Plan Standards for size and habitat requirements. Replacement Old-Growth areas (ROGs) have not been identified for any of the DOG areas. • Amendment: Allow changes in Forest Plan management allocations to adjust DOGs and designate ROGs. This amendment is permanent until the Forest Plan is amended or revised. • See Purpose and Need for Action and Effects Analysis in Wildlife section. • *This amendment would be needed for Alternatives 2, 3, and 4.*

Alternative 3

Purpose and Design:

Alternative 3 responds to the two key issues.

> Key Issue #1: *There is a concern that the proposed ground disturbing activities associated with road construction, commercial timber harvest, and prescribed burning could degrade water quality, and impact soil productivity and habitat for aquatic species. See Chapter 1 for full issue description.*
>
> Key Issue #2: *Commercial thinning of about 27 acres is proposed in forested areas identified as satisfactory big game cover. Currently satisfactory cover is 2.5% of the Mill Creek Subwatershed, below the Forest Plan Standard of 12%. These forested areas*

provide some of the highest quality cover habitat available for big game species (elk) in the project area. This thinning would degrade the satisfactory cover by decreasing the tree distance which in turn reduces the average canopy closure needed to maintain this standard. See Chapter 1 for full issue description.

Alternative 3 minimizes temporary road construction to less than 0.1 miles (500 feet) for each road. The average skidding was increased in some of the harvest units in response to decreasing the length of the temporary roads. With this reduction in access, approximately 1/3 of the harvest areas in Alternative 2 were dropped due to high logging costs. Without longer temporary or specified access roads, skidding distances made harvest not viable in these areas.

Alternative 3 excludes harvest in those areas identified as satisfactory cover to maintain the existing tree density needed to maintain this Forest Plan cover standard. Portions of four of the commercial thinning areas were dropped from harvest.

A map of the harvest activities and listing of harvest units are located in Appendix B.

The following are Alternative 3 activity descriptions. Specific design measure requirements are listed at the end of Chapter 2.

Activity Descriptions:

Commercial Harvest

The proposed harvest in this alternative has been reduced by approximately 30% from Alternative 2. The treatment units common to Alternative 2 have the same harvest prescriptions as previously described.

- Commercial thinning – 1,506 acres
- Shelterwood harvest – None

Commercial and precommercial thinning would occur in approximately 54 LOS acres. Acres treated would enhance the LOS, and there would be no net loss of LOS. One acre of old forest multi-strata (OFMS) in the hot-dry biophysical environment is included within a unit predominately comprised of young forest structure. The hot-dry biophysical environment is currently above HRV in the OFMS structure and below HRV in the OFSS structure

Commercial thinning to improve the sustainability of the multi-structure on 39 acres of OFMS (unit 78) is proposed in the cool-dry biophysical environment. The cool-dry biophysical environment is currently within HRV. Approximately 14 acres of OFSS would be commercially thinned to reduce the understory and maintain the OFSS structure. This would occur in the warm-dry biophysical environment. The acres are small pieces of several units.

Other than those treatment described above all other proposed treatments are located in non LOS stands and are designed to manipulate vegetation towards appropriate late and old structure in the future.

A portion of commercial thinning areas are located within wildlife connectivity corridors. The objectives are the same as Alternative 2.

Commercial thinning would also occur in approximately 50 acres of ROG. Objectives are the same as Alternative 2.

Road Use during Harvest

The amount and type of road reconstruction and road maintenance is similar to Alternative 2. The number of miles of temporary road construction was reduced by approximately 82% compared to Alternative 2. The location and description of the reconstruction, maintenance, and temporary road construction activities common to Alternative 2 are the same as previously described.

- Temporary road construction – 1.5 miles
- Road reconstruction – 10.9 miles
- Road maintenance – 29.2 miles

Precommercial thinning

- Precommercial thinning – 666 acres

The precommercial thinning treatments areas and activity descriptions are similar to Alternative 2, as well. Those acres dropped from commercial harvest would not be precommercially thinned.

Activity Fuels Treatments

- Yard tops attached – 276 acres
- Hand pile – 140 acres
- Grapple pile – 631 acres
- Prescribed burning – 327 acres
- Hand pile and prescribed burning – 6 acres (hand pile is in visual area)
- No treatment – 133 acres

Again, the activity fuels treatment is also similar to Alternative 2. Since harvest levels were reduced in Alternative 3, the amount of activity fuels treatments were reduced accordingly. The description of each of the following fuels treatment can be found in the narrative for Alternative 2.

Prescribed Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as in Alternative 2.

Old-Growth Adjustments

The delineation of three new ROGs including delineation of Pileated Woodpecker Feeding Areas, (PWFA) and adjustment of three DOGs are the same as described in Alternative 2.

Alternative 4

Purpose and Design

Alternative 4 was developed in response to the Key Issue #1: *There is a concern that the proposed ground disturbing activities associated with road construction, commercial* *timber harvest, and prescribed burning could degrade water quality, and impact soil productivity and habitat for aquatic species. See Chapter 1 for full issue description.*

Alternative 4 does not include any commercial timber harvest activities or temporary road construction. The alternative does include precommercial thinning to reduce stand density of smaller trees, and prescribed burning, however, it maintains satisfactory condition.

Activity Descriptions

Commercial Harvest/Road Use

There are no commercial harvest, temporary road construction, road maintenance, or reconstruction activities proposed in this alternative.

Precommercial Thinning

- Precommercial thinning – 795 acres

The precommercial thinning treatments are the same as described in Alternative 2. Precommercial thinning would occur in approximately 88 acres of Replacement Old-Growth. The objective of thinning is to reduce stocking to increase resiliency of the area for the long-term and accelerate growth and the development of large trees. Thinning would be limited to trees less than 9 inches dbh.

Precommercial thinning would occur in approximately 45 LOS acres. Stands treated would remain as LOS, and there would be no net loss of LOS structure in the subwatershed as a result of proposed actions. Precommercial thinning to improve the sustainability of the multi-structure on 39 acres of OFMS (unit 78) is proposed in the cool-dry biophysical environment. The cool-dry biophysical environment is currently within HRV in the OFMS structure. Approximately 6 acres of OFSS would be precommercially thinned to reduce the understory and maintain the OFSS structure. This would occur in the warm-dry biophysical environment. These acres would remain as OFSS. The acres are small pieces of several units

Activity Fuels Treatments

- Hand piling – 146 acres
- Grapple piling – 649 acres

The activity fuels treatment is similar to Alternative 2, except there is no commercial harvest associated with fuels treatment. The description of each of following fuels treatment can be found in the narrative for Alternative 2.

Prescribed Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as Alternative 2.

Old-Growth Adjustments

The delineation of three new ROGs and adjustment of three DOGs are the same as described in Alternative 2.

Implementation Schedule – Alternatives 2, 3, and 4

Commercial Harvest/Road Use

Alternatives 2 and 3 – Activities would occur for a 1 or 2 year period.

Alternative 4 – No activities.

Precommercial Thinning

Alternative 2 and 3 – Activities would follow the completion of commercial harvest; 1 to 2 year period.

Alternative 4 – Activities would occur for a 1 or 2 year period.

Activity Fuels Treatment

Alternatives 2 and 3 – Activities include yarding tops attached, grapple piling, and hand piling; the yarding of tops will occur during commercial harvest; the grapple piling and hand piling will follow completion of the commercial harvest and precommercial thinning; limited by snow depth.

Alternative 4 – Activities include grapple piling and hand piling.

Prescribed Fuels Treatment

Alternatives 2, 3, and 4 – Burning would occur during spring or fall periods; burning could occur annually for 5 years; scheduling is highly dependent on weather conditions; a maximum of 3,000 acres per year would be burned; burning limited to one grazing pasture per year; burning would not occur within harvest or commercial thinning units until these activities including activities fuels treatments are completed. These burn operations would be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fitted to the grazing systems being used on the affected allotments to minimize impacts to the permittee’s ranch operations.

Road Closures and Decommissioning

Alternatives 2 and 3 – Purchaser Closures (Timber sale) – Post closure notices – 1 year prior to closure; install closures the year after posting notice of closure.

Alternatives 2, 3, and 4 – Other closures and decommissioning would occur as funding becomes available during the next 5 years; reopening of closed roads would occur immediately.

Management Requirements, Constraints, and Design Measures

The Forest Service developed the following design measures to be used as part of the action alternatives. Throughout the project, all applicable Timber Management, Road Systems, Fuels Management, Watershed Management, and Vegetative Management BMPs (General Water Quality Best Management Practices, Pacific Northwest Region 1988) will be used to enable the achievement of water quality standards. (BMPs are further discussed in Chapter 3, Aquatics & Water Quality, and Regulatory Framework section, and in Appendix F):

Table 2.4. Wildlife Management Requirements, Alternatives 2 and 3.

Wildlife Alternatives 2 and 3	**Objective**	**Responsible Person**
Variable Tree Spacing – Commercial Thinning Retain variable tree spacing within harvest units. The density will vary as much as 50% across each stand. 5 to 15% of the understory will be retained in unthinned patches from 2 to 5 acres in size for wildlife cover. Variable Spacing – Density Requirements **Dry (Ponderosa Pine) Forest Sites** — **Prescribed Average 50 sq./ft. basal area** **Basal Area** / **Percentage of Stand** 25 / 10% 40 / 15% 50 / 50% 60 / 15% Unthinned / 5–15% **Dry Mixed Conifer Sites** — **Prescribed Average 65 sq./ft. basal area** **Basal Area** / **Percentage of Stand** 45 / 10% 55 / 15% 65 / 50% 75 / 15% Unthinned / 5–15%	Maintain variable spacing to maintain wildlife security cover	Silviculturist and Marking Crew
Connectivity Corridors – Commercial Harvest A minimum of 25% of each stand within connectivity corridors will be retained and left as clumps distributed throughout the unit if available. Each clump is expected to be no smaller than one acre in size. Canopy cover is to be retained in the upper 1/3 of the site potential.	Maintain connectivity corridors	Silviculturist and Marking Crew
Raptor Nests – Commercial Harvest New raptor nests discovered in or immediately adjacent to the project area during project implementation will have nest protection and disturbance standards adhered to (see Table 2.6). To conduct activities during a prohibited date a waiver must be obtained.	Protect new raptor nests from alteration and disturbance	Sale Administrator
Blue Grouse – Harvest Activities To provide blue grouse winter roosts, and retain large mistletoe infected or "wolfy" Douglas-fir trees along ridge tops and large scab openings, where available.	Protect Blue Grouse Winter Roosts	Sale Administrator, Silviculturist, District Wild-life Biologist
Down Logs – Commercial Harvest Where existing, maintain down logs at the following levels: in ponderosa pine three to six pieces per acre, 12 inch minimum diameter at small end, greater than 6 feet (20–40 total feet per acre); in mixed conifer 15 – 20 pieces per acre, 12 inch minimum diameter at small end, less than 6 feet (100 – 140 total feet/ acre); in lodgepole pine 15 – 20 pieces per acre, 8 inch minimum diameter at small end, greater than 8 feet (120 – 160 total feet per acre).	Provide down log habitat and long-term productivity.	Sale Administrator
Snags – Danger Tree Removal (upland areas along haul roads) Danger trees felled along haul roads will be felled away from the road when possible. When necessary to fall the tree across the road, only the portion of the tree within the roadway would be removed.	Down wood retention	Sale Administrator
Snags/Down Wood – DOG/ROG Locations – Temporary Road Construction Where temporary roads are constructed adjacent to DOGs, ROGs and / or PWFAs all felled hazard trees greater than 12 inch dbh will be retained on site. No temporary roads would be constructed within DOGs.	Projection of snags and down wood in DOGs, ROGs, and PWFAs	Sale Administrator

Wildlife Alternatives 2 and 3	Objective	Responsible Person
Snags – Commercial Harvest The Forest Plan Record of Decision defines snags as standing dead trees, usually greater than 40 feet in height and 12 inches dbh. They provide habitat for raptor nesting and primary cavity excavator species. In order to preserve this habitat, snags 12 inches dbh and larger will be retained unless they present a safety hazard, or must be removed for road reconstruction, temporary road construction, and on log landings. Retaining these snags will maintain foraging opportunities for primary excavator species. Snags felled for safety reasons within units or adjacent to landings would be left on the ground. Retaining clumps of live trees around snags and locating landings and temporary roads where there are few or no snags, would help minimize loses. Retention of untreated patches of trees would continue to provide avenues for snag creation. Snags felled to provide access to units, or within treatment units, would be left on site to provide down wood. Large live trees within 50 feet of large snags (those at least 18 inches dbh and 40 feet tall) will be retained. This will protect and maintain these existing large snags. To help protect and develop future snags 12 inches dbh or greater, take advantage of variable spacing and unthinned patches in thinning units to retain live trees around snags.	Snag Protection and long-term recruitment of snags	Silviculturist and Marking Crew

Table 2.5 – Wildlife Management Requirements, Alternatives 2, 3, and 4.

Wildlife Alternatives 2, 3, and 4	Objective	Responsible Person
Snag Protection – Prescribed Burning No ignition will occur within 50 feet of a snag 12 inches dbh or greater, in order to preserve existing snags. Greater protection would be given to trees 21 inches dbh and larger. Burning prescriptions would permit killing as much as 10% of the trees 10 inches dbh and greater, 15% of the trees 5 – 10 inches dbh, and 35% of the trees less than 5 inches dbh, although actual tree mortality levels are expected to be lower. No ignition will occur within 100 feet of featured down logs as described above to minimize charring and potential loss. Marked and designated wildlife trees will be protected. Protections will not preclude use of aerial ignition.	Protect large diameter snags during prescribed burning	Fuels Planner and Burning Crew
Shrubland Protection – Prescribed Burning To protect large shrublands including mountain mahogany, bitterbrush and sagebrush, no ignition would occur within 100 feet.	Protect shrublands during prescribed burning	Fuels Planner and Burning Crew
Aspen Sites – Prescribed Burning Prescribed fire will be excluded from 14 mapped aspen sites of approximately 27 acres, but are not limited to the following; use of roads, hand line, or natural barriers.	Protect aspen stands during prescribed burning	Fuels Planner, Burn Boss
Mountain Mahogany Protection – Prescribed Burning To minimize mountain mahogany mortality no ignition within 100 feet.	Protect mountain mahogany during prescribed burning	Fuels Planner and Burning Crew
Down Logs – Prescribed Burning Prescribed fire activities will minimize fire consumption of down logs greater than 12 inches at the small end, and snags greater than 12 inches in diameter breast height (dbh). Underburning and fuel treatment will not result in consumption greater than 3 inches (1.5 inches per side) of the featured large logs described above.	Protect down logs during prescribed burning.	Fuels Planner and Burning Crew

Wildlife Alternatives 2, 3, and 4	Objective	Responsible Person
Elk Calves and Deer Fawns – Prescribed Burning Prior to ignition of spring (after May 1) burns, if crews sight a lone cow elk or doe, they will search the area for calves or fawns.	Protection of calves and Deer Fawns during spring underburning.	Fuels Planner and Burning Crew
Satisfactory Cover – Prescribed Burning Minimize understory tree mortality to less than 5% during prescribed burning in identified satisfactory stands. Excluding fire from these stands is acceptable.	Maintain require-ments of satisfactory cover during prescribed burning	Fuels Planner and Burn Boss

Table 2.6. Raptor Timing Restrictions, Alternatives 2 and 3.

Summary of Raptor Timing Restrictions, Alternatives 2 and 3 – Commercial Harvest			
Description	Timing – Activities Permitted*	Timing – Activities Prohibited**	Notes
Occupied goshawk nest sites (within PFA or within ½ mile of nest sites)	Activities can occur: October 1 – March 31	Activities are prohibited: April 1 – September 30	Historic nest sites in project area
* Activities are permitted in all locations during these periods except within prescribed nesting areas, i.e., for goshawks, no activities within 30-acre nesting area; for all other raptors, no activities within 100 feet of nest trees. ** Activities are only prohibited within distances specified in Column 1 for each species.			

Table 2.7. Soils Management Requirements, Alternatives 2 and 3.

Soils Alternatives 2 and 3	Objective	Responsible Person
Skid Trails – Commercial Harvest Skid trail locations shall be designated and approved prior to logging. On areas where existing skid trails spaced 100 to 140 feet apart can be reused, reuse the old skid trails. Otherwise, space skid trails about 120 feet apart (except where they converge at landings and junctions); using existing skid trails where possible and appropriate.	(1) Keep soil impacts as small as practical, especially long-lasting impacts; and (2) keep detrimental soil impacts from this harvest and past harvests to less than 20% of the area of each sub-unit. (Limit soil damage.)	Sale Administrator/ Purchaser
Skid Trails – Commercial Harvest Skidders shall not be allowed off skid trails. Directional felling and/or tractor winching will be used where necessary. Low ground pressure equipment (=8.5 psi) can be allowed off skid trails on dry, frozen, or snow covered soil. “Dry” means July through September, or obviously dry during other months. “Frozen” means frozen to a depth of 4 inches or more. “Snow covered” means sufficient snow depth to prevent soil disturbance and compaction.	Limit soil damage.	Sale Administrator/ Purchaser
Slopes Greater than 35% – Commercial Harvest Avoid skidding on slopes steeper than 35%, where feasible, using directional felling and tractor winching. There shall be no skidding on any slope steeper than 45%.	Limit soil damage.	Sale Administrator/ Purchaser
Soil Condition – Subsoiling – Commercial Harvest The purchaser shall subsoil skid trails in units 049, 80, & 124) where the soil is suitable and where subsoiling would not spread invasive/noxious weeds. Subsoiling need not be done if the unit is logged under frozen or snow-covered conditions.	Keep detrimental soil impacts below 20%	Sale Administrator/ Purchaser
Soil Condition Skidding on unit 148 is limited to frozen or snow covered soil.	Keep detrimental soil impacts below 20%	Sale Adminis-trator/ Purchaser

Soils **Alternatives 2 and 3**	**Objective**	**Responsible Person**
Soil Moisture – Commercial Harvest No skidding will be done under wet soil conditions, when ruts six inches or deeper would form.	Limit soil damage	Sale Administrator/ Purchaser
Soil Erosion – Subsoiling – Commercial Harvest Erosion from subsoiling skid trails shall be controlled by subsoiling in a "J" pattern, by water bars, or by comparable measures. If runoff cannot be diverted out of the furrows (such as in draw bottoms), do not subsoil. Skid trails on slopes steeper than 28% should not be subsoiled. Do not subsoil sections of skid trails where excessive rock will be pulled to the surface.	Limit soil damage.	Sale Administrator/ Purchaser
Soil Condition – Skidding – Commercial Harvest Skidding on units 68, 69, 70, 72, 78, 90,142, 146, and 150 is limited to dry, frozen, or snow covered soil. For some of these units, subsoiling could be substituted for this requirement, upon approval of a soils specialist.	Keep detrimental soil impacts below 20%	Sale Administrator/ Purchaser
Skid Trails – Cross Drains – Commercial Harvest Erosion from skid trails and tractor winch furrows shall be controlled by the use of cross drains or comparable measures. Outfalls of the cross drains shall be clear and located on soil where water will infiltrate, not on shallow or impermeable soil. Cross drains on skid trails should be spaced appropriately for the terrain.	Limit long-lasting soil damage.	Sale Administrator/ Purchaser
Landing Location – Commercial Harvest Re-use existing landings where feasible and where they are away from shallow soils and ephemeral draws unless approved by a hydrologist, soil scientist, or fisheries biologist.	Protect water quality and limit soil damage.	Sale Administrator/ Purchaser
Landings – Subsoiling – Commercial Harvest Subsoil and revegetate (trees or grass) all landings where feasible.	Speed recovery of damaged soil	Sale Administrator/ Purchaser
Non-Forest Areas – Equipment – Commercial Harvest Equipment traffic on the non-forest or juniper woodland, shallow soil inclusions shall be kept to a minimum.	To avoid concentrating water and erosion.	Sale Administrator, Purchaser
Non-Forest Areas – Equipment – Commercial Harvest Units 076 (the northeastern tip); 106; 108; 149 – no ground based equipment will be allowed on the small, non-forest or juniper woodland, shallow soil inclusions.	To avoid concentrating water and erosion.	Sale Administrator, Purchaser
Moist Soil Areas – Skidding – Commercial Harvest Unit 108 (the seasonally moist soil area northwest of the sharp bend in the road); Unit 128 (the seasonally moist area below the draw near the northeast corner of the unit) – Ground based equipment may be used only when ruts are less than 2"deep	To avoid providing channels for water, and to keep detrimental compaction to a minimum	Sale Administrator, Purchaser
Temporary Roads – Shallow Soil Areas Where temporary roads cross shallow soil areas, such as where the road to unit 077 crosses 750 feet of a shallow soil, subsoiling is not feasible, but the road surface would be drained to prevent erosion.	To avoid concentrating water and erosion.	Sale Administrator, Purchaser
Skid Trail Seeding – Commercial Harvest Skid trails and disturbed soil shall be seeded as specified in Forest Plan Forest-wide Standards 128 and 129.	Limit long-lasting soil damage. Seeding is necessary to supplement other erosion control measures.	Sale Administrator/ Purchaser

Table 2.8. Soils Management Requirements, Alternatives 2, 3, and 4.

Soils Alternatives 2, 3, and 4	Objective	Responsible Person
Ground Cover – Prescribed Burning Ground cover standards will be met as specified in the Forest Plan (Chapter IV, pg 40). Soil erosion hazard, for areas within 50 feet of channels or ephemeral draws, is one step higher than that of the adjacent upland soil (For instance, if the upland soil has a soil erosion hazard of low, soil near the channels would have a soil erosion hazard of moderate, unless a soils specialist, hydrologist, or fish biologist determines otherwise for a specific area).	Limit soil damage	Fuels specialist
Soil Protection – Grapple Piling Mechanical fuel control shall be done with low ground pressure (≤8.5 psi) machinery on dry soil, and machinery will stay on skid trails where possible.	Limit soil damage.	Sale Administrator

Table 2.9. Watershed/Fisheries Management Requirements, Alternatives 2 and 3.

Watershed/Fisheries Alternatives 2 and 3	Objective	Responsible Person
RHCAs – Danger Trees (Along Haul Roads) Removal of danger trees within RHCAs is restricted. Only that portion of the tree within the roadway of the road or outside the RHCA can be removed.	Reduce sediment transport or erosion.	Sale Administrator
RHCAs – Commercial Harvest Riparian Habitat Conservation Areas (RHCA) for Category 1, 2, and 4 streams and for Category 3 and 4 wetlands shall be consistent with PACFISH (100–300 feet.)	Protect fish-bearing perennial and intermittent streams with PACFISH buffers.	Fisheries Biologist, Hydrologist
Skidding – Draw Bottoms – Commercial Harvest There shall be no skidding up or down draw bottoms, except where approved by a soils specialist, hydrologist, or fish biologist.	Protect ephemeral draws	Sale Administrator
RHCAs – Hazardous Substances – Commercial Harvest The Forest Service will require a Hazardous Substances Plan and Prevention of oil spill Plan from contractor will be reviewed and approved prior to implementation activities. Fuels and other toxicants shall not be stored within RHCAs, and other provisions of PACFISH Standard RA-4 shall be observed.	Prevent petroleum products or other deleterious materials from entering stream systems	Sale Administrator, Project Engineer COR
RHCAs – Road Work – Commercial Harvest For road work, operate machinery on road prism.	Reduce erosion/ sedimentation potential	Sale Administrator, Project Engineer
RHCAs – Landing Locations – Commercial Harvest Landings, especially fueling sites, shall not be located in ephemeral draws or RHCAs without approval of hydrologist, soil scientist or fisheries biologist. This includes both new and existing landing sites.	Reduce sediment transport or erosion.	Sale Administrator
Draw bottoms – Skidding – Commercial Harvest If skidding across draw bottoms that show signs of water flow, skid only when the soil in the draw is dry or frozen, and place slash or other ground cover on the skid trail after use.	Reduce erosion/sediment transport	Sale Administrator
RHCAs – Industrial Camping – Commercial Harvest Industrial camping permits will be required. Locations will be coordinated with a biologist before permits are issued.	Minimize resource damage.	Sale Administrator
Rock Fords – Commercial Harvest Throughout operations monitoring will ensure that the rock fords within Category IV RHCAs, intermittent streams, are adequate to allow water flow.	Reduce sediment transport or erosion.	Fisheries Biologist, Hydrologist

Watershed/Fisheries Alternatives 2 and 3	Objective	Responsible Person
Roads – Log Haul – Commercial Harvest Log haul is restricted to roads that are dry or frozen.	Reduce sediment transport or erosion.	Sale Administrator, Project Engineer
RHCA – Woody Debris – Commercial Harvest All trees felled in RHCAs for safety reasons will be kept on site to meet woody debris objectives because streams in the fisheries analysis area are deficient in LWD in accordance with PACFISH Standard RA–2.	Increase large wood in RHCAs	Sale Administrator, Project Engineer
Protected or Restricted Road Use – Commercial Harvest In order to reduce or eliminate effects to water quality during project activities near RHCAs - no contractor / purchaser road use will be authorized on: • Any decommissioned road in an RHCA. • 2600252 from mile post 0.23 to the end of the road. • 2620190 in the RHCA, (T11, R35, Sec.22, 26, 27) from the junction of the 2620 to approximately 300 ft from the 2620447 junction (T11, R35, Sec. 24)	Reduce sediment transport or erosion.	Sale Administrator, Project Engineer
Dust Abatement – Log Haul – Commercial Harvest Dust abatement would be done on roads during rock and timber haul within RHCAs and elsewhere as prescribed by Malheur National Forest's Roads Rules, 1991. Within RHCAs, this would be accomplished by: watering the road, and/or by reducing the traffic speed to no greater than ten miles per hour. Field reconnaissance and past performance indicates water can be withdrawn from designated water sources while still meeting water quality standards. Proposed water sources would be located in two different areas: Blue Mountain Work Center on Road 2600877. There is a rocked area behind a gate, near Clear Creek, which has been developed for water withdrawal. Obtaining water at the above sites would follow recommendations developed by National Marine Fisheries Service (May 1996). These recommendations include: the pump intake must not exceed 0.2 feet per second. In addition, the hose must be fitted with a screen mesh not exceeding 3/32 inch woven wire or perforated plate screens, or 0.0689 inch for profile screens with a minimum of 40% open area. In addition, intake of water cannot reduce stream flow more than 10%. No timing or flow restrictions are needed at the second site listed below: Rock Pit at Taylor Flat – This is a ground water source that may not have available water during late summer. No timing or flow restrictions are needed at this site. See project record – Aquatics and Water Quality Report – Appendices A and B for other water withdrawal restrictions.	Reduce impacts resident fish populations	Sale Administrator, Project Engineer

Table 2.10. Watershed/Fisheries Management Requirements, Alternatives 2, 3, and 4.

Watershed/Fisheries Alternatives 2, 3, and 4	Objective	Responsible Person
Sediment Structures – Road Decommissioning Install temporary structures to protect streams during decommissioning, where needed.	Reduce sediment transport to streams.	COR
Draw Bottoms – Fire Lines – Prescribed Fire Fire lines will not be built down draw bottoms. After prescribed burning activities, fire lines will be water barred and/or seeded as necessary to prevent erosion.	Reduce sediment transport to streams.	Fuels specialist

Watershed/Fisheries Alternatives 2, 3, and 4	Objective	Responsible Person
Stream Bank Disturbance – Seeding – Road Decommissioning Areas of stream bank disturbance during decommissioning associated with roads will be seeded or planted.	Reduce erosion, sedimentation.	COR
RHCAs – In-Stream Work - Road Decommissioning The work period for in-stream work will be July 15th through August 15th, as specified in The Oregon Guidelines For Timing of In-Water Work to Protect Fish and Wildlife Resources, June 2000.	Reduce impacts during fish spawning period	COR
RHCAs – Fire Ignition – Prescribed Burning No fire ignition will occur within RHCAs. This prohibition includes areas within 300 feet of fish-bearing water, 150 feet from the edge of permanently flowing non-fish-bearing streams, wetlands greater than one acre; 100 feet from the edge of scoured channels; and wetlands less than one acre.	Reduce impacts to riparian vegetation	Fuels specialist
RHCAs – Shrubs and Tree Shade – Prescribed Burning At least 95% of the shrub and tree shade, which directly shades permanently flowing stream channels, or which shades Crawford Creek, will be retained.	Maintain stream temperatures	Fuels specialist
RHCAs–Low Flow Period - Road Decommissioning Removal of a culvert on a stream will be done during low flow periods. Cease all work if storm events occur and increase stream flows.	Reduce sediments; protect fish-bearing streams.	COR

Table 2.11. Visual Management Requirements, Alternatives 2 and 3.

Visual Corridors Alternatives 2 and 3	Objective	Responsible Person
Temporary Roads – Landing Slash – Commercial Harvest Prior to harvest, the locations and clearing widths for all temporary roads and landings within 500 feet of Highways 7 and 26 will be reviewed by landscape architect or recreation specialist. Harvest activities must maintain a natural appearing landscape. The ground disturbance and clearing of the landings and disposal of logging debris on the landings cannot be visible from the highway and must be topographically screened. If the burning of the landing piles in this zone will cause more than 20% tree mortality surrounding the piles, consider either chipping or hauling the slash to a disposal area.	Reduce evidence of management activity.	Sale Administrator or Contracting Officer's Representative and Landscape architect or recreation specialist.
Temporary Roads – Commercial Harvest Immediately following harvest within 500 feet of Highway 7, all visible temporary roads will be rehabbed to reduce the visual disturbance effects. Any stumps grubbed from road surface will be removed from view, the road prism will be smoothed to conform to the existing topography, the ditch along the highway will be reconstructed, and debris such as large rocks and limbs will be placed on the cleared ground created by the temporary roads. The road surface will be planted with conifers to hasten recovery.	Reduce evidence of management activity	Sale Administrator or Contracting Officer's Representative and landscape architect or recreation specialist
Subsoiling – Commercial Harvest and Road Closures No subsoiling will be permitted within 200 feet of Highways 26 and 7 associated with the decommissioning of FS 7000043, FS 2620469, and FS 2600200. Debris such as logs or boulders can be used to close the roads if necessary	Reduce evidence of management and avoid contrasting color impact.	Sale Administrator or Contracting Officer's Representative
Marking/Ribbons – Commercial Harvest Within 200 feet of the highways, marking paint is to be applied to the side of the tree facing away from the road. Ribbon and signs in this 200 foot zone are to be removed upon completion of the harvest unit activities.	Reduce evidence of management & avoid contrasting color and form impact.	Marking Crew Leader Sale Administrator

Visual Corridors Alternatives 2 and 3	Objective	Responsible Person
Harvest Prescriptions – Commercial Harvest Within the foreground areas in the harvest units, a mosaic of stocking levels and tree sizes will be retained. Avoid creating abrupt transitions between thinned and unthinned stands in the foreground. Retain western larch as a component of stands in which it occurs naturally. Increase views of western larch where it occurs in the foreground.	Reduce evidence of management and encourage the increase in stocking of western larch.	Silviculturist
Low Cut Stump, Skid Trails, Slash – Commercial Harvest During commercial and precommercial thinning activities, stumps will be cut low to the ground (less than 6 inches) within 200 feet of State Highway 7 and US Highway 26. This will reduce visibility of stumps within visual corridors. Ground disturbing skid trails will not be located within 100 feet of Highways 7 and 26 unless winter logged or skid trails do not expose mineral soil. Slash created by harvest activities and precommercial thinning will be hand piled up to 200 feet from Oregon State Highway 7 and US Highway 26.	Reduce evidence of management and avoid contrasting color impact.	Sale Administrator or Contracting Officer's Representative
Fire lines – Prescribed Burning Minimize construction of fire lines that can be seen from Highways 26 & 7. If fire lines are determined necessary, they will be constructed shortly before use, and rehabilitated (camouflaged) as soon as possible after burning. The objective is to reduce the period that they are visible. Only hand fire lines will be constructed in areas where they can be seen from Highways 26 & 7.	Reduce evidence of management and avoid contrasting color and form impact.	Fuels Specialist
Burning Prescriptions – Prescribed Burning Burning prescriptions in visual foreground areas would be developed to produce low intensity fire, minimizing damage to the larger diameter over-story trees. Those trees greater than 21 inch dbh within 200 feet to the highways would be protected from high intensity flames that could incur mortality. This protection could include such activities as raking needles away from the base of trees or wetting down the area around the tree prior to ignition. Burning intensities within 200 feet along the visual corridors for U.S. Highway 26 and Oregon State Highway 7 will be controlled by ignition methods and techniques to retain a minimum of 80% of the live crowns. Isolated small trees within a stand of larger trees may end up having less than 80% of the live crown remaining.	Reduce evidence of management and avoid contrasting color and form impact.	Fuels Specialist

Table 2.12. Special Use Management Requirements, Alternatives 2, 3, and 4.

Special Use Permits (Power Lines and Ditches) Alternatives 2, 3, and 4	Objective	Responsible Person
Special Use Site Protection – Prescribed Burning During burning operations there is the potential to damage permitted improvements such as ditches, fences, power poles and lines, telephone pedestals and fiber glass location markers. Burning operations should protect existing improvements and coordination with permittee's and adjacent property owners will need to take place prior to conducting the burning operations to address specific concerns. Protecting power lines and poles during burning should avoid the hazards of weakening poles and power lines falling to the ground. Care should also be taken when crossing with vehicles to protect ditch bank integrity. Ditches will need to be cleaned out after burning operations to remove material that may have rolled or fallen into irrigation ditches to prevent blocking water flow during irrigation season causing potential breaching.	Protection of improvements during burning	Fuels specialist

Table 2.13. Invasive/Noxious Weeds Requirements, Alternatives 2, 3, and 4.

Invasive/Noxious Weeds Alternatives 2, 3, and 4	Objective	Responsible Person
Invasive/Noxious Weeds Prevention Standards – All Activities All heavy equipment (bulldozers, skidders, graders, backhoes, log trucks, etc.) that will operate outside the limits of the road prism will be cleaned prior to entering on to National Forest System Lands. Equipment used within known locations of invasive/noxious weed infestations would be cleaned prior to moving to another site within the forest or project area. Only weed-free seed, straw and mulch will be used for road decommission and erosion control. If State certified straw and /or mulch are not available, use sources certified to be weed free using the North American Weed Free Forage Program standards (see Appendix O of the Invasive Plants EIS) or a similar certification process. Where other design measures require seeding use only certified weed free native seed mixes.	Reduce the introduction, establishment and spread of invasive/ noxious weeds associated with this project	Sale Administrator Project Engineer, COR
Use only gravel, fill, sand, and rock that are judged to be weed free by District or Forest weed specialists. Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive/noxious weeds before use and transport. Treat or require treatment of infested sources before any use of pit material. Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive/noxious weeds in consultation with District or Forest-level invasive plant specialists, incorporate invasive/noxious weed prevention practices as appropriate. If new sites of invasive/noxious weeds are located all ground disturbance activities should cease in the vicinity of the newly located infestation. Before the activities resume an invasive/noxious weed specialist (botanist, etc.) is to be contacted so the situation can be evaluated and any appropriate actions identified. Invasive/noxious weed surveys would be done for 1 to 5 years after the project on and along decommissioned, closed, and temporary roads as well as skid trails and landings used during the project.	Detect new infestations of invasive/ noxious weeds.	District Weed Specialist

Table 2.14. Study Plot Management Requirements, Alternatives 2, 3, and 4.

Research Study Plots Alternatives 2 and 3	Objective	Responsible Person
Study Plots – All Activities A 50 foot no treatment zone will be placed around thinning study plots. A total of 18 plots will be protected from both harvest and prescribed fire. Study plots are located within harvest Units 66, 72, and 74A. Skid trails and landings will not be located within study plot protection zones. Trees will be directionally felled away from protection zones. Eleven study plots are located within the prescribed fire boundary.	Protection of study plots	Sale preparation specialist

Table 2.15. Range Management, Alternatives 2, 3, 4.

Range Management Alternatives 2, 3, and 4	Objective	Responsible Person
Range Management – All Activities The Grazing Permittees and the Rangeland Management Specialist will be kept informed of scheduling of project activities that would affect grazing operations. All range improvements (such as fences, spring developments etc.) are to be protected. If they are damaged they will be repaired to FS specifications by the entity responsible for the damage prior to leaving the area or before the improvement is needed for grazing. Prescribed burn operations will be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where	Minimize the affects of project activities on the permittee's grazing operations and reduce the risk of accidents due to	Sale Administrator, COR, person in charge of prescribed burn operations, Contractor

possible the burning would be fitted to the grazing systems being used on the affected allotments to minimize impacts to the permittee's ranch operations. It is anticipated that after an area is burned livestock grazing would resume after a rest period of one full growing season in accordance with the Forest's Post Fire Interim Grazing Guidelines (2003). Following this rest a District interdisciplinary team will determine if forage recovery and species diversity is sufficient to resume grazing. Examples: (1) If the burn occurs before green-up then grazing may resume the following yr. (2) If the burn occurs after green-up then grazing may resume the second year after the burn. *In these two examples the time to resume grazing is assuming that the reviewing interdisciplinary team determines that the vegetation and soil characteristics have recovered sufficiently. If livestock are present on either side of a fence, means will be taken to protect the integrity of the grazing schedule, and prevent the movement of livestock to other pastures. This could include contractual requirement to assure gates are kept closed, placement of temporary cattle guard or presence of a "gate keeper." If no livestock are present, gates and fences shall be operable prior to logging activities proceeding to the next pasture, while cattle are in the project area. Fence right of ways, stock driveways, trails, and other access to other range improvements will be cleared of slash produced by logging or post sale activities	permittees being in the wrong place at the wrong time. Protect government & permittee investments. Prevent unscheduled movement between pastures and allotments by livestock.	

Table 2.16. Recreation Management Requirements, Alternatives 2 and 3.

Recreation Alternatives 2 and 3	Objective	Responsible Person
Snowmobile Trails – Snow Plowing – Commercial Harvest Two snowmobile trails are co-located (share the roadway) with proposed haul routes. Crawford Creek Snowmobile Trail #S–258 is co-located on the following roads: The 26000207 Road — This road accesses proposed unit 68 and part of unit 66. The 26000204 Road — This road accesses proposed units 60, 62, 64, 70, 72, 74, 76 and part of unit 66. The 2620 Road — This road accesses proposed units 12, 14, 30, 34, 38, 40, 41, 49, 52, 53, 54, 56, 58, 78, 102, 104, 106, 108, 110, 112, and 152. Summit Creek Snowmobile Trail #S–259 is co-located with the 2622 road that accesses units 44 and 46. Plowing and use of these roads for harvest activities during the winter recreational season, generally Dec. 15th - April 15th (though timing varies with snow conditions), will be coordinated in advance with forest recreation representatives from the Blue Mountain Ranger District on the Malheur National Forest and the Unity Ranger District of the Wallowa-Whitman National Forest. The objective of coordination will be to ensure safety and provide a continuous alternate route for snowmobile use when possible. Harvest activity use will take precedence over recreational use. Alternate snowmobile routes will be on existing roads (existing, designated snowmobile routes) and will be coordinated with local snowmobile clubs. The alternate snowmobile route will be Route 343, across Highway 26, then cross country 1/4 mile, to 2665045, 2665, 2645, 2646, and back onto the groomed route on 2600207. This will replace the 204 route on the south end of Crawford. On the north end, the route will be 1940, to 080 to the upper end of 2620. Alternate routes will not be on any haul route or interfere with haul. Any snowmobile routes that conflict with project activities will be signed with proper signage and alternate routes will be utilized during the implementation of the project. Coordination of signage will be done with the local snowmobile club.	Limit impacts on snow-mobiling	Recreation Specialist and Sale Administrator

Recreation Alternatives 2 and 3	Objective	Responsible Person
Public Notification – Prescribed Burning Notify public of burning activities prior to hunting season and notify local residents.	Inform public of burning activities	Fuels Specialist

Table 2.17. Air Quality Requirements, Alternatives 2, 3, and 4.

Recreation Alternatives 2, 3 and 4	Objective	Responsible Person
The Clean Air Act Burning of any kind would not occur unless prior approval is granted by Oregon Department of Forestry (ODF). All amounts of PM 10 and PM 2.5 emissions would be calculated using the CONSUME software in the SmokeTracs reporting system, which is also submitted with planned burn operations to the ODF to determine compliance with the Clean Air Act. All burning would occur outside visibility-protection periods set for central Oregon of July 1 to Sept. 15. Burning would be planned for times when transport winds are sufficient to displace much of the smoke.	To comply with state air quality regulations	Fuels Specialist/Fire Management Officer

Table 2.18. Heritage Management Requirements, Alternatives 2 and 3.

Heritage Alternatives 2 and 3	Objective	Responsible Person
Heritage Sites – Commercial Harvest All NRHP eligible and potentially eligible (unevaluated) sites will be avoided from any ground disturbing impacts during all timber harvest activities, with the exception of the Sumpter Railroad grade (See project design below)	Site protection	Sale Administrator/ Zone Archaeologist
Sumpter Valley Railroad – Temporary Road – Commercial Harvest A temporary road crossing will be allowed across a Sumpter Valley Railroad grade. The crossing will be restored to its original condition after use per the terms of the 1986 PMOA for Management of Historic Railroad Systems. The temporary road will be subsoiled but this activity will be prohibited within the railroad grade (coordinate with Zone Archaeologist).	Protect railroad grade	Sale Administrator/ Zone Archaeologist

Table 2.19. Heritage Management Requirements, Alternatives 2, 3, and 4.

Heritage Alternatives 2, 3, and 4	Objective	Responsible Person
Heritage Sites – Fuel Treatments There will be no piling, hand or with ground-based machines (i.e. grapple), within the boundaries of a NRHP eligible or potentially eligible (unevaluated) site; all hand and grapple piling and burning of slash or fuel concentrations will take place outside of site boundaries.	Site Protection	Sale Administrator/ Zone Archaeologist
Wooden Structural Remains – Prescribed Burning All NRHP eligible and potentially eligible (unevaluated) historic properties with structural remains or other wooden feature types will be avoided or protected during all burning activities. Eligible historic remains will be identified on the ground and proper protection measures will be conducted during the burning activities.	Site Protection	Fuels Planner/ Zone Archaeologist
Lithic Scatter Sites – Prescribed Burning Under the terms of the Management Strategy for the Treatment of Lithic Scatter Sites (Keyser et al. 1988), low intensity burning will have no effect on the prehistoric eligible or potentially eligible (unevaluated) sites.	Site Protection	Fuels Planner/ Zone Archaeologist
Sites – Hand Lines – Prescribed Burning There will be no hand lines constructed through the boundaries of NRHP eligible or potentially eligible sites.	Site Protection	Fuels Planner/ Zone Archaeologist

Heritage **Alternatives 2, 3, and 4**	**Objective**	**Responsible Person**
New Sites – All Activities If cultural resources are encountered during project implementation, all ground-disturbing activities will cease until the Zone Archaeologist is contacted, assesses the situation, and recommends appropriate action.	New site Protection	Zone Archeologist

Table 2.20. Safety Management Requirements, Alternatives 2 and 3.

Safety **Alternatives 2 and 3**	**Objective**	**Responsible Person**
State certified flaggers would control traffic in accordance with requirements by ODOT standards, during felling within 200 feet of the pavement on Highways 7 and 26. All compliance issues would be a part of the contract with the contractor. Unit 116: This proposed tractor unit is located adjacent to Highway 7 in the Taylor Flat area. Safety concerns with activities around this unit (including procedures, additional Oregon State bonding and insurance, timing and weather conditions) would be met for traffic during operations involving reopening a closed road and construction of a temporary junction with Highway 7. During the construction of this junction State certified flaggers would control traffic in accordance with requirements by ODOT standards. All compliance with safety issues would be a part of the contract with the purchaser/contractor or any person or party completing work items. After activities are complete the road will again be closed and the temporary junction will be decommissioned. Felling in Units 22, 24, 60, 62, 64, 116, 118, 120, 122, 127, 130, and 136: Felling trees within 200 feet of the edge of the pavement on U.S. Highways 7 and 26 in these units may pose hazards to traffic. Safety concerns (including procedures, timing and weather conditions) would be met for all traffic during operations involving tree felling in these areas.	Maintain public safety near highways	Sale Administrator

Table 2.21. Safety Management Requirements, Alternatives 2, 3, and 4.

Safety Management Requirement/Design Measure **Alternatives 2, 3 and 4**	**Objective**	**Responsible Person**
During prescribed burning operations adjacent the highway, hazard signs would be placed along highway and ODOT notified?	Maintain public safety	Fuels specialist

Table 2.22. Summary of Timing Restrictions, Alternatives 2, 3, and 4.

Description	**Timing**
Preferred In-stream work period	Activities can occur: July 15 – August 15
Occupied goshawk nest sites (within ½ mile)	Activities can occur: October 1 – March 31
Other occupied raptor nest sites (within ½ mile)	Activities can occur: October 1 – February 1
Must coordinate use of roads: 2600207, 2600204, 2620, and 2622 with forest recreation representative to ensure snowmobile safety. Harvest use takes precedence.	Activities must be coordinated during snow season: December 15 – April 15. (dates may vary with snow season)

Table 2.23. Plant Management Requirements, Alternatives 2, 3, and 4.

Plants **Alternatives 2, 3, and 4**	**Objective**	**Responsible Person**
To protect *Achnatherum* species habitat, vehicles and off-road equipment should avoid scabland areas. Rock outcrops are generally avoided during harvest activity, but piling of harvest generated fuels in near vicinity of these specific areas should be avoided to protect *Pellaea bridgesii* habitat.	Protect *Pellaea bridgesii* and *Achnatherum* species habitat	Forest Botanist
To protect *Botrychium* species, *Listera borealis, Cypripedium fasiculatum* habitat and *Carex interior* habitat, vehicles and off-road equipment should avoid seeps, springs, wet meadows, and riparian areas.	Protect *Botrychium* species and *Carex interior* habitat	Forest Botanist

Protect *Phacelia minutissima* habitat, areas supporting false hellebore (*Veratrum californicum*), should be avoided with vehicles and heavy equipment even if they dry out late in the season.	Protect *Phacelia minutissima* habitat	Forest Botanist
To protect *Carex idahoa and Carex backii* habitat, prescribed burning should produce only low to moderate fire severity so rhizomes of any existing plants will survive and sprout after the burn.	Protect *Carex idahoa and Carex backii* habitat	Forest Botanist
To avoid additional introduction of non-native species within the project area, local native seed mixes or non-persistent weed-free certified seed will be used for areas requiring erosion control or rehabilitation measures.	Avoid introduction of additional non-native species	Forest Botanist

Monitoring Plans

1. Vegetation Monitoring

Tree marking will be monitored to ensure compliance with the silvicultural prescription and marking guide.

All areas planned for tree planting will be examined prior to planting. Exams will assess levels of competing vegetation, pocket gopher activity, and other environmental conditions. Seedling species and stock type will be prescribed as well as site preparation, planting, and protection methods. Any changes from methods prescribed in this document will require additional NEPA analysis.

Planted areas will be monitored for seedling survival, growth, and damaging agents. Stocking surveys will occur periodically until planting areas are certified adequately stocked and “free to grow.” Deficient areas will be replanted to at least minimum stocking. Protection measures may be implemented to increase tree survival.

2. Watershed and Fisheries

Monitor Best Management Practices (BMPs): 5 to 15% of the timber harvest areas will be monitored to ensure BMP standards are being met. Monitoring would be done by the District hydrologist, fisheries biologist, soil scientist, or trained technicians after completion of the project.

Monitor Unit Boundaries along RHCAs: Monitor 10% of timber harvest units adjacent to RHCAs to ensure adequate buffering of mechanized harvest/fuels reduction activities.

Monitor Road Decommission and Reconstruction Activities: Implementation monitoring would be conducted to determine if decommission or reconstruction activities were completed. Following completion of road decommission or reconstruction activities, effectiveness monitoring would be completed at year 1 and 3. Monitoring would consist of ocular surveys completed by hydrology or fisheries personnel (including photographs) on decommissioned road prisms within 100 feet of streams and at stream crossings to check for erosion (rilling or sheet) and/or establishment of ground cover on the prism and sediment transport to streams.

3. Grazing

An interdisciplinary team consisting of at least two resource specialists, such as a range conservationist, botanist, ecologist, silviculturist, or hydrologist, would conduct the monitoring following the prescribed burns to determine if the desired percent of ground cover has been reestablished.

4. Invasive/Noxious Weed Monitoring and Treatment

Invasive/noxious weed surveys would be done for 1 to 5 years after the project on and along decommissioned, closed, and temporary roads, burned grapple piles, as well as skid trails and landings used during the project.

5. Fire and Fuels Monitoring

Monitoring of work conducted under grapple and hand piling contracts would consist of periodic inspections while work is in progress and after completion to determine compliance with contract standards. Prescribed burning implementation monitoring includes burn day monitoring to ensure burning is conducted within the parameters stated in the Burn Plan. This monitoring is completed by fire personnel. Weather, flame length, and smoke dispersal would be a minimum of what is recorded. Fuel reduction and resultant tree mortality will be monitored through fuels plots and walk through surveys by fire personnel.

Comparison of Alternatives:

This section provides a tabular comparative summary of the effects of implementing each alternative as derived from Chapter 3 effects analysis.

Table 2.24. Comparison of Alternatives: Purpose and Need (Vegetation Activities, Transportation, Old-Growth Adjustments, Economics, LOS Development, Visuals).

Comparison /Purpose and Need	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
1. Vegetation Restoration				
▪ Commercial Thinning (acres)	0	2,073	1,506	0
▪ Precommercial Thinning (acres)	0	935	666	795
▪ Shelterwood Harvest (acres)	0	119	0	0
▪ Planting Conifers (acres)	0	119	0	0
▪ Tractor Harvest (acres)	0	2,192	1,506	0
2. Road System				
Road Activities from Timber Harvest ▪ Temporary Road Construction (miles)	0	8.6	1.5	0
▪ Road Reconstruction (miles)	0	10.9	10.9	0
▪ Road Maintenance (miles)	0	32.5	29.2	0
Road Restoration Closures (Gate or Sign) (miles)	0	1.5*	1.5*	1.5*
▪ Decommissioning (miles)	0	18.0**	18.0**	18.0**
▪ Decommissioning (RHCA) (miles)	0	5.8	5.8	5.8
▪ Open Closed Road (miles)	0	2.1***	2.1***	2.1***
3. Adjust Dedicated Old-Growth/ Identify Replacement Old-Growth				
▪ Additional ROGs designated	0	three new	three new	three new
▪ Adjustment of DOGs	0	3	3	3
4. Capture Economic Value				
▪ Volume Harvested (MBF)	0	6,800	4,300	0
5. Development of Future LOS - Old Forest Single-Stratum (OFSS)				
Warm Dry/Hot-Dry Bio. Environments ▪ Old Forest Single-Stratum (50 years)	10%/8%	21%/46%	16%/44%	10%/8%
6. Fire and Fuels Treatments				
▪ Percent Change in Areas with High to	0%	28%	19%	13%

Comparison /Purpose and Need	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Extreme Crown Fire Potential (percentages are based on a 5,700 acres landscape within the project area)				
▪ Prescribed burning (acres)	0	5,300	5,300	5,300
Activity Fuel Treatments w/ Harvest & Precommercial Thinning Activities ▪ Yard tops attached (acres)	0	441	276	0
▪ Hand pile (acres)	0	147	140	146
▪ Grapple pile (acres)	0	822	631	649
▪ Yard tops attached and hand pile (acres)	0	11	0	0
▪ Yard tops attached and grapple pile (acres)	0	55	0	0
▪ Prescribed burning (acres)	0	563	327	0
▪ Hand pile and prescribed burning (acres)	0	16	6	0
7. Visual Corridor				
▪ Foreground Treatments (Commercial)	0	461	238	0

* 0.7 miles - Mill Creek Subwatershed, 0.8 miles - Idaho/Summit Subwatershed.
** 17.8 miles – Mill Creek Subwatershed, 0.2 miles – Dry Fork Subwatershed
*** 1.7 miles – Mill Creek Subwatershed, 0.4 Dry Fork Subwatershed

Table 2.25. Acres of Commercial Harvest Treatment by Alternative within Forest Plan Management Areas.

Management Area	Alt. 1	Alt. 2	Alt. 3	Alt. 4
1 – General Forest	0	402	296	0
13 – DOG	0	88 (ROG)	50 (ROG)	0
14 – Visual	0	461 – Foreground 1,390 – Middle-ground	238 – Foreground 987 – Middle-ground	0

Note: These acres do not total the number of harvest acres shown in Table 2.24. The management areas overlap. For example, an area identified as DOG can also be within the visual foreground.

Table 2.26. Road Density Summary: Existing and Proposed (Mill Creek Subwatershed ONLY).

Status	Existing	Proposed (Alternatives 2, 3, & 4)
Open (Miles)	50.7	51.4
Closed to Motorized Vehicles (Miles	62.8	44.0
New Decommissioning (Taken off road system)		17.8*
Open Road Density (Miles per sq. Mile)	1.8	1.8

* Majority of roads proposed for decommissioning are already closed
(0.3 miles of open road are proposed for decommissioning)
(Road density: Mill Creek Subwatershed – 17, 846 ac or 17,835/640 = 27.87 sq mi
Existing: 50.7/27.87 = 1.82 and Proposed: 51.1/27.87 = 1.83)

Table 2.27. Proposed Changes for Management Area 13 (All Action Alternatives).

DOG/ROG	Existing MA-13 (Acres)	Proposed MA-13 (Acres)	RHCA Overlap with MA-13 (Acres)	Forest Plan Management Allocation Changes (Acres)		
				MA-1 & 2	MA-14	MA-13
134 – DOG	382	395	46	–8	–5	13
134 – ROG	0	256	24	–149	–107	256
241 – DOG	169	169	6	0	0	0
241 – ROG	0	85	11	–14	–71	85

DOG/ROG	Existing MA-13 (Acres)	Proposed MA-13 (Acres)	RHCA Over-lap with MA-13 (Acres)	Forest Plan Management Allocation Changes (Acres)		
				MA-1 & 2	MA-14	MA-13
335 – DOG	273	317	28	–21	–23	44
335 – ROG	0	179	0	–72	–107	179
Total	824	1401	115	–264	–313	577

Table 2.28. Comparison of Alternatives by Issue and Measurement.

Issue	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1. Effects of road construction, commercial timber harvest, and prescribed burning on soil, water quality, and listed aquatic species habitat				
▪ Temporary road construction - miles	0	8.6	1.5	0
▪ Temporary road constructed in RHCAs - miles	0	0	0	0
Road Activities In RHCAs (all stream categories) -miles ▪ Log haul ▪ Maintenance ▪ Reconstruction	 0 0 0	 5.6 4.0 0.7	 5.5 4.8 0.7	 0 0 0
▪ Equivalent Roaded Acres - percent	2007 - 7.3% 2012 - 6.4%	2007 - 9.0% 2012 - 7.9%	2007 - 8.6% 2012 - 7.5%	2007 - 7.3% 2012 - 6.4%
▪ Timber harvest - acres	0	2,192	1,506	0
▪ Detrimentally disturbed soils – percent (standard not to exceed 20%)	No Impacts	No units exceed 20% threshold	No units exceed 20% threshold	No units exceed 20% threshold
▪ Effects determination by fish species	No Impacts	See Table S – 10	See Table S – 10	See Table S – 10
▪ Prescribed burning affects on sediment and temperature	No Impacts	No Measurable Increase	No Measurable Increase	No Measurable Increase
2. Effects of commercial thinning on satisfactory big game cover				
▪ Commercial thinning in satisfactory cover - acres	0	27	0	0
▪ Cover post project– percent Marginal cover % (Standard 5%) Satisfactory cover % (Standard 12%) Total cover (Standard 20%)	 47.5 2.5 50	 42.0 2.4 44.4	 43.3 2.5 45.8	 45.8 2.5 48.3
3. Effects of under burning on calving/ fawning areas				
▪ Impacts on calving/fawning	No Impacts	Limited Short-term Impacts	Limited Short-term Impacts	Limited Short-term Impacts
4. Impacts of thinning on connectivity corridors				
▪ Acres treated by commercial harvest and precommercial thinning (PCT)	0	257	187	177
▪ % treated by Harvest and PCT	0%	7%	5%	5%
▪ Comparison to Forest Plan Standard	Meets or exceeds FP Standard	Meets or exceeds FP Standard	Meets or exceeds FP Standard	Meets or exceeds FP Standard
5. Effects of thinning and prescribed burning on neotropical migrant bird species				
Dry Forest Habitats	No Impact	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts

Issue	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Riparian Woodlands and Shrubland Habitats	No Impact	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts
Shrub-Steppe Habitats	No Impact	No Impact	No Impact	No Impact
6. Effects on threatened, endangered species and FS sensitive wildlife species				
▪ Wildlife BE determinations for TES species	No Impacts	See Table S – 9	See Table S – 9	See Table S – 9
7. Effects of harvest and burning activities multi-strata old-growth dependent species				
▪ Acres treated with harvest and PCT in Old Forest Multi-Strata (OFMS) and Young Forest Multi-Strata (YFMS)	0	418	248	135
▪ % OFMS in 50 years	29%	28%	29%	29%
▪ Impacts on multi-strata associated management indicator species (MIS) o Pileated woodpecker, American Marten, three-toed woodpecker and northern goshawk	No Impact	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts	Limited Short-term Impacts, Long-term Beneficial Impacts
8. Effects of harvest and burning activities on white headed woodpecker habitat (OFSS)				
▪ OFMS to OFSS conversion - acres	0	6	1	0
▪ OFSS Maintenance - acres	0	17	14	6
▪ OFSS Development - acres	0	2,130	1,452	750
▪ % OFSS in 50 years	15%	27%	24%	15%
▪ Impacts to white headed woodpecker	No Impact	Long-term Beneficial Impacts	Long-term Beneficial Impacts	Long-term Beneficial Impacts
9. Effects on snag retention and primary cavity excavator species				
▪ Post harvest snag densities	No Impact	Minimal decrease from existing	Minimal decrease from existing	Minimal decrease from existing
▪ Post prescribed fire snag densities	No Impact	Minimal Increase	Minimal Increase	Minimal Increase
▪ DecAID Advisory tool Results-Tolerance Levels	No change	No Change or Minimal Increase	No Change or Minimal Increase	No Change or Minimal Increase
▪ Snag density (comparison to Forest Plan Standard)	No Impact-Currently Below standard	Below standard	Below standard	Below standard
10. Smoke impacts to local communities				
▪ Smoke emission	No Impact	Meets State Requirements	Meets State Requirements	Meets State Requirements
▪ Impacts to local communities (Austin and Bates)	No Impact	Short-Term Impacts	Short-Term Impacts	Short-Term Impacts
11. Tree mortality caused by under-burning				
▪ Estimated tree mortality by diameter class – percent 10 inches or greater 5-10 inches 5 inches or less	No Impact	Less than 10% Less than 15% Less than 35%	Less than 10% Less than 15% Less than 35%	Less than 10% Less than 15% Less than 35%

Issue	Alternative 1	Alternative 2	Alternative 3	Alternative 4
12. Burning effects on down wood and soil nutrients				
▪ Comparison to Forest Plan down wood Standards	No Impact – Currently below standards	Minimal Short-term Impact-Remain below standards	Minimal Short-term Impact-Remain below standards	Minimal Short-term Impact-Remain below standards
13. Effects to public access				
▪ Open road density – miles/sq. mile	1.8	1.8	1.8	1.8
▪ Comparison to Forest Plan Standard	Meets Standards	Meets Standards	Meets Standards	Meets Standards
14. Effects on visual quality				
▪ Visual Quality Objective – Highways 7 and 26 (Retention Standard)	No Impact	Meets Retention	Meets Retention	Meets Retention
15. Effects on grazing permittee operations				
▪ Rest period after burning	No Impact	One growing season	One growing season	One growing season
▪ Change in forage	No Impact	Mid to long-term increase	Mid to long-term increase	Mid to long-term increase
17. Effects of invasive/noxious weeds				
▪ Miles of temporary road	0	8.6	1.5	0
▪ Miles of road reconstruction	0	10.9	10.9	0
▪ Invasive/noxious weeds within harvest units - acres	0	41.5	41.5	0
▪ Invasive/noxious weeds within prescribed burning units - acres	0	31.1	31.1	31.1
▪ Grapple piling - acres	0	877	631	649
▪ Risk of spread (combined activities)	No Impact	Minimal risk of spread	Minimal risk of spread	Minimal risk of spread
17. Fall burning impacts to recreation (hunting)				
▪ Recreation analysis	No Impact	Limited Short-term impact	Limited Short-term impact	Limited Short-term impact
18. Effects to local economy				
▪ Present net value $$ returned	0	183,201	87,624	0

Table 2.29. Comparison of Alternatives: Listed and Sensitive Wildlife Species.

Species	Status	Alt 1	Alt 2	Alt 3	Alt 4
Gray Wolf	S	NI	NI	NI	NI
Northern Bald Eagle	S	NI	NI	NI	NI
North American Lynx	T	NE	NE	NE	NE
American Peregrine Falcon	S	NI	NI	NI	NI
California Wolverine	S	NI	NI	NI	NI
Pygmy Rabbit	S	NI	NI	NI	NI
Pacific Fisher	S	NI	NI	NI	NI
Western Sage Grouse	S	NI	NI	NI	NI
Gray Flycatcher	S	NI	NI	NI	NI
Bobolink	S	NI	NI	NI	NI
Upland Sandpiper	S	NI	NI	NI	NI
Tricolored Blackbird	S	NI	NI	NI	NI
Bufflehead	S	NI	NI	NI	NI

E = Endangered, T = Threatened, S = Sensitive. NE = No Effect, NAE = No Adverse Effect, NLAA = May Effect, Not Likely to Adversely Affect, LAA = May Effect, Likely to Adversely Affect, BE = Beneficial Effect, BI= Beneficial Impact, NI = No Impact, MIIH = May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.

Table 2.30. Comparison of Alternatives: Listed and Sensitive Fisheries and Aquatic Species.

Species	Status	Alt 1	Alt 2	Alt 3	Al 4
Redband trout	S	MIIH	MIIH (BI)	MIIH (BI)	MIIH (BI)
Malheur mottled sculpin	S	NI	NI	NI	NI
Columbia spotted frog	S	NI	MIIH (BI)	MIIH (BI)	MIIH (BI)
Westslope cutthroat trout	S	NI	NI	NI	NI
Columbia River Basin Bull Trout	T	NLAA	NLAA	NLAA	NLAA
Mid Columbia River Steelhead	T	LAA	LAA (BE)	LAA (BE)	LAA (BE)
Steelhead Designated Critical Habitat	T	LAA	LAA(BE)	LAA(BE)	LAA(BE)
Spring Chinook Salmon	S	MIIH	MIIH (BI)	MIIH (BI)	MIIH (BI)
Spring Chinook Salmon	EFH	NAE	NAE	NAE	NAE

Table 2.31. Comparison of Alternatives: Sensitive Plant Species: Summary of Effects Determination Statements.

Sensitive Species	Occurrence in Project Area	Habitat Status Within Project Area	Alt 1 (No Action)	Alt 2, Alt 3, and Alt 4
Achnatherum hendersonii **Henderson's ricegrass**	**Not Found**	**Present**	**NI**	**MIIH**
Achnatherum wallowensis **Wallowa ricegrass**	**Not Found**	**Present**	**NI**	**MIIH**
Astragalus diaphanus var. diurnus South Fork John Day milkvetch	Not Found	Not Present	NI	NI
Astragalus tegetarioides Deschutes milkvetch	Not Found	Not Present	NI	NI
Botrychium ascendens **upswept moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium crenulatum **crenulate moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium lanceolatum **lance-leaf moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium minganense **Mingan moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium montanum **mountain moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium pinnatum **pinnate moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Calochortus longebarbatus var. peckii long-bearded sego lily	Not Found	Not Present	NI	NI
Camissonia pygmaea dwarf evening primrose	Not Found	Not Present	NI	NI
Carex backii **Back's or Cordilleran sedge**	**Not Found**	**Present**	**NI**	**MIIH**
Carex idahoa **Idaho sedge (formerly C. parryana)**	**Not Found**	**Present**	**NI**	**MIIH**
Carex interior **inland sedge**	**Suspected**	**Present**	**NI**	**MIIH**
Cypripedium fasciculatum **clustered lady's- slipper**	**Suspected**	**Present**	**MIIH**	**MIIH**
Dermatocarpon luridum silverskin lichen	Not Found	Not Present	NI	NI
Leptogium burnetiae var. hirsutum hairy skin lichen	Not Found	Not Present	NI	NI
Listera borealis **northern twayblade**	**Not Found**	**Present**	**MIIH**	**MIIH**
Lomatium erythrocarpum redfruit desert parsley	Not Found	Not Present	NI	NI
Lomatium ravenii Raven's lomatium	Not Found	Not Present	NI	NI

Sensitive Species	Occurrence in Project Area	Habitat Status Within Project Area	Alt 1 (No Action)	Alt 2, Alt 3, and Alt 4
Luina serpentina colonial luina	Not Found	Not Present	NI	NI
Mimulus evanescens vanishing monkeyflower	Not Found	Not Present	NI	NI
Pellaea bridgesii **Bridge's cliff-brake**	**Not Found**	**Present**	**NI**	**NI**
Phacelia minutissima **least phacelia**	**Not Found**	**Suspected**	**NI**	**MIIH**
Pleuropogon oreganus Oregon semaphore grass	Not Found	Not Present	NI	NI
Thelypodium eucosmum arrow-leaved thelypody	Not Found	Not Present	NI	NI
NI = No Impact. MIIH = May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal Listing or cause a loss of viability to the population or species.				

Identification of the Preferred Alternative

Alternative 2, with associated project design measures and monitoring items, is the Agency Preferred Alternative.

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 in that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

The three action alternatives have many similar treatment types and effects. To make the discussion of the effects analysis less redundant, these similar effects are identified by a “Common to All Action Alternatives” or “Common to Action Alternatives” heading in some of the sections in this chapter. The “Common to All” section generally follows immediately after the discussion of the No Action Alternative – Alternative 1, which are then followed by the effects unique to each alternative.

The temporal scales used throughout the effects analysis are described as short, mid and long-term. Unless otherwise stated, short-term represents impacts that may occur in less than 5 years, mid-term 5 to 20 years, and long-term more than 20 years.

The listing of past, present, and foreseeable activities are identified in Appendix D. These activities were considered by each Interdisciplinary Team Specialist for potential cumulative effects. These effects are discussed within each of the following resource effects sections. Only those activities that would create possible cumulative effects were analyzed within these resource effects sections. The analysis of the past actions follows the Council on Environmental Quality guidance provided on June 24, 2005.

Changes from Draft to Final EIS for this Chapter

Table 3.1. Changes between the DEIS and the FEIS.

Chapter 3 Change Items
Cumulative effects sections were updated to address ongoing or foreseeable future activities that have been completed. New foreseeable future projects in the Mill Creek Subwatershed were added (Wrac Lodgepole and Forest Weeds EIS).
Forest Vegetation and Wildlife Section The Forest Vegetation section of the FEIS received minor updates to the following areas: ▪ A footnote on Historic Range of Variation has been added to the tables. ▪ Definitions for short-term, mid-term, and long-term have been added. ▪ Effects to riparian vegetation have been added for Alternatives 3 and 4. ▪ The Consistency with Direction and Regulations has been updated. The wildlife effects section was modified to include a nonsignificant Forest Plan Amendment to commercially thin 27 acres of satisfactory cover with Alternative 2. In the DEIS, 70 acres of commercial thinning was proposed in satisfactory cover (see Chapter 1 above).
Aquatics and Water Quality Section The Aquatics and Water Quality Section of the FEIS received minor updates to the following areas: ▪ The affected environment for roads

▪ Water temperature/stream shading effects analysis ▪ Aquatic habitat and water quality cumulative effects analysis ▪ The values in Table AW – 12 were updated
Fire and Fuels Section In the Fire and Fuels section on the FEIS, activity fuel treatments were clarified for Alternatives 2 and 3.
Section "Other Disclosures" was added ▪ This section discloses consistency with applicable laws. ▪ A section discussing "Inventoried Roadless, Potential Wilderness and Areas with Undeveloped Character" was added. ▪ A consistency discussion on E. O. 13443: Facilitation of Hunting, Heritage and Wildlife Conservation, was added.
Sensitive Plants Section ▪ Additional analysis was added to the Sensitive Plant section. ▪ Small factual errors were corrected in the Sensitive Plant section. Minor changes were made to effects determinations for some species under action alternatives. These changes were made where impacts to potential habitat could be minimized but not totally avoided.

Specialist Reports, Use of "Best Available Science," and Project Record

This Environmental Impact Statement hereby incorporates by reference the Forest Vegetation, Fuels and Fuels, Soil, Aquatic and Water Quality, Terrestrial Wildlife, Sensitive Plants, Noxious/Invasive Weeds, Rangeland Resources, Recreation, Visual/Scenery, Roads/Access, Heritage Resources, and Economics/Social Specialist Reports, Forest Roads Analysis (December, 2004), Crawford Roads Analysis (updated 2008), and Upper Middle Fork Watershed Assessment (1998) (Crawford Project Record (40 CFR 1502.21). These specialist reports contain the detailed data, methodologies, analysis, conclusions, maps, references, and technical documentation that the resource specialists referenced to reach the conclusions in this environmental analysis.

Best available science is considered in preparation of this EIS. The concept of "best available science" is also a matter of opinion to some degree since scientists can legitimately disagree about the meaning or significance of individual study results. As a general matter, we show consideration of the best available science when we insure scientific integrity of the discussions and analyses in the project NEPA document. Specifically, this EIS and the accompanying project record identifies methods used, references reliable scientific sources, discusses responsible opposing views, and discloses incomplete and unavailable information, scientific uncertainty, and risk (See 40 CFR, 1502.9 (b), 15022.22, 1502.24).

The project record for the Crawford Project includes all project-specific information, including resource reports, the watershed analysis, and other results of field investigations. The record also contains information resulting from public involvement efforts. The project record is located at the Malheur National Forest in John Day, Oregon, and is available for review during regular business hours.

Forest Vegetation

Regulatory Framework

Malheur Plan Direction and Standards

This section describes the Forest Wide Standards and timber management constraints set forth in the Malheur National Forest Land and Resources Management Plan (Forest Plan), as amended.

Forest–Wide Standards

Timber Management (Forest Plan, pgs IV – 36 – 38)

- Based on site-specific silvicultural prescriptions, apply even-aged or uneven-aged management systems to forest timber stands. Determine the applicable management system for any timber stand through the use of specific management area direction and project level environmental analysis.
- Before scheduling stands for a clear-cut or seed tree regeneration system or a final removal of a shelterwood, ensure that the site has the capability to be adequately restocked within 5 years.
- Planting stock will be grown from the seed of phenotypically superior trees within the seed and elevation zones of collection, except where a certified silviculturist certifies that another location is acceptable without loss of productivity.
- Manage to maintain or re-establish ponderosa pine, at time of regeneration, on sites where ponderosa pine is sub-climax.
- Schedule and implement precommercial thinning to achieve desired stocking level based on a site-specific silvicultural examination and interdisciplinary prescription.

Insects and Disease

Apply integrated pest management principles to minimize the impacts of the mountain pine beetle, western spruce budworm, tussock moth and other insect and disease infestations. Avoid the creation of vegetation conditions that could promote insect and disease infestations.

REGIONAL FORESTER'S EASTSIDE FOREST PLAN AMENDMENT 2

All timber sales will be designed to incorporate the interim riparian, ecosystem and wildlife standards as set forth in the Regional Forester's Forest Plan Amendment 2. These standards supersede previous Forest Plan and other management guidelines. The amendment incorporates three standards; riparian, ecosystem, and wildlife. Personal use firewood sales, post and pole sales, sales to protect health and safety, and sales to modify vegetation within special use recreation areas are exempt from these standards. Precommercial thinning, fiber sales, sales of dead material less than 7 inches dbh, salvage sales outside old-growth, and commercial thinning and understory removal sales are not subject to the ecosystem standard. Key wildlife and ecosystem standards that are applicable to the vegetation portion of this analysis include:

- Characterize the proposed timber sale and its associated watershed for the major ecosystem pattern and compare to the Historic Range of Variability (HRV).

- The interim wildlife standard has two possible scenarios to follow based on the HRV for each biophysical environment within a given watershed. For the purposes of this standard, late and old structural stages (LOS) can be either "Multi-strata with Large Trees," or "Single-Stratum with Large Trees." Use Scenario A whenever any one type of LOS is below HRV. If both types occur within a single biophysical environment and one is above HRV and one below, use Scenario A. Only use Scenario B when both LOS stages within a particular biophysical environment are at or above HRV.

  An HRV analysis was completed for the Crawford Project. The analysis showed that single-stratum LOS is below HRV for most biophysical environments. With the exception of the warm-dry biophysical environment, multi-strata LOS meets or exceeds HRV. Therefore, the Crawford Project used Scenario A.

SCENARIO A:

- If wither one or both of the late and old structural (LOS) stages falls below HRV in a particular biophysical environment within a watershed, then there should be no net loss of LOS from that biophysical environment. Do not allow timber sale harvest activities to occur within LOS stages that are below HRV.
- Some timber sale activities can occur within LOS stages that are within or above HRV in a manner that maintain or enhance LOS within that biophysical environment. It is allowable to manipulate one type of LOS to move stands into the LOS stage that is deficit if this meets the historical conditions.
- Outside of LOS, many timber sale activities are allowed. The intent is still to maintain and/or enhance LOS components in the stands subject to timber harvest as much as possible, by adhering to the following standard:
  - Maintain all remnant late and old seral and/or structural live trees greater than or equal to 21 inches in dbh that currently exist within stands proposed for harvest activities.
  - Manipulate vegetation structure that does not meet late and old structural conditions, in a manner that moves it towards these conditions as appropriate to meet HRV.
  - Maintaining open, park-like conditions where this condition occurred historically. Manipulate vegetation in a manner to encourage the development and maintenance of large diameter, open canopy structure (while understory removal is allowed, some amount of seedling, sapling, and poles need to be maintained for development of future stands).
  - Maintain connectivity and reduce fragmentation of LOS. Harvesting within connectivity corridors is permitted if all criteria are met. Some of which includes: canopy closures will be maintained within the top one-third of site potential; some amount of understory (if it occurs) is left in patches or scattered to assist in supporting density and cover; some understory removal, stocking control, or salvage may be possible activities, depending on the site.

Wildlife standards not listed in this section are discussed in the Terrestrial Wildlife Section.

Analysis Methods

Modeling is used to project stand development for future structural stages. The INFORMS program was used to run the Forest Vegetation Simulation (FVS) growth simulator on all of the forested stands within the project area. The FVS model, with the Blue Mountain variant, is being used to compare structures between alternative treatments. Long-term projections become estimates at best; however, results do show trends and are useful for comparing different alternatives. The following definitions for short-term, mid-term, and long-term are used to facilitate discussion of effects: short term is 0 to 5 years, mid-term is 5 to 25 years, and long-term is 25+ years. Most discussion is focused on the short and long term. The analysis area used for the HRV analysis is the Mill Creek Subwatershed.

Assumptions

Assumptions for the INFORMS Model

- Benchmarks for the future structural stage analysis are set at a time immediately after treatment has occurred and 50 years from now.
- The mechanical treatments in this alternative are only applied once, at the start of the modeling time period. They aren't repeated again within the 50 year modeling cycle.
- There was no adjustment for the modified thinning in the connectivity corridors.
- Prescribed burning was applied only once and in the first decade in the INFORMS model. Future additional prescribed burning was assumed for effects – see below).
- The stands without mechanical treatment are grown using the assumptions for the No Action Alternative.
- No other stand disturbances occur that result in stand replacement (fire, insects, wind, etc.).

(The above modeling constraints are used to simplify the analysis, are to be used for comparative purposes only, and are not meant to accurately predict actual future conditions.)

The following conditions are reasonable expectations for the future management of the area and are used to estimate the effects of the various alternatives. All alternatives are compared using this set of assumptions for the future.

Assumptions for Estimating Effects

- The Historic Range of Variation (HRV) approximates the desired condition.
- The future climate will be within the current range of variation.
- Current insects and diseases will continue to inhabit the forest and populations will fluctuate depending on stand conditions.
- The current trends in forest stand composition, structure, and density will continue, assuming that no further mechanical vegetation management would occur.
- Natural regeneration resulting from opening up stands will be kept at low levels by periodic underburning.

Affected Environment

Past Management Activity

Native Americans lived and passed through the area and utilized it for various activities including hunting for big and small game, fishing, gathering berries and other vegetal food, digging for roots, spiritual gatherings and family outings. They also set fires in addition to the natural fires to manage the forests for their use (Boyd 1999).

Settlement by European immigrants began in the mid-1800s, initially by those involved in mining and grazing. Timber harvesting was localized, mainly for mine props and buildings. Beginning in the 1900s with the coming of the Sumpter Valley Railway, lumbering began in earnest in the ponderosa pine found on the lowlands. A major permanent track ran down the Middle Fork John Day Valley and numerous temporary spurs were constructed along every major creek and drainage in the watershed to haul timber to mills constructed in and nearby Bates and Austin. Towards the middle of the century, harvest moved upland to the middle elevations and consisted of partial removal of the higher value species. The early 1900s also saw the formation of the National Forests and eventually fire suppression, which along with intensive grazing reduced the amount of fires to a low level.

The combination of timber harvest and fire suppression gradually converted forests from early seral species to a higher proportion of late seral species. Stand densities and multi-layer canopies also increased across the forests. These late seral trees are not resistant to forest insects, diseases, or to fire.

Within the last three decades there have been several outbreaks of defoliating insects and bark beetles that have caused widespread mortality. In the Middle Fork drainage there have been several large, high severity fires that have burned across the landscape including areas that historically burned at a low intensity but at frequent intervals. These have been fueled by the increased dead and down timber, dense stands, and multiple crown layers creating ladder fuels into the upper tree crowns. The effect has been to convert large acreages to the stand initiation structural stage, drastically changing wildlife habitat and impacting streams and aquatic life.

Approximately 1,000 acres of timber harvest in the last 15 years has begun to correct the past changes, concentrating on thinning overstocked stands and shifting the species composition of late-seral species stands to more resilient early-seral species stands. These timber management projects include Tip Thin, Dan's Thin, Wye, Spike, and Pog Pogo which are listed in Appendix D. There has been approximately 800 acres of commercial thinning mostly in small to medium diameter ponderosa pine stands. The approximately 200 acres of regeneration treatments in fir-dominated stands have removed many of the late-seral species and retained healthy early-seral tree species, and reforested with early-seral species with the goal of shifting the species composition to more resilient early-seral tree species.

Precommercial thinning has been applied to hundreds of acres in the lower elevations of the area, predominately in the ponderosa pine stands. The effect has been to select the better growing trees and reduce competition between trees, resulting in increased growth rates and larger trees produced in a shorter time period.

Biotic Conditions

Information concerning stands has been gathered through a combination of photo interpretation, formal timber stand exams, informal exams (1993 – 1995), and walk-throughs (1999).

The analysis area is largely forested. The lower elevations and south facing slopes are generally ponderosa pine with ground vegetation of pine grass, elk sedge, and common snowberry. Other tree species include western larch, Douglas-fir, lodgepole pine, and grand fir. These stands are generally young and even-aged due to the nature of past harvests. There is low structural diversity and a lack of larger diameter trees and snags. The limiting factors to vegetative growth are competition for water, sunlight and soil nutrients.

The rest of the plant associations are predominantly grand fir. The grand fir series contain grand fir, Douglas-fir, western larch, lodgepole pine, and ponderosa pine. Pinegrass, twinflower, grouse huckleberry, and big huckleberry dominate ground vegetation. These stands are typically overstocked multi-strata canopies that are at high risk for insect and disease problems and stand replacement fire. Lodgepole pine with ground vegetation of grouse huckleberry occurs in the upper elevations.

There are five forested biophysical environments that occur within the analysis area as displayed in the table below.

Table V – 1. Biophysical Environments within the Subwatershed.

Biophysical Environment	Acres	Percent within the Subwatershed
Hot–Dry	700	4 %
Warm–Dry	10,700	60 %
Cool–Moist	100	1 %
Cool–Dry	700	4 %
Cold–Dry (Lodgepole)	3,700	21 %
Non–Forest	1,800	10 %

*Biophysical Environments – PAG (Plant Association Groups) – Vegetation classification using similar moisture and temperature environments resulting in similar fire regimes. Non-Forest includes woodlands, shrublands, and meadows.

- Hot–Dry Forest – Occupy low to mid elevations and mainly south slopes. Stands are composed primarily of ponderosa pine. Fire regime is low intensity, high frequency (10–15 years) over most of the area, with small patches of mortality.
- Warm–Dry Forest – Occupy low to mid elevations and south slopes at higher elevations. Stands are composed of ponderosa pine, Douglas-fir, lodgepole, grand fir, and western larch. Fire regime is low intensity, high frequency (10–15 years) over most of the area, with small patches of mortality.
- Cool–Moist Forest – Occupy mid elevations, northerly aspects and cooler, wetter draw bottoms. Stands are composed of ponderosa pine, Douglas-fir, grand fir, lodgepole pine, western white pine, and western larch. Fire regime is mixed, with low intensity, high frequency (10–15 years) regime overlaid with a high intensity, low frequency (100–200 years) regime. Patch size would range from 200 to 2,000 acres.
- Cool–Dry Forest – Occupy mid to higher elevations, northerly aspects and cooler areas that are relatively dry. Stands are composed of ponderosa pine, Douglas-fir, grand fir, lodgepole pine, western white pine, and western larch. Fire regime is mixed, with low intensity, high frequency (10–15 years) regime overlaid with a high intensity, low frequency (100–200 years) regime. Patch size would range from 200 to 2,000 acres.
- Cold–Dry Forest – Occupy high elevation sites, northerly aspects, and colder, relatively dry areas. Stands are composed of Engelmann spruce, sub-alpine fir, whitebark pine, and lodgepole pine and the fire regime is high intensity, low frequency (50–275+ years) with noticeable susceptibility to torching and crown fires.
- Non-forest – Non-forest biophysical environments include woodlands, shrublands, meadows and grasslands. Woodlands occupy dry sites at low to mid elevations, often on south slopes. Woodland stands are historically open ponderosa pine savannahs and sparse western juniper that was maintained by frequent fires. Dry meadows and grasslands are found in several locations within the planning area and are characterized by generally shallow and rocky soils.

Hot–Dry Biophysical Environments

Hot-dry forests occupy approximately 700 acres (4% of the Mill Creek Subwatershed). They occur across a range of soils (volcanic ash as well as mixed and residual soils – gravely to cobbly loams, and clay loams) and southerly to flat aspects along mid to lower elevations.

Species composition includes nearly pure stands of ponderosa pine to mixes where ponderosa pine is the dominant species and Douglas-fir, grand fir, western larch, and lodgepole pine occur in lesser amounts. The hot-dry forests were subject to frequent, low intensity fires that maintained the ponderosa pine in the stands.

In some locations juniper is increasing its range into the hot-dry forests in the absence of frequent ground fires. Also, ponderosa pine is encroaching into meadows that historically were kept free of trees by frequent fire occurrences.

Species Compositions and Successional Development

The low intensity/high frequency disturbance regime common in this forest type favored fire resistant species (ponderosa pine, and to a lesser extent western larch and Douglas-fir) and the development of more open stands with little vertical structure. Shade tolerant species (grand fir and Douglas-fir) were generally susceptible to these fires due to their thinner bark when young and persistent, low hanging crown characteristics. Smaller understory trees were vulnerable to periodic fires surviving only in openings with too little fuels to carry a fire. The extent of these ground fires likely varied from small areas (less than 10 acres in size) to entire slopes covering thousands of acres depending upon the season, topography, and climatic conditions. The intensity also varied in response to vegetative conditions.

Overall, the frequency of these fires made them an agent of stability in these forest ecosystems. They kept the ground vegetation dominated by fire adapted grasses (such as pine grass and elk sedge), while promoting and maintaining mature forest vegetation dominated by ponderosa pine.

Disturbance Processes

Hot-dry forests have been affected by a variety of disturbances. These include: insects; diseases; fire; and human related disturbances such as timber harvest, fire suppression, and grazing. Fire is by far the major disturbance agent in dry forests. Other disturbance agents in this forest type include a variety of insects and diseases. In general, these disturbance agents added to the structural diversity of these stands by providing small areas/openings for understory vegetation to establish.

Fire

Historic fire disturbance regimes in these forest environments can be best characterized as high frequency/low intensity. Fires started by natural ignition (i.e. lightning) or Native American people burned in the form of underburns and small areas of lethal fires on a frequency of every 10 to 35 years in these forest types (Agee 1993, Hall 1977). These fires were agents of stability, helping to maintain stands with high proportions of fire tolerant species and large areas of relatively open, park-like conditions. Small areas of denser forest patches occurred in areas missed or more resistant to fire (draws, spring seep areas, and wetter aspects, for example). See the Fire and Fuels section under Fire Regimes and Condition Classes for additional information.

Recent fires have been large, stand replacing events that are very out of character with the historical fires that occurred. The Summit Fire is the most recent in the Galena Watershed and covered 30,000 acres, of which over half was in the dry forest potential vegetation group (PVG). (See Appendix B for a map of watersheds near the Crawford Project Area.) The Summit Fire burned with stand replacement intensity across ¾ of the area burned, much more intense than historical fires.

Insects

The western pine beetle was the primary bark beetle working in the stands historically dominated by larger diameter ponderosa pine. Scattered individual tree mortality created small openings in stands where pockets of understory could establish. Mountain pine beetle and pine engraver were likely present at low levels due to the overall lack of suitable habitat (i.e. dense thickets of smaller diameter trees).

Bark beetles are the most common insects present in the dry forests. Denser stands with a high proportion of sapling to pole sized ponderosa pine have increased levels of mountain pine beetle and Ips beetle activity and associated mortality. Western pine beetle is also present across dry forests, keying in on highly stressed, larger overstory ponderosa pine. Fir engraver activity is prevalent in dry forests due to the combination of high stand densities and increased proportion of grand fir occupying these sites. At endemic levels, these forest insects play an important role in contributing to structural diversity, and providing dead wood habitat important for wildlife, and soil productivity. At epidemic levels, they create conditions that can lead to disturbance intensities outside the historic range.

Impacts of the recent (1985 to 1992) spruce budworm outbreak have been relatively minor in the hot-dry forest as there is a lack of sufficient host trees (grand fir and Douglas-fir) to sustain populations.

Diseases

The primary root diseases in dry forests are Annosus and Armillaria that result in small “centers” of mortality and associated gaps in the forest canopy. These areas provided openings for under-story vegetation (grasses, shrubs and seedlings) to establish and added to structural diversity. Overall levels were generally low due to the effects of fires maintaining increased abundance of species most tolerant to diseases (ponderosa pine and western larch), and increased ability of trees to ward off infections due to lower stand densities.

Dwarf mistletoe was present in low levels throughout the hot-dry forests of the watershed. It predisposed the occasional tree to bark beetle attack or torching by fire. Brooms created by mistletoe infections were susceptible to fire, especially brooms in the lower crown. Thus, frequent fires likely helped keep overall levels of mistletoe low due to the “fire pruning” of infected branches and through potential negative impacts of the heat and smoke on developing mistletoe plants. Levels of mistletoe infection vary and are generally low in the planning area, probably a result of the historic clear cutting that removed most of the overstory trees.

Mechanical

Windthrow of occasional trees also added structural diversity by creating small gaps in the forest canopy, facilitating establishment of understory vegetation. Generally, ponderosa pine is relatively wind firm, but small patches of blowdown do occur.

Human

Human related disturbances (timber harvest, fire exclusion) have affected the dry forests more than the other forest types across the watershed. In the past, the most noticeable harvests focused on the removal of the larger overstory ponderosa pine.

The most noticeable feature is the absence of large ponderosa pine trees in many stands. This is particularly evident in the lower and mid elevations due to early railroad logging; there are few large trees and an abundance of young, small to medium sized trees. Many of the young ponderosa pine stands have been precommercial thinned in the past and some have already been commercial thinned.

Table V – 2. Hot-Dry Forest HRV and Current Structural Stages.

Structural Stage*	Historic Range of Variation[1]	Current Condition
Stand Initiation (SI)	5 – 15%	0%
Stem Exclusion Open Canopy (SEOC)	5 – 20%	40%
Stem Exclusion Closed Canopy (SECC)	0 – 5%	0%
Understory Reinitiation (UR)	0 – 5%	3%
Young Forest Multi-Strata (YFMS)	5 – 10%	40%
Old Forest Single-Stratum (OFSS)	20 – 70%	0%
Old Forest Multi-Strata (OFMS)	5 – 15%	17%

[1] Historic Range of Variation is based on professional judgment of the historical extent of structural stages. (Powell, 1998). Current Condition is derived from stand exam information and the FVS model.

***Structural Stage –** Classification of forest stands by developmental stage and size.

- Stand Initiation (SI) – A single canopy stratum of seedlings and saplings established after a stand replacing disturbance.
- Stem Exclusion Open Canopy (SEOC) – A single canopy stratum of pole to small saw sized timber that excludes an understory by lack of water.
- Stem Exclusion Closed Canopy (SECC) – A single canopy stratum of pole to small saw sized timber that excludes an understory by shade.
- Understory Reinitiation (UR) – The overstory has been opened up by natural mortality or thinning, allowing the understory to become established.
- Young Forest Multi-Strata (YFMS) – Multiple canopy layers provide vertical and horizontal diversity with a mix of tree sizes. Large trees are absent or at low stocking levels.
- Old Forest Single-Stratum (OFSS) – Large trees are frequent, limited understory and one canopy level.
- Old Forest Multi-Strata (OFMS) – Large trees are frequent, has multiple canopy levels.

Warm–Dry Biophysical Environments

Warm-dry forests occupy approximately 10,700 acres (60% of the Mill Creek Subwatershed). They occur across a range of soils (volcanic ash as well as mixed and residual soils – gravely to cobbly loams, clay loams) and southerly to flat aspects along mid to lower elevations.

Warm-dry forests are represented by an array of plant associations, indicating the wide range of environments they occupy. Species compositions range from nearly pure ponderosa pine to mixes of ponderosa pine, Douglas-fir, grand fir, western larch, and lodgepole pine. The warm-dry forest includes most of the Douglas-fir plant associations and the drier grand fir plant associations (up to and including the grand fir/grouse huckleberry association), since they all were subject to frequent, low intensity fires that maintained early seral species in the stands.

Species Compositions and Successional Development

The low intensity/high frequency disturbance regime common in this forest type favored fire resistant species (ponderosa pine, western larch, and to a lesser extent Douglas-fir) and development of more open stands with little vertical structure. Shade tolerant species (grand fir and Douglas-fir) were generally susceptible to these fires due to their thinner bark when young and persistent, low hanging crown characteristics. This was also true for moist forests occurring in the transitional area with dry forests. Smaller understory trees were vulnerable to periodic fires surviving only in openings with too little fuels to carry a fire. The extent of these ground fires likely varied from small areas (less than 10 acres in size) to entire slopes covering thousands of acres depending upon the season, topography, and climatic conditions. The intensity also varied in response to vegetative conditions. Areas missed by frequent fires (wetter northerly aspects) developed conditions where subsequent fires could potentially be of moderate to high intensity, resulting in patches of stand replacement/regeneration.

Overall, the frequency of these fires made them an agent of stability in these forest ecosystems. They kept the ground vegetation dominated by fire adapted grasses (such as pine grass and elk sedge) and shrubs (ceanothus, snowberry, and Oregon grape), while promoting and maintaining mature forest vegetation dominated by early seral species, such as ponderosa pine, western larch and, to a lesser extent, Douglas-fir. Because of the stabilizing effect of these fires, stands tended to be maintained with early seral species and larger fire resistant trees. Succession to shade tolerant species and associated multi-strata structures only occurred in areas that escaped several fire cycles.

Disturbance Processes

Warm-dry forests have been affected by a variety of disturbances. These include: insects; diseases; fire; and human related disturbances such as timber harvest, fire suppression, and grazing. Fire is by far the major disturbance agent in dry forests. Other disturbance agents in this forest type include a variety of insects and diseases. In general, these disturbance agents added to the structural diversity of these stands by providing small areas/openings for understory vegetation to establish.

Fire

Historic fire disturbance regimes in these forest environments can be best characterized as high frequency/low intensity. Fires started by natural ignition (i.e. lightning) or Native American people, burned in the form of underburns and small areas of lethal fires on a frequency of every 10 to 35 years in these forest types (Agee 1993, Hall 1977). These fires were agents of stability, helping to maintain stands with high proportions of fire tolerant species and large areas of relatively open, park-like conditions. Small areas of denser forest patches occurred in areas missed or more resistant to fire (draws, spring seep areas, and wetter aspects, for example). See the Fire and Fuels section under Fire Regimes and Condition Classes for additional information.

Recent fires have been large, stand replacement events that are very out of character with the historical fires that occurred. The Summit Fire is the most recent in the Galena Watershed and covered 30,000 acres, of which over half was in the dry forest potential vegetation group (PVG). The Summit Fire burned with stand replacement intensity across ¾ of the area burned, much more intense than historical fires.

Insects

The western pine beetle was the primary bark beetle working in the stands historically dominated by larger diameter ponderosa pine. Scattered individual tree mortality created small openings in stands where pockets of understory could establish. Mountain pine beetle and pine engraver were likely present at low levels due to the overall lack of suitable habitat (i.e. dense thickets of smaller diameter trees).

Bark beetles are the most common insects present in the warm-dry forests. Denser stands with a high proportion of sapling to pole sized ponderosa pine have increased levels of mountain pine beetle and Ips beetle activity and associated mortality. Western pine beetle is also present across dry forests, keying in on highly stressed larger overstory ponderosa pine. Fir engraver activity is prevalent in dry forests due to the combination of high stand densities and increased proportion of grand fir occupying these sites. At endemic levels, these forest insects play an important role in contributing to structural diversity, and providing dead wood habitat important for wildlife, and soil productivity. At epidemic levels, they create conditions that can lead to disturbance intensities outside the historic range.

Impacts of the recent (1985 to 1992) spruce budworm outbreak are found in the moister vegetation types within the dry forest group, especially in the multi-strata stand structures. In general, the suppressed tree classes of grand fir, Douglas-fir, and spruce exhibit poor crowns, reduced growth and varying degrees of mortality because of past repeated defoliation. The band of dry forest along the southern boundary of the Vinegar Hill-Indian Rock Scenic Area is at the moist end of the dry forest spectrum and it was hit particularly hard by the budworm outbreak in 1991, with heavy defoliation and above average mortality levels. This area has been the location of three severe fires in the mid 1990s, no doubt made worst by the increased fuel levels caused by the budworm infestations. Another area of heavy defoliation and mortality lies just north and east of Ragged Rocks in the heads of the Butte, Ruby, and Ragged Creek drainages.

Diseases

The primary root diseases in dry forests are Annosus and Armillaria that result in small “centers” of mortality and associated gaps in the forest canopy. These areas provided openings for understory vegetation (grasses, shrubs and seedlings) to establish and added to structural diversity. Overall levels were generally low due to the effects of fires maintaining increased abundance of species most tolerant to diseases (ponderosa pine and western larch), and increased ability of trees to ward off infections due to lower stand densities. Frequent fires also helped keep root diseases at low levels due to the promotion of soil fungi that compete with pathogenic fungi, and through beneficial effects of fire on soil nutrients and nutrient cycling.

Annosus root disease is most prevalent in stands previously entered with overstory and partial overstory removal harvests. Numerous stands show signs of Annosus related mortality associated with large, old stumps and harvest related disturbance (skid trails). These past harvests resulted in varying degrees of disturbance to the soils and ground vegetation, facilitating the spread of Annosus root disease through wind-borne spores infecting large stumps. Mortality from the disease has been identified in both ponderosa pine and grand fir indicating that both the P-strain (pine strain) and S-strain (true fir strain) of the Annosus root disease are present.

Armillaria root disease is also present (often with Annosus), resulting in mortality in virtually all sizes and species of trees in areas of heavy infection. Armillaria root rot is found in several areas in the Tincup Creek and Little Boulder Creek drainages at fairly high levels. Armillaria infected stands show considerable amounts of mortality in virtually all sizes and species of trees. Grand fir and Douglas-fir are most susceptible while, lodgepole pine, Engelmann spruce, ponderosa pine, and the occasional western white pine show varying degrees of tolerance. Western larch is the most resistant to the disease, but can still be infected when growing poorly due to over-stocking.

Dwarf mistletoe was present in low levels throughout the dry forests of the watershed. It predisposed the occasional tree to bark beetle attack or torching by fire. Brooms created by mistletoe infections were susceptible to fire, especially brooms in the lower crown. Thus, frequent fires likely helped keep overall levels of mistletoe low due to the “fire pruning” of infected branches and through potential negative impacts of the heat and smoke on developing mistletoe plants. The primary species infected by dwarf mistletoe are ponderosa pine and Douglas-fir. Levels of mistletoe infection vary with more severe infections occurring in Douglas-fir mistletoe centers and stands with infected overstories that are spreading to susceptible understory trees.

As with insects, these forest diseases play an important role in creating structural diversity, creating a source of snags and down logs, and providing important wildlife habitat and recycling nutrients “locked up” in trees and logs to maintain soil productivity. At severe levels, these diseases can greatly inhibit the development of a stand, limiting growth and habitat potential.

Mechanical

Windthrow of occasional trees also added structural diversity by creating small gaps in the forest canopy, facilitating establishment of understory vegetation. As in the cooler, more moist forest types, all of these disturbance agents played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Human

Human related disturbances (timber harvest, fire exclusion) have affected the dry forests more than the other forest types across the watershed. In the past, the most noticeable harvests focused on the removal of the larger overstory ponderosa pine.

Table V – 3. Warm-Dry Forest HRV and Current Structural Stages

Structural Stage	Historic Range of Variation[1]	Current Condition
Stand Initiation (SI)	5 – 15%	1%
Stem Exclusion Open Canopy (SEOC)	5 – 20%	20%
Stem Exclusion Closed Canopy (SECC)	1 – 10%	36%
Understory Reinitiation (UR)	1 – 10%	17%
Young Forest Multi-Strata (YFMS)	5 – 25%	19%
Old Forest Single-Stratum (OFSS)	5 – 55%	3%
Old Forest Multi-Strata (OFMS)	5 – 20%	4%

[1] Historic Range of Variation is based on professional judgment of the historical extent of structural stages. (Powell, 1998). Current Condition is derived from stand exam information and the FVS model.

The most noticeable feature is the absence of large ponderosa pine trees in many stands. This is particularly evident in the lower and mid elevations due to early railroad logging; there are few large trees and an abundance of young, small to medium sized trees. Another noticeable trend has been increasing proportions of shade tolerant grand fir and Douglas-fir growing in the understory. This has increased the proportion of stands with multi-strata structures.

Cool-Moist Biophysical Environment

Cool-moist forests occupy approximately 100 acres (1% of the Mill Creek Subwatershed) on northerly aspects, mid elevations, and in the cooler, wetter draw bottoms throughout the watershed.

In the absence of a major disturbance (fire) moist forests will develop forest vegetation dominated by grand fir, Douglas-fir, and spruce. Where frost is frequent, lodgepole pine will be the dominant species. Ponderosa pine, western white pine, western larch, and lodgepole pine are early seral species that are dependent on disturbances to maintain suitable growing conditions.

Species Compositions and Successional Development

The historic species composition of the cool moist forest had higher proportions of fire tolerant early seral species (ponderosa pine, lodgepole pine, and western larch) and lesser amounts of fire intolerant species (grand fir, Engelmann spruce, and Douglas-fir) prior to European influences. Lodgepole pine generally dominated in cold air pockets, which favored it over the less cold hardy species. Western white pine was likely present in greater proportions since blister rust, an exotic disease, had not been introduced.

Species composition varies depending upon the successional development stage, past disturbances, and microclimate or microsite differences. Earlier successional stages are dominated by early seral species such as lodgepole pine, ponderosa pine, western white pine, and western larch; while later stages show increased proportions of climax species such as grand fir, Douglas-fir, or spruce (in wetter areas). Western larch increases in abundance where past disturbance created bare soil conditions and an adequate seed source was present to re-colonize the disturbed areas. Wetter and cooler areas (such as along riparian areas and headwater areas) have increased amounts of Engelmann spruce. The moist forests occupying the transitional areas with the dry forests generally reflect “drier” moist sites sustaining increased proportions of ponderosa pine, western larch, and Douglas-fir.

Disturbance Processes

Historically, fires were major agents of change and renewal in the moist forests of the watershed. The low frequency of stand replacement fires allowed for the development of large contiguous stands (large patch sizes) that provided high quality core habitats ranging from 200 to 2,000 acres. Fires generally kept the forest in a fairly vigorous condition, which reduced the role of insects and disease as a disturbance process. Currently, the moist forests have the most forest health problems.

Fire

The historic/natural fire disturbance regime in the drier forest types of the moist forest is best characterized as a high frequency, low intensity regime overlaid with a low frequency, high intensity regime. The relatively frequent disturbances were generally low severity, ground fires which would occur every 10 to 50 years. Every 100 to 200 years there would be an infrequent disturbance that was generally a high severity, stand replacing fire. The extent of the fires was variable due to the topography and could be as large as several hundred acres to over a thousand acres. Fire return intervals in these forest environments were on the magnitude of 50 to 275+ years (Agee 1993). See the Fire and Fuels section under Fire Regimes and Condition Classes for additional information.

Tree mortality was variable, as the tree species that grow in the moist forest have both thin and thick bark, and shallow and deep roots. Western larch and ponderosa pine have thick bark on medium to large trees. Grand fir, western white pine, Engelmann spruce, and Douglas-fir have thinner bark, especially when young and are most susceptible to mortality from ground fires. The persistent branches of grand fir and Douglas-fir make them very susceptible to torching, often resulting in crown fires which kill all of the trees in a patch. The moist forests occupying the transitional areas with the dry forests experienced more frequent, low to moderate intensity fires, resulting in vegetative and structural characteristics more similar to the dry forests (see Dry-Forest section).

Where seed sources are present, fires can germinate snowbrush, creating a dense shrub field that could persist for several decades. Snowbrush adds to the diversity of vegetation and is a nitrogen fixing plant that can help replace some of the nitrogen lost through volatilization and leaching during and after a fire.

Insects

Between the high intensity fires, other disturbance agents (such as insects and diseases) played a role in shaping stand structures and compositions across the landscape.

Endemic levels of bark beetles (primarily mountain pine beetles and fir engraver beetles) occurred in small patches acting as natural thinning agents facilitating the growth and development of residual trees and creating small openings (increasing structural diversity).

Epidemic levels of bark beetles also occurred. Large areas of dense stands of lodgepole that developed following fires created conditions conducive for outbreaks of mountain pine beetles (such as 1970s mountain pine beetle outbreak) resulting in subsequent stand reinitiation as understory trees responded to increased available light, water and nutrients. Resultant fuel levels associated with the bark beetle mortality also set the stage for regeneration/renewal by creating conditions conducive for subsequent high intensity fires.

Evidence of the 1970s mountain pine beetle outbreak is common. This past activity resulted in significant mortality in mature lodgepole and ponderosa pine, creating high levels of down wood and increased representation of shade tolerant species. Following the decline of lodgepole and ponderosa pine, understory grand fir and Douglas-fir were released; resulting in an understory reinitiation stage. As this shade tolerant understory thrives, stands begin developing multi-strata stand structures.

Fir engraver and Douglas-fir bark beetles are other common insects in the moist forests. These two insects are endemic, with the exception of increased fir engraver activity in areas with elevated levels of root disease. In these areas, root diseases decrease the vigor of infected trees, which are then attacked by insects. Douglas-fir bark beetle activity is present in association with larger diameter, heavily mistletoe infected Douglas-fir trees. Again, the heavy mistletoe infection stresses these trees so that they are highly susceptible to opportunistic insects.

Defoliating insects (such as western spruce budworm and Douglas-fir tussock moth) also occurred at epidemic levels in these forest types as large areas reached mid to late successional stages. The high proportion of suitable hosts (namely true firs), multiple canopy layer conditions and increased tree stress resulting from high stand densities and climatic conditions (i.e. drought periods) created conditions ideal for outbreaks of defoliators. Defoliation weakens many trees predisposing them to subsequent attacks by bark beetles and/or root diseases.

Impacts of the recent (1985 to 1992) spruce budworm outbreak are widespread, especially in the multi-strata structures. In general, the suppressed tree classes of grand fir, Douglas-fir and spruce exhibit poor crowns, reduced growth, and varying degrees of mortality due to past repeated defoliation. The band of moist forest along the southern boundary of the Vinegar Hill-Indian Rock Scenic Area was hit particularly hard by the budworm outbreak in 1991, with heavy defoliation and above average mortality levels. This area has been the location of three severe fires in the mid 1990s, no doubt made worse by the increased fuel levels caused by the budworm infestations. Another area of heavy defoliation and mortality lies just north and east of Ragged Rocks in the heads of the Butte Creek, Ruby Creek, and Ragged Creek drainages.

Trees surviving these outbreaks sometimes responded with increased growth due to the nutrient flush provided by the insect excretions and the thinning effects of tree mortality. The reduced canopy coverage and tree densities in heavily defoliated stands created conditions for understory reinitiation of trees, grasses, and shrubs. The mortality of the understory also increased fuel loads and the potential for regeneration by a high intensity stand replacement type fire.

The current and past insect related mortality has also provided significant increases in snag levels and down logs across the moist forests in the watershed, providing increased amounts of cavity nesting species habitat.

Diseases

Root diseases such as Annosus and Armillaria generally worked at small to medium scales (less than 1 acre to 10 to 20 acres patches) within stands. Root disease mortality centers created gaps in stands helping to develop multi-strata structural characteristics enhancing both the horizontal and vertical structural diversity. Severe levels of root disease resulted in significant tree mortality hindering development of late structural characteristics, while maintaining understory reinitiation and old forest multi-strata structural characteristics. These areas of high mortality were also at increased risk to stand replacing fires which ultimately returned stands to early seral species with greater tolerance to root diseases. Areas that escaped fires, and developed large areas of suitable hosts, likely showed increased levels of root diseases, resulting in changes to the stand structure and composition as levels of root disease intensified.

Other diseases such as gall rust and atropellis canker occurred as they do today, affecting lodgepole growing in humid areas, resulting in stem malformation and subsequent breakage adding to the diversity of tree forms within stands. White pine blister rust was not present during reference times as it has been introduced since European occupation of the Pacific Northwest.

Dwarf mistletoe was present throughout these forest types. Lodgepole pine, western larch ponderosa pine, and Douglas-fir dwarf mistletoes were likely present at low levels since infected trees were generally highly susceptible to fire. Stand replacing fires also sanitized stands of mistletoe-infected trees, keeping mistletoe levels low across the forest.

The primary root diseases operating within the moist forests are Armillaria and Annosus root diseases. Armillaria root rot is found in several areas in the Tincup Creek and Little Boulder Creek drainages at fairly high levels. Armillaria infected stands show considerable amounts of mortality in virtually all sizes and species of trees. Grand fir and Douglas-fir are the most susceptible while, lodgepole pine, Engelmann spruce, ponderosa pine, and the occasional western white pine show varying degrees of tolerance. Western larch is the most resistant to the disease, but can still be infected in some instances.

Annosus root disease is often found in association with Armillaria, and is also prevalent in many stands previously entered with partial removal harvests. These stands show signs of Annosus related mortality associated with stumps and harvest related soil disturbance (skid trails). Most of the mortality is associated with grand fir indicating that it is the S-strain (true fir strain) of the root disease.

Indian paint fungus is common in grand fir throughout moist forests. Mature and suppressed grand firs have the highest incidence of the fungus. Indian paint fungus plays an important role in providing cavity-nesting habitat in live trees and subsequent snags. Large (30+ inch diameter) hollow, decayed live grand fir trees are often sought out as denning habitat by black bears and other mammals, and also provide excellent primary and secondary cavity nesting habitat.

Western gall rust and atropellis canker are also fairly common in moist forest stands with a significant lodgepole component. These stem diseases cause cankers that can result in girdling the tree or at least creating a weak point that is susceptible to subsequent wind/snow breakage.

It is difficult to know to what degree the blister rust and past logging has affected the distribution of white pine in the area. It is believed there was more white pine in areas that were logged in the earlier parts of this century. The introduction of white pine blister rust into western forests has caused a reduction in tree vigor and some mortality, although the white pine in the drier Blue Mountain environment seems to be fairly resistant to the disease.

As with insects, these diseases play an important role in the forest by adding to structural diversity by creating snags, openings in the forest canopy, and sources of down logs important for wildlife habitat and soil productivity. At elevated levels, these diseases select for species that are more resistant, such as larch and pines. It can also inhibit stand development, limiting growth, tree size, and stand density.

Mechanical

Windthrow and breakage of occasional trees also added structural diversity by creating small gaps in the forest canopy allowing the release of the understory vegetation. Wind related disturbance was also important in recruiting habitat logs to the forest floor and creating live snags where tops were broken out, but the tree remained alive.

Human

Fire exclusion, sheep and cattle grazing, and past harvest activities have also changed the condition of the moist forests. These human disturbances have affected the structural character, patch size, and species compositional across the watershed. In general, human disturbance has reduced large tree structures, reduced patch sizes, increased fragmentation, and reduced the proportions of fire tolerant species.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Table V – 4. Cool-Moist Forest HRV and Current Structural Stages.

Structural Stage	Historic Range of Variation[1]	Current Condition
Stand Initiation (SI)	1 – 10%	0%
Stem Exclusion Open Canopy (SEOC)	0 – 5%	15%
Stem Exclusion Closed Canopy (SECC)	5 – 25%	3%
Understory Reinitiation (UR)	5 – 25%	32%
Young Forest Multi-Strata (YFMS)	40 – 60%	11%
Old Forest Single-Stratum (OFSS)	0 – 5%	0%
Old Forest Multi-Strata (OFMS)	10 – 30%	39%

[1] Historic Range of Variation is based on professional judgment of the historical extent of structural stages. (Powell, 1998). Current Condition is derived from stand exam information and the FVS model.

Cool–Dry Biophysical Environment

Cool-dry forests occupy approximately 700 acres (4% of the Mill Creek Subwatershed) on drier, colder frost pockets throughout the watershed.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of the cool-dry forests were largely dependent upon the stage of succession of the stand and associated landscape as dictated by the time since the last major disturbance (namely high intensity fire). The conditions that affect disturbances in the cool-dry forests have not changed substantially over time, resulting in little change in the fire severity from historic times to the present.

In the absence of a major disturbance such as fire, cool-dry forests will develop forest vegetation dominated by grand fir, Douglas-fir, and western larch. Where frost is frequent, lodgepole pine will be the dominant species. Lodgepole pine is the primary early seral species that would initially occupy a site. In stands with a longer fire-free interval, climax species such as grand fir would become established. Stands with a short fire return interval were maintained in lodgepole pine because succession was continually reset never getting past the early seral stages.

Disturbance Processes

Cool-dry forests were not economically attractive in the past; therefore timber harvest has been at a lesser level than in the warmer and drier forests.

Fire

Historically, wildfire was the major disturbance affecting cool-dry forests. Between high intensity fires; other disturbance agents, such as wind throw, insects, and diseases, also played a role in shaping stand structures and compositions across the landscape.

The historic/natural fire disturbance regime in these forest types is best characterized as a low frequency, high intensity regime. These relatively infrequent disturbances were generally high severity, stand replacing fires.

Fire starts are frequent, due to the higher elevation location of the cool-dry forest stands. The extent of fires was highly variable due to topography and the extent of flammable lodgepole stands. Fire size could be as small as one stand of trees or as large as several thousand acres. Fire return intervals in these forest environments were on the magnitude of 50 to 275+ years

(Agee 1993). See the Fire and Fuels section under Fire Regimes and Condition Classes for additional information.

Tree mortality from fires is high; many of the trees in this group retain branches to the ground for a long time and grow in dense, multistory patches. This predisposes them to torching and crowning fire behavior which kills most of the trees in the stand. Additionally, the thin bark of these species does not protect them from basal heating, making them easily killed, even by light ground fires. Stand establishment after disturbance is often very rapid.

Fire is still the most influential disturbance process occurring in cool-dry forests. The impact of fire suppression is much less in this forest type than in other types, due to long fire return intervals. The main effect of fire suppression over the last 70 plus years has been to increase the species diversity, allowing more fir and spruce to occupy the stands than would naturally occur.

Insects

Endemic levels of bark beetles (primarily mountain pine beetles and fir engraver beetles) occurred in small patches acting as natural thinning agents, facilitating the growth and development of residual trees and creating small openings (increasing structural diversity).

Epidemic levels (populations that maintain themselves in a local area below outbreak population levels) of insects periodically occur in cool-dry forest types. Large areas of dense stands of lodgepole that developed following fires created conditions conducive for outbreaks of mountain pine beetles (such as the 1970s mountain pine beetle outbreak) resulting in subsequent stand reinitiation as understory trees responded to increased available light, water, and nutrients. Resultant fuel levels associated with bark beetle mortality also set the stage for regeneration/ renewal by creating conditions conducive for subsequent high intensity fires.

Defoliating insects such as western spruce budworm and Douglas-fir tussock moth also occurred at endemic levels in these forest types. They caused minor damage, weakening some trees and predisposing them to subsequent attack by mountain pine beetles and fir engraver. Impacts of the recent (1985 to 1992) western spruce budworm outbreak were moderate, with damage occurring mainly in the multi-strata structure stands. Budworm defoliation did not cause the widespread top kill or mortality that it did in the moist forest type.

The current and past insect related mortality has provided significant increases in snag levels and down logs. While it provides wildlife habitat, insect related mortality has also increased fuel levels, increasing size and intensity of future stand replacement fires.

Diseases

Root diseases such as Annosus and Armillaria generally infected stands at small scales (less than 1 acre). Root disease mortality centers created gaps in stands helping to develop multi-strata structural characteristics enhancing both horizontal and vertical structural diversity. Severe levels of root disease resulted in significant tree mortality, hindering development of late structural characteristics while maintaining understory reinitiation and young forest multi-strata structural characteristics. These areas of high mortality were also at increased risk to stand replacing fires which ultimately returned stands to early seral species with greater tolerance to root diseases. Areas that escaped fires and developed large areas of suitable hosts likely showed increased levels of root diseases resulting in changes to the stand structure and composition as levels of root disease intensified.

Other diseases such as gall rust and atropellis canker occurred as they do today, affecting lodgepole growing in humid areas, resulting in stem malformation and subsequent breakage, adding to the diversity of tree forms within stands.

Dwarf mistletoe, a parasitic plant, was another disease present throughout these forest types. Lodgepole mistletoe was likely present at low levels since infected trees were generally highly susceptible to fire. Stand replacing fires also sanitized stands of mistletoe infected trees, keeping mistletoe levels low across the landscape.

Root diseases in the sub-alpine fir have not caused major problems. Momentous root disease, which is common in the mature spruce, makes it vulnerable to wind throw and subsequent spruce beetle attack.

Mechanical

Wind throw and breakage of occasional trees also added structural diversity by creating small gaps in the forest canopy allowing the "release" of understory vegetation. Wind related disturbance was also important in recruiting habitat logs to the forest floor and creation of live snags where tops were broken out, but the tree remained alive.

Human

The main human disturbance has been fire suppression, which has allowed stands to follow successional paths farther than otherwise would have happened with more fires. Logging and other activities have been somewhat limited with the exception of salvage harvest of beetle killed lodgepole pine stands in the northeast portion of the project area that has resulted in regeneration of those stands.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Table V – 5. Cool-Dry Forest HRV and Current Structural Stages.

Structural Stage	Historic Range of Variation[1]	Current Condition
Stand Initiation (SI)	5 – 30%	0%
Stem Exclusion Open Canopy (SEOC)	0 – 5%	0%
Stem Exclusion Closed Canopy (SECC)	5 – 35%	0%
Understory Reinitiation (UR)	5 – 20%	53%
Young Forest Multi-strata (YFMS)	5 – 20%	0%
Old Forest Single-stratum (OFSS)	1 – 10%	0%
Old Forest Multi-strata (OFMS)	1 – 20%	47%

[1] Historic Range of Variation is based on professional judgment of the historical extent of structural stages. (Powell, 1998). Current Condition is derived from stand exam information and the FVS model.

Cold–Dry Biophysical Environment

Cold-dry forests occupy approximately 3700 acres (21% of the Mill Creek Subwatershed) on high elevation sites, northerly aspects, and in the colder frost pockets throughout the watershed. There are no old-growth lodgepole pine stands within the project area.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of the cold-dry forests were largely dependent upon the stage of succession of the stand and associated landscape as dictated by the time since the last major disturbance (namely high intensity fire). The conditions that affect disturbances in the cold forests have not changed substantially over time, resulting in little change in the fire severity from historic times to the present.

In the absence of a major disturbance such as fire, cold-dry forests will develop forest vegetation dominated by grand fir, western larch, sub-alpine fir, and Engelmann spruce. Where frost is frequent, lodgepole pine will be the dominant species. Lodgepole pine and western larch are the primary early seral species that would initially occupy a site. In stands with a longer fire-free interval, climax species such as grand fir, sub-alpine fir, and Engelmann spruce would become established. Stands with a short fire return interval were maintained in lodgepole pine because succession was continually reset never getting past the early seral stages.

Disturbance Processes

Cold-dry forests were not economically attractive in the past; therefore timber harvest has been at a lesser level than in the warmer and drier forests.

Fire

Historically, wildfire was the major disturbance affecting cold-dry forests. Between high intensity fires; other disturbance agents, such as wind throw, insects, and diseases, also played a role in shaping stand structures and compositions across the landscape.

The historic/natural fire disturbance regime in these forest types is best characterized as a low frequency, high intensity regime. These relatively infrequent disturbances were generally high severity, stand replacing fires. See the Fire and Fuels section under Fire Regimes and Condition Classes for additional information.

Fire starts are frequent, due to the higher elevation location of the cold-dry forest stands. The extent of fires was highly variable due to topography and the extent of flammable lodgepole stands. Fire size could be as small as one stand of trees or as large as several thousand acres. Fire return intervals in these forest environments were on the magnitude of 50 to 275+ years (Agee 1993).

Tree mortality from fires is high; many of the trees in this group retain branches to the ground for a long time and grow in dense, multistory patches. This predisposes them to torching and crowning fire behavior which kills most of the trees in the stand. Additionally, the thin bark of these species does not protect them from basal heating, making them easily killed, even by light ground fires. Stand establishment after disturbance is often very rapid.

Fire is still the most influential disturbance process occurring in cold-dry forests. The impact of fire suppression is much less in this forest type than in other types, due to long fire return intervals. The main effect of fire suppression over the last 70 plus years has been to increase the species diversity, allowing more fir and spruce to occupy the stands than would naturally occur.

Insects

Endemic levels of bark beetles (primarily mountain pine beetles and fir engraver beetles) occurred in small patches acting as natural thinning agents, facilitating the growth and development of residual trees and creating small openings (increasing structural diversity).

Epidemic levels (populations that maintain themselves in a local area below outbreak population levels) of insects periodically occur in cold forest types. Large areas of dense stands of lodgepole that developed following fires created conditions conducive for outbreaks of mountain pine beetles (such as the 1970s mountain pine beetle outbreak) resulting in subsequent stand reinitiation as understory trees responded to increased available light, water, and nutrients. Spruce bark beetles are also found in cold forests. These insects are active within burned areas, blowdown areas, and areas with elevated levels of root disease. Resultant fuel levels associated with bark beetle mortality also set the stage for regeneration/renewal by creating conditions conducive for subsequent high intensity fires.

Defoliating insects such as western spruce budworm and Douglas-fir tussock moth also occurred at endemic levels in these forest types. They caused minor damage, weakening some trees and predisposing them to subsequent attack by mountain pine beetles and fir engraver. Impacts of the recent (1985 to 1992) western spruce budworm outbreak were moderate, with damage occurring mainly in the multi-strata structure stands. Budworm defoliation did not cause the widespread top kill or mortality that it did in the moist forest type.

The current and past insect related mortality has provided significant increases in snag levels and down logs. While it provides wildlife habitat, insect related mortality has also increased fuel levels, increasing size and intensity of future stand replacement fires.

Diseases

Root diseases such as Annosus and Armillaria generally infected stands at small scales (less than 1 acre). Root disease mortality centers created gaps in stands helping to develop multi-strata structural characteristics enhancing both horizontal and vertical structural diversity. Severe levels of root disease resulted in significant tree mortality, hindering development of late structural characteristics while maintaining understory reinitiation and young forest multi-strata structural characteristics. These areas of high mortality were also at increased risk to stand replacing fires which ultimately returned stands to early seral species with greater tolerance to root diseases. Areas that escaped fires and developed large areas of suitable hosts likely showed increased levels of root diseases resulting in changes to the stand structure and composition as levels of root disease intensified.

Other diseases such as gall rust and atropellis canker occurred as they do today, affecting lodgepole growing in humid areas, resulting in stem malformation and subsequent breakage, adding to the diversity of tree forms within stands.

Dwarf mistletoe, a parasitic plant, was another disease present throughout these forest types. Lodgepole mistletoe was likely present at low levels since infected trees were generally highly susceptible to fire. Stand replacing fires also sanitized stands of mistletoe infected trees, keeping mistletoe levels low across the landscape.

Root diseases in the sub-alpine fir have not caused major problems. Tomentosus root disease, which is common in the mature spruce, makes it vulnerable to wind throw and subsequent spruce beetle attack.

Mechanical

Windthrow and breakage of occasional trees also added structural diversity by creating small gaps in the forest canopy allowing the "release" of understory vegetation. Wind related disturbance was also important in recruiting habitat logs to the forest floor and creation of live snags where tops were broken out, but the tree remained alive.

Human

The main human disturbance has been fire suppression, which has allowed stands to follow successional paths farther than otherwise would have happened with more fires. Logging and other activities have been somewhat limited with the exception of salvage harvest of beetle killed lodgepole pine stands in the northeast portion of the project area that has resulted in regeneration of those stands.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Table V – 6. Cold-Dry Forest HRV and Current Structural Stages.

Structural Stage	Historic Range of Variation[1]	Current Condition
Stand Initiation (SI)	1 – 20%	1%
Stem Exclusion Open Canopy (SEOC)	0 – 5%	9%
Stem Exclusion Closed Canopy (SECC)	5 – 20%	14%
Understory Reinitiation (UR)	5 – 25%	36%
Young Forest Multi-Strata (YFMS)	10 – 40%	1%
Old Forest Single-Stratum (OFSS)	0 – 5%	5%
Old Forest Multi-Strata (OFMS)	10 – 40%	34%

[1] Historic Range of Variation is based on professional judgment of the historical extent of structural stages. (Powell, 1998). Current Condition is derived from stand exam information and the FVS model.

Aspen Stands

Aspen is found in several locations within the Mill Creek Subwatershed. It is a unique habitat that is currently much reduced from its historical extent. It is felt that the combination of fire suppression, heavy grazing by both domestic and wild ungulates, and conifer encroachment has reduced the survival of aspen and a deteriorating condition of the remaining stands.

Non Forest Biophysical Environments

Non-forest areas occupy approximately 1,800 acres (10% of the Mill Creek Subwatershed). Non-forest biophysical environments include woodlands, shrublands, meadows and grasslands.

Dry meadows and grasslands are found in several locations within the planning area and are characterized by generally shallow and rocky soils. They were historically maintained by frequent wildfires in an open savannah condition with a few widely spaced ponderosa pine trees and juniper woodlands. With fire suppression there has been some ingrowth of juniper and ponderosa pine trees.

There are several moist meadows, including Phipps Meadow, Japanese Meadow, Lobelia Meadow, Pie Meadow, and smaller riparian meadows scattered through the area. Small groups of quaking aspen are found in moist areas. They are mainly in declining condition from historical distribution due to reduction in fires, conifer shading and competition, and grazing by both domestic and wild animals.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of woodlands were largely dependent upon frequent fire and occasional insect attacks during droughts. Widely spaced ponderosa pine trees are the only tree species in any numbers, with an understory of juniper in varying amounts. With fire exclusion, both juniper and ponderosa pine have expanded their range into previously fire maintained meadows and have increased their numbers in the savannah areas.

Disturbance Processes

Fire

Fire was the dominant disturbance process in woodlands, occurring as frequent, low intensity underburns in the past.

Human

Human related disturbances (timber harvest, fire exclusion) have affected woodlands. Selective removal of the occasional ponderosa pine, combined with exclusion of fire, resulted in significant changes in the structural and compositional character of the woodlands.

Levels of Growing Stock Research Plots

There are 18 long-term research plots that have been established in the Mill Creek Subwatershed that are being used to test the effects of various thinning densities on tree growth. They are on ½ acre in size and have a 30 foot buffer around them that needs to be protected from outside influence by this project to retain their worth for the future.

Environmental Consequences

Vegetative conditions within the project area are not within the Historic Range of Variability (HRV) within most biophysical environments. In addition, the species composition and stand densities are changed from the historical conditions, leading to a forest that is less resilient to natural disturbances. Changed vegetative conditions from the proposed treatments may not provide the same levels of habitat or food sources.

Measures of Success for developing a Resilient and Sustainable Forest:

- Acres and percentage change of structural stages in relation to the HRV.
- Acres and percent change in areas treated to reduce overstocking and to change species composition.

Alternative 1 – No Action

Direct and Indirect Effects

Introduction

This alternative does not propose any treatment of stands by commercial harvest, precommercial thinning, mechanical fuel treatment, or prescribed fire.

Composition and Density

The forest is currently overstocked, compared with historical levels, except where recent management has thinned stands. While many stands were precommercial thinned several decades ago, growth and understory re-initiation has made these stands overstocked again. Along with overstocking, there has been an increase in the proportion of Douglas-fir and true firs in both the hot-dry and warm-dry forest types due to both past harvest, that removed the early seral species of large diameter trees, and the exclusion of fire that would have removed most of the fire-susceptible species in favor of more resistant species i.e. ponderosa pine and western larch.

Since no treatment is proposed under Alternative 1 to reduce overstocking or to shift the species composition, the stands would continue to become more overstocked, growth would continue to slow, and the trees would become increasingly susceptible to disturbance from insects, disease, and fire. The more crowded and dense the timber stands become over time increases the likely-hood and potential severity of catastrophic disturbance events such as uncharacteristically severe wildfire. The overall resiliency to withstand natural disturbances would continue to decline.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. As a result of the slow growth rates of the overstocked stands, old forest stands would develop slowly into OFSS increasing from 0 to 8% and from 3 to 10% and OFMS from 17 to 59% and from 4 to 36% in the hot-dry and warm-dry biophysical environments respectively over the next 50 years. In the cool-moist biophysical environment there is an increase in OFMS from 39 to 64% and no change in OFSS over 50 years. In the cool-dry biophysical environment there is a decrease in OFMS from 47 to 12% and no change in OFSS over 50 years. In the cold-dry there is a decrease in OFMS from 34 to 7% and an increase in OFSS from 5 to 35% over the next 50 years. The decrease in OFMS in the cool-dry and cold-dry biophysical environments is the result of mortality in densely stocked stands. Overall, there is an increasing risk of large-scale, stand-replacing fires that would set back structural stage development, resulting in large areas of young trees and longer time spans to develop old forest structures. Disturbances would continue to be at a larger scale than historically occurred, with “out of scale” adverse effects to water, fish, wildlife, vegetation, and other resources. Stands would not be within the HRV for stand structure. At year 50, only the OFMS in the cool-dry is within HRV (see Tables V – 7 through V – 11).

Understory Vegetation

Mountain mahogany would continue to be encroached by conifers, leading to decline in vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and need sunlight, would continue to decline as the stands become more closed. Pine grass, and other ground vegetation, would continue to decrease in vigor and forage quality with increasing shade and lack of nutrient cycling provided by burning.

Aspen

Aspen would continue to be encroached by conifers, leading to decline in vigor and numbers. Reproduction would remain low due to the lack of fire, and continued browsing by ungulates would eliminate the suckers that do begin to grow.

Table V – 7. Effects of No Action on Hot-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–15%	5–20%	0–5%	0–5%	5–10%	20–70%	5–15%
Existing	**0%**	**40%**	**0%**	**3%**	**40%**	**0%**	**17%**
10	0%	40%	0%	3%	40%	0%	17%
50	0%	33%	0%	0%	0%	8%	59%

Table V –8. Effects of No Action on Warm-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–15%	5–20%	1–10%	1–10%	5–25%	15–55%	5–20%
Existing	**1%**	**20%**	**36%**	**17%**	**19%**	**3%**	**4%**
10	1%	20%	36%	17%	19%	3%	4%
50	0%	5%	24%	6%	19%	10%	36%

Table V – 9. Effects of No Action on Cool-Moist Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1–10%	0–5%	5–25%	5–25%	40–60%	0–5%	10–30%
Existing	**0%**	**15%**	**3%**	**32%**	**11%**	**0%**	**39%**
10	0%	15%	3%	32%	11%	0%	39%
50	0%	0%	3%	33%	0%	0%	64%

Table V – 10. Effects of No Action on Cool-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–30%	0–5%	5–35%	5–20%	5–20%	1–10%	1–20%
Existing	**0%**	**0%**	**0%**	**53%**	**0%**	**0%**	**47%**
10	0%	0%	0%	53%	0%	0%	47%
50	0%	0%	0%	88%	0%	0%	12%

Table V – 11. Effects of No Action on Cold-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1–20%	0–5%	5–20%	5–25%	10–40%	0–5%	10–40%
Existing	**1%**	**9%**	**14%**	**36%**	**1%**	**5%**	**34%**
10	1%	9%	14%	36%	1%	5%	34%
50	0%	0%	13%	36%	9%	35%	7%

Genetic Diversity

The existing genetic diversity within units proposed for shelterwood harvest (in the other alternatives) would retain the existing natural genetic diversity. Generally, trees that have grown up in near proximity are relatively homogeneous and share pollen with nearby trees, resulting in narrow genetic variability.

Levels of Growing Stock Research Plots

There would be no direct adverse effects to the research plots by this alternative. The risk of a large crown fire would still remain as the surrounding stands would still be in dense conditions with close spaced crowns and ladder fuels. Also, the risk of an insect outbreak starting in the surrounding overstocked stands and killing trees in the research plots is still occurs. Either situation would result in reducing the viability of the research plots for future data gathering.

Resiliency and Sustainability

The resiliency and sustainability of the forest would continue to decline and it would remain at risk to natural disturbances with larger and more sever outcomes than occurred historically. Overstocked stands would continue to slow in growth and decrease in vigor as stand density continues to increase. Trees would slowly increase in size, but would remain multi-storied. The bulk of the stands, which would grow into old forest, would continue to be old forest multi-strata

(OFMS) structural stage with very few growing into old forest single-stratum (OFSS), continuing the imbalance compared to HRV. Late seral species would continue to increase occupancy in the mixed conifer stands. The quantity and vigor of grasses and shrubs in the understory would continue to decline due to the shading and competition for nutrients and water.

Insect Risk

The risk of an attack by bark beetles would increase as the trees lose vigor and are less able to defend against them. Research has determined that trees have increased susceptibility when radial growth is less than ½ an inch per decade. As more attacks become successful, the population increases to outbreak levels, killing or damaging larger pockets of trees. Risk of outbreaks of defoliating insects would continue to increase as the stand composition continues to shift to more late seral species (grand fir and Douglas-fir), as they are much more susceptible to defoliating insects. Large-scale applications of insecticides are felt to be ineffective since the habitat for the insect remains and the natural populations are available to periodically reach outbreak levels (Mason 1998, Powell 1994). Widespread defoliation and mortality would increase the fuel loads greatly. The dense, slow growing stands would remain a high risk for fir engraver attacks; further increasing mortality and fuel loading.

Disease Risk

Dwarf mistletoe infections can be expected to increase as trees slow in growth and crowns grow closer together. Stem and root diseases would continue to spread in the host fir trees, causing increasing mortality.

Cumulative Effects

The cumulative effects analysis area consists of the Mill Creek Subwatershed and the immediately adjacent subwatersheds. All of the past, present, and foreseeable activities in FEIS Appendix D have been considered for their cumulative effects. Past actions that have affected the resiliency and sustainability of vegetation in the Mill Creek Subwatershed include historic Native American practices, fire suppression, and timber harvest. These activities have led to the current vegetation condition are discussed in detail in the affected environment.

Resiliency and Sustainability

Within the Mill Creek Subwatershed the combination of past timber harvest and fire suppression have gradually converted forests from early seral species to a higher proportion of late seral species. Stand densities and multi-layer canopies also increased across the forests. These late seral trees are not resistant to forest insects, diseases, or to fire. Past harvest activities in the 1990s in this subwatershed have made some small scale positive changes in the overall forest health and sustainability. With no mechanical or prescribed fire treatments proposed in this alternative, the forested stands would remain at risk to disturbances by insects, disease, or wildfire that are larger in scale and severity than happened historically. These disturbances can cross subwatershed boundaries into surrounding areas causing varying amounts of change. There would be no change to the existing condition and there would be no additional cumulative effects with implementation of the No Action Alternative.

Wrac Lodgepole Thinning, as listed in Appendix D, is within the cold-dry biophysical environment and is the only foreseeable project in the Mill Creek Subwatershed that would influence tree vegetation. The 60 acre thinning unit is scheduled to be implemented in 2008 and is comprised primarily of 4 to10 inch lodgepole. Thinning would not change the structural stage; therefore the project would not have an effect on the HRV of the cold-dry biophysical environment. Thinning would improve the overall health of the stand and would have a small beneficial effect on the resiliency and sustainability of vegetation in the Mill Creek Subwatershed.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Introduction

Most treatment is planned to take place in the hot-dry and the warm-dry biophysical environments. No harvesting is planned in existing old forest stands in the warm-dry biophysical environment. (See Appendix B – Connectivity Corridor map for Late and Old Structure stands.) All treatments are designed to enhance growth of young stands into old forest structural stages and to enhance the sustainability of the forest to grow into old forest stages. These are the areas that are most in need of restoration to return them to a more resilient and sustainable condition. The stands not treated would have the same effects as discussed for the No Action Alternative.

Composition and Density

Commercial thinning in overstocked stands would enable the remaining trees to respond by increasing their crowns and roots, and increasing their ability to utilize nutrients, sunlight, and water. Growth would increase and the trees would grow into old forest structural stages sooner. The increased vigor of the trees would decrease their susceptibility to disturbance from insects and disease; and lessen the likelihood and potential severity of bark beetle outbreaks and mistletoe infestation. The decreased stand density, the increase in size, and the increase in the height to the bottom of the live crown will reduce the chances of torching and the potential for catastrophic crown fires. The overall resiliency to natural disturbances would be increased.

The variable density thinning would have some areas opened up to produce forage and encourage future regeneration that in some areas will become hiding/security cover patches. Reducing the stand density would encourage natural regeneration to occur in the thinned stands. Observations show that when stand densities are below 50 ft^2/acre basal area, ponderosa pine regenerates quite readily and can form another understory. Periodic prescribed fire is recommended in the future to maintain the understory to an acceptable level to sustain the historic conditions of low stocking and few ladder fuels.

The Regional Forester's Eastside Forest Plan Amendment 2 (USDA 1995) gives direction for maintaining connectivity between LOS habitats to allow the free movement of old-growth wildlife species. Alternative 2 proposes 257 acres of treatment within connectivity corridors (Appendix B – connectivity corridor map). The proposed thinning would leave a higher residual basal area of at least 60 ft^2 in connectivity corridors, maintaining the canopy closure within the top one-third of site potential. Canopy closures in these stands would range from 32 to 50%. Minimum of 25% of each stand would be retained in untreated patches. This would improve stand conditions to some extent, but not to the degree as the standard thinning treatments, as the stand density would not be as low. Growth rates would be improved but not as much as compared to stands that are thinned to a lower basal area. It is expected that these areas would be brought below bark beetle thresholds but would again approach those thresholds sooner that other treated areas. These areas would be likely to see mortality due to bark beetles sooner than areas treated to a lower basal area. It is anticipated that an additional thinning would be necessary in the future to maintain the stands in good growing condition, and to remove additional late-seral trees.

Stands dominated by late seral species, outside of existing late and old structure, are proposed for shelterwood treatments. Existing late and old structure components will be maintained including all live trees greater than or equal to 21 inches dbh. The shelterwood treatments would remove many of the smaller late-seral species from stands, retaining the early-seral species that are present and reforesting openings with early-seral species. The shelterwood treatments would remove many of the late-seral species from stands, retaining the early-seral species that are present, and reforesting openings with early-seral species. This would shift the species composition closer to the historic composition. The result would range in appearance from a commercial thin to a shelterwood harvest, depending on the existing stand species composition. Treated stands would be more adapted to the natural disturbances that exist, increasing the overall resiliency to these disturbances. Resilient stands would decrease the risk that disturbance would “reset” the stands to earlier structural stages, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale of 200 to 2,000 acres.

The portions of stands that resemble commercial thinning would respond by increasing their crowns and roots, increasing the ability to utilize nutrients and water. The increased vigor of the trees would decrease their susceptibility to disturbance from bark beetles and mistletoe. The decreased density, increase in tree size and height of the live crown, and reduction in fuel loading would lessen the chances of a stand replacing fire. The portions of stands that resemble shelter-wood treatments would be replanted with early-seral species seedlings. The shelterwood trees left in the stand would be retained as legacy trees to provide a degree of vertical structure. With the reduced competition they would grow well and be resistant to natural disturbance.

Unthinned patches retained in units to provide hiding/security cover would remain overstocked and growth would continue to slow. The trees would become increasingly susceptible to disturbance from insects, disease, and the patch would remain in a condition that if a wildfire did occur it would be at a higher intensity and severity.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. The increased tree growth from thinning would cause the development of old forest structural stages to accelerate, allowing the thinned stands to grow into the larger size classes, sooner.

In Alternative 2, commercial and precommercial thinning would occur in approximately 61 LOS acres. Stands treated would remain as LOS, and there would be no net loss of LOS structure in the subwatershed as a result of proposed actions. Five acres of old forest multi-strata (OFMS) are included as small pieces in several units that are predominately comprised of young forest structure. The five acres of OFMS that would be converted to old forest single-stratum (OFSS) after thinning are within the hot-dry biophysical environment. The hot-dry biophysical environment is currently above HRV in the OFMS structure and below HRV in the OFSS structure. OFSS is currently 0%, with a historic range of 20-70%; and OFMS is 17%, with a historic range of 5-15%. Regional Forester’s Eastside Forest Plan Amendment 2 (Scenario A) allows manipulation one type of LOS to move stands into the LOS stage that is deficit if this meets the historical conditions.

Combined the cool-moist and cool-dry biophysical environments occupy 5% of the Mill Creek subwatershed. Commercial thinning on thirty-nine acres of OFMS (unit 78) in the cool-dry biophysical environment is proposed with Alternative 2. This treatment would improve the sustainability of the stand's multi-structure. The cool-dry biophysical environment is currently within HRV in the OFMS structure and Regional Forester's Eastside Forest Plan Amendment 2 (Scenario A) allows manipulation in a manner that maintains or enhances LOS within that biophysical environment. LOS development over the next 50 years is estimated to be the same as No Action in this biophysical environment.

In Alternative 2, approximately 17 acres of OFSS would be commercially thinned to reduce the understory. This would occur in the warm-dry biophysical environment. These acres would remain as OFSS. The acres are small pieces of several units.

Other than those treatment described above all other proposed thinning and shelterwood treatments are located in non LOS structures and are designed to manipulate vegetation towards appropriate LOS structures in the future. In the hot-dry biophysical environment OFSS is projected to increase from 0 to 46% and OFMS from 17 to 46% in the next 50 years for a total of 92% in old forest structural stages. This is compared to the No Action Alternative that only increases the percentage of old forest single-stratum to 8% in 50 years. Old forest multi-strata would increase to 59% under the No Action Alternative. Changes in forest structure under No Action are a result of growth and mortality over time.

The warm-dry biophysical environment OFSS is projected to increase from 3 to 21% and OFMS from 4 to 35% in the next 50 years for a total of 56% in old forest stages. This is compared to the No Action Alternative where old forest single-strata is estimated at 10% in 50 years and old forest multi-strata at 36% for a total of 46% in the old forest stages. While the OFMS remains about the same between the alternatives, the proportion of OFSS is nearly doubled by the proposed treatments in Alternative 2.

The cold-dry biophysical occupies 21% of the subwatershed. Over the next 50 years OFSS is expected to increase from 5 to 40% and OFMS is expected decrease from 34 to 6%. The decrease in OFMS is primarily a result of mortality in densely stocked stands changing the structure. The change in OFSS is a result of growth of some stem exclusion stands and mortality in some OFMS stands. A portion of the acres treated in this biophysical environment also contribute to the increase in OFSS.

There is a decreased risk of large-scale disturbances such as insect defoliators or stand-replacing fires that would set back structural stage development, both for the treated and surrounding stands. Stands would be resilient to disturbance and would be the least likely to "reset" to earlier structural stages by disturbances, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale of small patches and clumps of trees removed.

The thinning treatments proposed in connectivity corridors would not reduce the stand density as much as the standard thinning, therefore it would improve stand conditions somewhat, but not to the degree as thinning to the lower basal areas. If not thinned again in the future, growth would slow and it would take an additional time to reach the old forest structural stage than with the 50 basal area thinning.

Where shelterwoods are created for regeneration to early seral species, the seedlings would grow rapidly, and with proper spacing control, would eventually develop into OFSS. They would be more resistant to insects and disease than the current late seral species, but are susceptible to fire until they are about 30 years old. After that time they would be more resistant to fire due to their thicker bark and lack of persistent lower limbs (ladder fuels). Stands treated would be, or would be growing towards, the HRV for stand structure.

Prescribed burning activities would be low intensity and are not expected to change existing stand structures or canopy cover. The primary objective of underburning is surface fuel reduction. Specific prescriptions for burning in LOS, satisfactory cover, Replacement Old-Growth stands (ROGs) have been developed to meet objectives for those areas. See Chapter 2 and Fire Fuels section of Chapter 3 for specific burning prescriptions. The Terrestrial Wildlife section of Chapter 3 provides additional detail on the effects of underburning on specific habitats.

Understory Vegetation

Thinning would reduce conifers encroaching on mountain mahogany, increasing shrub vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and needing sunlight, would increase as the stands become more open. Pine grass, and other ground vegetation, would increase in vigor and forage quality with decreasing shade and increased nutrient cycling provided by burning.

Aspen

Aspen stands would not be treated by thinning or burning. As in Alternative 1, aspen would continue to be encroached on by conifers, leading to decline in vigor and numbers. Reproduction would remain low due to the lack of fire and continued browsing by ungulates would eliminate those suckers that do begin to grow.

Riparian Vegetation

No mechanical thinning or other vegetative treatments are proposed under this alternative. Prescribed fire would not be ignited in RHCAs, but there is the chance that low intensity fire may back into these areas during the burning operations from nearby uplands, since no fire lines are proposed along RHCAs. Past experience has shown that the different moisture regime in the RHCAs moderates the fire behavior so that there are only minor effects to the streamside vegetation. Shrubs and conifers providing streamside shade are rarely affected since they do not burn with enough intensity to cause mortality.

In the outer portions of the RHCAs where the moisture regime transitions into drier conditions similar to the surrounding uplands, the result is more of a mosaic of burned and unburned areas with some shrub and small conifer mortality. This creates an opportunity for more shrubs, which were adapted to sprout after frequent fires, to increase as the stands become more open.

Table V – 12. Effects of Alternative 2 on Hot-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–15%	5–20%	0–5%	0–5%	5–10%	20–70%	5–15%
Existing	**0%**	**40%**	**0%**	**3%**	**40%**	**0%**	**17%**
10	0%	40%	0%	3%	39%	1%	17%
50	0%	8%	0%	0%	0%	46%	46%

Table V – 13. Effects of Alternative 2 on Warm-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–15%	5–20%	1–10%	1–10%	5–25%	15–55%	5–20%
Existing	**1%**	**20%**	**36%**	**17%**	**19%**	**3%**	**4%**
10	1%	22%	34%	19%	17%	3%	4%
50	0%	10%	14%	4%	16%	21%	35%

Table V – 14. Effects of Alternative 2 on Cool-Moist Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1–10%	0–5%	5–25%	5–25%	40–60%	0–5%	10–30%
Existing	**0%**	**15%**	**3%**	**32%**	**11%**	**0%**	**39%**
10	0%	15%	3%	32%	11%	0%	39%
50	0%	0%	3%	33%	0%	0%	64%

Table V – 15. Effects of Alternative 2 on Cool-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–30%	0–5%	5–35%	5–20%	5–20%	1–10%	1–20%
Existing	**0%**	**0%**	**0%**	**53%**	**0%**	**0%**	**47%**
10	0%	0%	0%	53%	0%	0%	47%
50	0%	0%	0%	86%	2%	0%	12%

Table V – 16. Effects of Alternative 2 on Cold-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1–20%	0–5%	5–20%	5–25%	10–40%	0–5%	10–40%
Existing	**1%**	**9%**	**13%**	**36%**	**2%**	**5%**	**34%**
10	1%	9%	14%	38%	2%	3%	32%
50	0%	1%	7%	35%	11%	40%	6%

Genetic Diversity

Units proposed for shelterwood harvest by planting would have increased genetic variability compared to native stock, since the trees that the seedlings are grown from are widely separated. Generally, trees that have grown in near proximity are relatively homogeneous and share pollen, resulting in narrow genetic variance. Current seedlings are grown from seed collected in the wild from selected genetic trees (not from clonal seed orchards). Genetic tree selection guidelines ensure that trees are widely dispersed across the local seed zone within the same elevation band.

Levels of Growing Stock Research Plots

There would be no direct adverse effects from mechanical treatment or prescribed fire to the research plots by this alternative, as they would be buffered by a minimum of 50 feet no-treatment zone. The risk of a large crown fire would be reduced in those surrounding stands that are treated by either prescribed burning or by thinning operations. Also, the risk of an insect outbreak starting in the surrounding overstocked stands would be reduced in those that are thinned. Therefore, this alternative would increase the likelihood that these plots would still be usable for future data gathering.

Resiliency and Sustainability

Approximately 43% of the project area originally diagnosed for a silvicultural treatment is currently proposed for thinning and shelterwood harvest under Alternative 2. Thinned ponderosa pine stands would increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs would increase due to the reduction in shading and competition for nutrients and water. Shelterwood harvest in mixed conifer stands would shift the species composition towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires. Fuel reduction treatments and prescribed burning would reduce the fuel loadings on the forest floor and reduce the chances of a fire becoming stand replacement intensity.

Insect Risk

Thinning is proposed in ponderosa pine stands. The additional light and warmth in thinned stands is inhospitable for bark beetles, providing an immediate degree of protection to the trees. As the trees respond with increased growth, over the next several decades after the thinning, their increased vigor would allow them to withstand attempted beetle attacks by successfully pitching out the invading insects. As fewer attacks are successful, the population outbreaks would decrease, reducing the amount or size of pockets of mortality. The reduction in the proportion of late-seral species would reduce the extent of defoliation by spruce budworm and Douglas-fir tussock moth (Mason 1998, Powell 1994).

The host tree species for spruce budworm, tussock moth, and fir engraved would be reduced by thinning mixed conifer stands. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. The incidence of the fir engraver would also be reduced as the proportion of fir is reduced, and the remaining fir trees would be healthier and less susceptible to attacks. Stands not treated would benefit from the reduction of host species in nearby stands, which would lessen the severity and size of outbreaks.

Disease Risk

Stem and root diseases would be reduced since both the thinnings and the shelterwood cuts would reduce the primary host (late seral species). The removal of late seral species during the thinning operations would reduce the amount of trees susceptible to root diseases. This would eventually allow the disease to fade to a minor role in the forest. Thinning would increase growth rates which would allow the remaining trees to outgrow dwarf mistletoe infections, gradually decreasing the percent of crown infected. The increased spacing would reduce the lateral spread of mistletoe.

Cumulative Effects

The activities in Appendix D – “Cumulative Activities Considered” have been considered for the incremental impact of this alternative when added to other past, present, and reasonably fore-seeable future actions for the cumulative effects on forest vegetation. The area considered for cumulative effects is the Mill Creek Subwatershed and the immediately adjacent subwatersheds. The effects of past and present activities listed in Appendix D have been integrated into and described under the affected environment.

Wrac Lodgepole Thinning, as listed in Appendix D, is within the cold-dry biophysical environment. The 60 acre thinning unit is comprised primarily of 4 to10 inch lodgepole. Thinning will not change the structural stage; therefore the project will not have an effect on the HRV of the cold-dry biophysical environment. Thinning will improve the overall health of the stand.

Resiliency and Sustainability

Within the Mill Creek Subwatershed the combination of past timber harvest and fire suppression have gradually converted forests from early seral species to a higher proportion of late seral species. Stand densities and multi-layer canopies also increased across the forests. These late seral trees are not resistant to forest insects, diseases, or to fire. Past harvest activities in the 1990s in this subwatershed have made some small scale positive changes in the overall forest health and sustainability. The proposed treatments in this alternative, in combination with past actions, would create a matrix of treated stands over most of the subwatershed. These treatments would be over a sufficient proportion of the landscape to reduce the severity and extent of wildfire and also the chance of insects and disease reaching an outbreak situation. Disturbances within treated stands are expected to reduce in intensity and duration, as a result of better growing conditions and a more resistant species mix. Disturbances in stands not treated would be smaller in geographic scope and more within historic scales as there would be less unbroken blocks of stands in unhealthy condition.

With the proposed mechanical and prescribed fire treatments, the risk of large-scale disturbances to forested stands would be reduced. These disturbances can cross subwatershed boundaries into surrounding areas causing varying amounts of change; therefore, reducing risk in one area also has a beneficial effect to the surrounding areas. This alternative proposes the largest amount of treated stands and has the most beneficial increase in forest resiliency to disturbance by fire, insects, and disease, reversing the adverse effects of past overstory removal and fire suppression.

Wrac Lodgepole Thinning, as listed in Appendix D, is within the cold-dry biophysical environment and is the only foreseeable project in the Mill Creek Subwatershed that would influence tree vegetation. The 60 acre thinning unit is scheduled to be implemented in 2008 and is comprised primarily of 4 to10 inch lodgepole. Thinning will not change the structural stage; therefore the project would not have an effect on the HRV of the cold-dry biophysical environment. Thinning would improve the overall health of the stand and would add positively to the benefits of proposed treatments in this alternative to the resiliency and sustainability of vegetation in the Mill Creek Subwatershed.

Alternative 3

Introduction

This alternative proposes to thin approximately 1506 acres of overstocked timber stands, 567 acres less than Alternative 2 and no shelterwood harvest. This alternative also proposes approximately 666 acres of precommercial thinning, 269 acres less than Alternative 2. No harvesting is proposed in existing old forest stands in the warm-dry biophysical environment, and all treatments are designed to enhance growth of young stands into old forest structural stages and to enhance the sustainability of the forests to grow into the old forest stages. The proposed prescribed burning remain the same as Alternative 2. Compared to Alternative 2, Alternative 3 treats 69% of the area. Stands that are not treated would be subject to the same effects as discussed for the No Action Alternative.

Direct and Indirect Effects

Composition and Density

Alternative 3 would have about 567 acres less commercial thinning, no shelterwood harvest and regeneration, and about 269 acres less precommercial thinning than Alternative 2. The effects of this alternative on stand composition and density correspond to about 69% of the effects of Alternative 2.

The Regional Forester's Eastside Forest Plans Amendment 2 (USDA 1995) gives direction for maintaining connectivity between LOS habitats to allow the free movement of old-growth wildlife species. The amount of connectivity maintained in this alternative is the same as Alternative 2. The number of acres of proposed commercial and precommercial thinning within connectivity corridors is slightly less than for Alternative 2. Alternative 3 proposes 187 acres of thinning within connectivity corridors, compared to 257 acres in Alternative 2. See Appendix B – Connectivity Corridor map. The thinning prescription within connectivity corridors is the same as Alternative 2. The proposed thinning would leave a higher residual basal area of at least 60 ft^2 in connectivity corridors, maintaining the canopy closure within the top one-third of site potential. Unthinned patches within units are also the same as described in Alternative 2.

Structural Stages

Approximately 69% of the stands would be treated by Alternative 3 compared to that of Alternative 2. Development of old forest single-stratum would be reduced while old forest multi-strata would be the same as in Alternative 2. There is an increased risk of uncharacter-istically severe wildfire that would set back structural stage development, both for the treated stands and surrounding stands, compared to Alternative 2.

In Alternative 3 commercial and precommercial thinning would occur in approximately 54 LOS acres. Stands treated would remain as LOS, and there would be no net loss of LOS structure in the subwatershed as a result of proposed actions. Old forest multi-strata (OFMS) is a small piece of a unit that is predominately comprised of young forest structure. This acre of OFMS that would be converted to old forest single-stratum (OFSS) after thinning is within the hot-dry biophysical environment. The hot-dry biophysical environment is currently above HRV in the OFMS structure and below HRV in the OFSS structure. OFSS is currently 0%, with a historic range of 20-70%; and OFMS is 17%, with a historic range of 5-15%. Regional Forester's Eastside Forest Plan Amendment 2 (Scenario A) allows manipulation one type of LOS to move stands into the LOS stage that is deficit if this meets the historical conditions.

Combined the cool-moist and cool-dry biophysical environments occupy 5% of the Mill Creek Subwatershed. Commercial thinning on 39 acres of OFMS (unit 78) in the cool-dry biophysical environment is proposed with Alternative 2. This treatment would improve the sustainability of the stand's multi-structure. The cool-dry biophysical environment is currently within HRV in the OFMS structure and Regional Forester's Eastside Forest Plan Amendment 2 (Scenario A) allows manipulation in a manner that maintains or enhances LOS within that biophysical environment. LOS development over the next 50 years is estimated to be the same as no action in this biophysical environment.

In Alternative 3, approximately 14 acres of OFSS that are small pieces of several predominately units with young forest structures would be commercially thinned to reduce the understory. This would occur in the warm-dry biophysical environment. These acres would remain as OFSS.

Other than those treatment described above that are with existing LOS structures, all other proposed thinning and shelterwood treatments are located in non LOS structures and are designed to manipulate vegetation towards appropriate LOS structures in the future. Most of the treatments are proposed in the warm-dry biophysical environment and OFSS is projected to increase from 3 to 16% and OFMS from 4 to 37% in the next 50 years. This is compared to the Alternative 1 that increases the percentage of OFSS to 10% and OFMS to 36% in 50 years, and Alternative 2 that increases the percentage of OFSS to 21% and OFMS to 35% in 50 years. Changes in forest structure under Alternative 1 are a result of growth and mortality over time.

In the cold-dry biophysical occupies 21% of the subwatershed. Over the next 50 years OFSS is expected to increase from 5 to 44% and OFMS is expected decrease from 34 to 5%. The changes in OFSS and OFMS are primarily the result of mortality in densely stock stands. Very few acres of treatment are proposed that influence in LOS structural stages.

Prescribed burning activities would be low intensity and are not expected to change existing stand structures or canopy cover. The primary objective of underburning is surface fuel reduction. Specific prescriptions for burning in LOS, satisfactory cover, replacement old growth stands (ROGs) have been developed to meet objectives for those areas. See Chapter 2 and Fire Fuels section of Chapter 3 for specific burning prescriptions. The Terrestrial Wildlife section of Chapter 3 provides additional detail on the effects of underburning on specific habitats.

Understory Vegetation

The effects on the understory are less than Alternative 2; Alternative 3 treats 69% of the area.

Aspen

Aspen stands would not be treated by thinning or burning. As in Alternative 1, aspen would continue to be encroached by conifers, leading to a decline in vigor and numbers. Reproduction would remain low due to the lack of fire, and continued browsing by ungulates would eliminate the suckers that do begin to grow.

Riparian Vegetation

The non-forested acres typically have minimal fuel loads which are discontinuous and therefore rarely burn. Past district experience has shown that when fire is allowed to back into RHCAs the effects are dependent on the existing vegetation. As soon as vegetative species and moisture regimes within the RHCA change and become more shaded with more moisture and higher humidity, the fire would not burn, so riparian vegetation is rarely affected. Shrubs and conifers providing streamside shade and riparian vegetation are rarely affected because they do not burn with enough intensity to cause mortality.

Table V – 17. Effects of Alternative 3 on Hot-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–15%	5–20%	0–5%	0–5%	5–10%	20–70%	5–15%
Existing	**0%**	**40%**	**0%**	**3%**	**40%**	**0%**	**17%**
10	0%	40%	0%	3%	40%	0%	17%
50	0%	9%	0%	0%	0%	44%	47%

Table V – 18. Effects of Alternative 3 on Warm-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–15%	5–20%	1–10%	1–10%	5–25%	15–55%	5–20%
Existing	**1%**	**20%**	**36%**	**17%**	**19%**	**3%**	**4%**
10	1%	20%	34%	19%	19%	3%	4%
50	0%	10%	15%	5%	17%	16%	37%

Table V – 19. Effects of Alternative 3 on Cool-Moist Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1–10%	0–5%	5–25%	5–25%	40–60%	0–5%	10–30%
Existing	**0%**	**15%**	**3%**	**32%**	**11%**	**0%**	**39%**
10	0%	15%	3%	32%	11%	0%	39%
50	0%	0%	3%	33%	0%	0%	64%

Table V – 20. Effects of Alternative 3 on Cool-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–30%	0–5%	5–35%	5–20%	5–20%	1–10%	1–20%
Existing	**0%**	**0%**	**0%**	**53%**	**0%**	**0%**	**47%**
10	0%	0%	0%	53%	0%	0%	47%
50	0%	0%	0%	86%	3%	0%	11%

Table V – 21. Effects of Alternative 3 on Cold-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1–20%	0–5%	5–20%	5–25%	10–40%	0–5%	10–40%
Existing	**1%**	**9%**	**14%**	**36%**	**1%**	**5%**	**34%**
10	1%	9%	14%	35%	2%	5%	34%
50	0%	1%	7%	33%	10%	44%	5%

Genetic Diversity

Results would be similar to Alternative 2, but there is no shelterwood harvest and the thinning is being proposed on 33% less stands.

Levels of Growing Stock Research Plots

There would be no direct adverse effect to the research plots by this alternative, as they would be buffered by a minimum of 50 feet no-treatment zone. The risk of a large crown fire would be reduced in those surrounding stands that are treated by either prescribed burning or by thinning. Also, the risk of an insect outbreak starting in the surrounding overstocked stands would be reduced in those that are thinned. Therefore, this alternative would increase the likelihood that these plots would still be usable for future data gathering.

Resiliency and Sustainability

Alternative 3 proposes to treat about 67% of the area of Alternative 2. Ponderosa pine stands would increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs would increase due to the reduction in shading and competition for nutrients and water. Species composition changes in mixed conifer stands would be towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage.

Insect Risk

The effects of this alternative on reducing the risk of insect attacks would be approximately 31% less than that of Alternative 2.

Disease Risk

The effects of this alternative, on reducing disease, would be approximately 31% less than that of Alternative 2.

Cumulative Effects

The activities in Appendix D – "Cumulative Activities Considered" have been considered for the incremental impact of this alternative when added to other past, present, and reasonably fore-seeable future actions for the cumulative effects on forest vegetation. The area considered for cumulative effects is the Mill Creek Subwatershed and the immediately adjacent subwatersheds. The effects of past and present activities listed in Appendix D have been integrated into and described under the affected environment.

Resiliency and Sustainability

Within the Mill Creek Subwatershed the combination of past timber harvest and fire suppression have gradually converted forests from early seral species to a higher proportion of late seral species. Stand densities and multi-layer canopies also increased across the forests. These late seral trees are not resistant to forest insects, diseases, or to fire. Past harvest activities in the 1990s in this subwatershed have made some small scale positive changes in the overall forest health and sustainability. Compared to Alternative 2, the reduced amount of proposed treatment in Alternative 3 would leave a larger proportion of forested stands at risk to large scale disturbances, increasing the risk to forested areas within and immediately adjacent to the subwatershed.

Wrac Lodgepole Thinning, as listed in Appendix D, is within the cold-dry biophysical environ-ment and is the only foreseeable project in the Mill Creek Subwatershed that would influence tree vegetation. The 60 acre thinning unit is scheduled to be implemented in 2008 and is comprised primarily of 4 to10 inch lodgepole. Thinning will not change the structural stage; therefore the project would not have an effect on the HRV of the cold-dry biophysical environment. Thinning would improve the overall health of the stand and would add positively to the benefits of proposed treatments in this alternative to the resiliency and sustainability of vegetation in the Mill Creek Subwatershed.

Alternative 4

Introduction

This alternative proposes no commercial timber harvest. Proposed precommercial thinning and prescribed burning compares to that of Alternative 2. This alternative treats the least number of stands, identified as needing treatment to meet the desired condition, than the other action alternatives. This is a decrease of approximately 75% from the area proposed to be treated by Alternative 2, plus precommercial thinning is expected to be less effective than the commercial entries proposed for Alternative 2, for improving forest resiliency and sustainability, as only trees less than 9 inches dbh would be cut. The stands not treated would have the same effects as discussed under the No Action Alternative.

Direct and Indirect Effects

Composition and Density

This alternative thins about 1,300 less acres (60% less area) than Alternative 2, and would remove fewer trees since precommercial thinning would only cut up to 9 inches dbh. Thinned stands are only expected to marginally respond as the stands would still be overstocked with the stand basal area only slightly reduced.

The only gain would be the decrease in the fire hazard due to removal of much of the understory and the treating of the slash piles. Surface fires would burn with less intensity and ladder fuels would be reduced, however the resistance to crown fire spread would be the same since there would be little change in the overstory crown structure. Removing the understory would facilitate the reintroduction of fire into these stands resulting in a slight shift back towards historical conditions.

This alternative is the farthest from meeting the desired condition for a sustainable forest of the action alternatives. It thins the least amount of stands to the desired density.

Alternative 4 proposes 177 acres of precommercial thinning within connectivity corridors, compared to 257 and 187 acres of commercial thinning and precommercial thinning in Alternatives 2 and 3, respectively. See Appendix B – connectivity corridor map. The thinning prescription within connectivity corridors would only cut trees up to 9 inches dbh. Unthinned patches within treatment units would be maintained.

Structural Stages

Development of old forest stand structures in the thinned stands, with the increased growth rates would take about the same amount of time as the No Action Alternative. There is a slightly decreased risk of uncharacteristically severe wildfire that could set back structural stage development, both for the treated stands and surrounding stands.

In Alternative 4 precommercial thinning would occur in approximately 45 LOS acres. Stands treated would remain as LOS, and there would be no net loss of LOS structure in the subwatershed as a result of proposed actions. .

Combined the cool-moist and cool-dry biophysical environments occupy 5% of the Mill Creek Subwatershed. Precommercial thinning to improve the sustainability of the multi-structure on 39 acres of OFMS (unit 78) is proposed in the cool-dry biophysical environment with Alternative 4. The cool-dry biophysical environment is currently within HRV in the OFMS structure and Regional Forester's Eastside Forest Plan Amendment 2 (Scenario A) allows manipulation in a manner that maintains or enhances LOS within that biophysical environment.

In Alternative 4, approximately 6 acres of OFSS would be precommercially thinned to reduce the understory and maintain the OFSS structure. This would occur in the warm-dry biophysical environment. These acres would remain as OFSS. The acres are small pieces of several units.

Thinning treatments in all biophysical environments are limited to cutting of trees less than 9 inches in diameter. Most of the treatments are proposed in the warm-dry biophysical environment. The projected change in LOS structures in warm-dry, hot-dry, cool-moist, cool-dry, and cold-dry biophysical environments is the same as No Action Alternative over the next 50 years.

Prescribed burning activities would be low intensity and are not expected to change existing stand structures or canopy cover. The primary objective of underburning is surface fuel reduction. Specific prescriptions for burning in LOS, satisfactory cover, replacement old growth stands (ROGs) have been developed to meet objectives for those areas. See Chapter 2 and Fire Fuels section of Chapter 3 for specific burning prescriptions. The Terrestrial Wildlife section of Chapter 3 provides additional detail on the effects of underburning on specific habitats.

Riparian Vegetation

The non-forested acres typically have minimal fuel loads which are discontinuous and therefore rarely burn. Past district experience has shown that when fire is allowed to back into RHCAs the effects are dependent on the existing vegetation. As soon as vegetative species and moisture regimes within the RHCA change and become more shaded with more moisture and higher humidity, the fire would not burn, so riparian vegetation is rarely affected. Shrubs and conifers providing streamside shade and riparian vegetation are rarely affected because they do not burn with enough intensity to cause mortality.

Table V – 22. Effects of Alternative 4 on Hot-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–15%	5–20%	0–5%	0–5%	5–10%	20–70%	5–15%
Existing	**0%**	**40%**	**0%**	**3%**	**40%**	**0%**	**17%**
10	0%	40%	0%	3%	40%	0%	17%
50	0%	33%	0%	0%	0%	8%	59%

Table V – 23. Effects of Alternative 4 on Warm-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–15%	5–20%	1–10%	1–10%	5–25%	15–55%	5–20%
Existing	**1%**	**20%**	**36%**	**17%**	**19%**	**3%**	**4%**
10	1%	20%	36%	17%	19%	3%	4%
50	0%	5%	24%	6%	19%	10%	36%

Table V – 24. Effects of Alternative 4 on Cool-Moist Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1–10%	0–5%	5–25%	5–25%	40–60%	0–5%	10–30%
Existing	**0%**	**15%**	**3%**	**32%**	**11%**	**0%**	**39%**
10	0%	15%	3%	32%	11%	0%	39%
50	0%	0%	3%	33%	0%	0%	64%

Table V – 25. Effects of Alternative 4 on Cool-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5–30%	0–5%	5–35%	5–20%	5–20%	1–10%	1–20%
Existing	**0%**	**0%**	**0%**	**53%**	**0%**	**0%**	**47%**
10	0%	0%	0%	53%	0%	0%	47%
50	0%	0%	0%	88%	0%	0%	12%

Table V – 26. Effects of Alternative 4 on Cold-Dry Forest Structural Stages.

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1–20%	0–5%	5–20%	5–25%	10–40%	0–5%	10–40%
Existing	**1%**	**9%**	**14%**	**36%**	**1%**	**5%**	**34%**
10	1%	9%	14%	36%	1%	5%	34%
50	0%	0%	13%	36%	9%	35%	7%

Understory Vegetation

The effects of this alternative would be similar to the No Action Alternative, but the thinning of the understory would have a small benefit to the re-establishment of shrubs and forage species.

Aspen

Aspen stands would not be treated by thinning or burning. As in Alternative 1, aspen would continue to be encroached by conifers, leading to decline in vigor and numbers. Reproduction would remain low due to the lack of fire and continued browsing by ungulates would eliminate the suckers that do begin to grow.

Genetic Diversity

Results would be similar to the No Action Alternative due to the limited extent of management proposed.

Levels of Growing Stock Research Plots

There would be no direct adverse effects to the research plots by this alternative, as they would be buffered by a minimum of 50 foot no-treatment zone. The risk of a large crown fire would be reduced in those surrounding stands that are treated by either prescribed burning or by pre-commercial thinning. Also, the risk of an insect outbreak starting in the surrounding overstocked stands would be slightly reduced in those that are thinned. Therefore, this alternative would slightly increase the likelihood that these plots would still be usable for future data gathering, but not to the extent provided by Alternative 2.

Resiliency and Sustainability

This alternative thins about 60% less area than Alternative 2 at a much lower intensity (the basal area would not be materially reduced). Ponderosa pine stands would very slightly increase in growth and vigor as the stand density is reduced slightly.

Precommercial thinning of stands would increase growth only minimally, since trees over 9 inches dbh would not be treated. Resistance to insects, disease, and fire damage would not be reduced. The canopy base height, a factor in determining if a surface fire will ignite the crown layer, in treated stands would be increased slightly but less than either Alternative 2 or 3.

Insect Risk

The effects of this alternative on reducing the risk of insect attacks would be approximately the same as the No Action Alternative.

Disease Risk

The effects of this alternative on reducing disease would be approximately the same as the No Action Alternative.

Cumulative Effects

The activities in Appendix D – "Cumulative Activities Considered" have been considered for the incremental impact of this alternative when added to other past, present, and reasonably foreseeable future actions for the cumulative effects on forest vegetation. The area considered for cumulative effects is the Mill Creek Subwatershed and the immediately adjacent subwatersheds. The effects of past and present activities listed in Appendix D have been integrated into and described under the affected environment.

Resiliency and Sustainability

Within the Mill Creek Subwatershed the combination of past timber harvest and fire suppression have gradually converted forests from early seral species to a higher proportion of late seral species. Stand densities and multi-layer canopies also increased across the forests. These late seral trees are not resistant to forest insects, diseases, or to fire. Past harvest activities in the 1990s in this subwatershed have made some small scale positive changes in the overall forest health and sustainability. With the least amount of mechanical treatments, the risk to forested stands would remain relatively high to large-scale disturbances. Fire hazard is decreased a moderate amount, but the risk of insect or disease is not materially decreased. These disturbances can cross subwatershed boundaries into surrounding areas causing varying amounts of change.

Wrac Lodgepole Thinning, as listed in Appendix D, is within the cold-dry biophysical environment and is the only foreseeable project in the Mill Creek Subwatershed that would influence tree vegetation. The 60 acre thinning unit is scheduled to be implemented in 2008 and is comprised primarily of 4 to10 inch lodgepole. Thinning will not change the structural stage; therefore the project would not have an effect on the HRV of the cold-dry biophysical environment. Thinning would improve the overall health of the stand but when considered cumulatively with proposed actions in Alternative 4, the subwatershed fire hazard and risk of insect or disease will remain as described above.

Consistency with Direction and Regulations

Forest Plan

The No Action Alternative does not meet the Forest Plan direction to establish ponderosa pine (and other early-seral species) in appropriate sites to increase fire, insect, and disease resiliency.

Alternatives 2 and 3 meet the direction to minimize losses due to insects and disease by managing stands at appropriate densities and by selecting for the more insect and disease resistant ponderosa pine and western larch. Both natural regeneration and planting are utilized to reforest the shelterwood harvest areas and seed used to grow the seedlings is collected from superior trees within the seed zone and elevation band.

Alternative 2 includes 2,192 acres of commercial harvest, 935 acres of precommercial thinning, and prescribed fire within a 5,300 acre perimeter. Alternative 3 includes 1,506 acres of commercial harvest, 666 acres of precommercial thinning, and prescribed fire within a 5,300 acre perimeter. Alternative 2 by treating the most acres mechanically followed by the use of prescribed fire best meets the purpose to promote a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands and the purpose to reduce the fire fuels by primarily reducing density of standing vegetation, surface fuels, and fuel ladders.

Alternative 4 selects for the more insect and disease resistant ponderosa pine and western larch with the precommercial thinning, however, the thinned stands are only expected to marginally respond as the stands would still be overstocked with the stand basal area only slightly reduced.

Regional Forester's Eastside Forest Plan Amendment 2

All alternatives meet the direction to not decrease old forest structural stages, since no live trees over 21 inches dbh are to be harvested (except for incidental trees cut for road and landing construction and for safety).

There is no shelterwood harvesting proposed in the old forest structural stages. Nor are there any thinning harvests in old forest structure stands in the warm-dry biophysical environment, as it is below HRV in that biophysical environment (Scenario A of the Regional Forester's Eastside Forest Plan Amendment 2). There is no net loss of old forest structure with any of the alternatives. The prescriptions for the connectivity corridors between old forest structure stands are designed to maintain the stands in the upper 1/3 of site potential.

Alternatives 2 and 3 meet the objectives to protect existing old forest structure and to shorten the time to grow additional old forest structural stages. This is due to thinning overstocked stands increases growth rates and sustainability against loss to insects, disease, and fire. Of the action alternatives, Alternative 2 meets the highest number of objectives, followed by Alternative 3, and Alternative 4. Alternative 4 does little to increase growth rates and sustainability against loss to insects, disease, and fire.

National Forest Management Act (NFMA)

Requirements of 36 CFR 219.28, which are part of the NFMA regulations, will be met. Specifically: 1) Harvest will occur only on suitable timberlands; 2) Following commercial thinning activities, none of the action alternatives will require reforestation activities since the stands will remain fully stocked or overstocked; 3) Alternative 2 includes 119 acres of shelter-wood harvesting. Following shelterwood harvest, areas that are understocked and greater than ½ acre in size would be planted to meet direction that areas shelterwood harvested will be reforested within 5 year. The National Forest Management Act of 1976 requires the disclosure of any silvicultural prescription that creates an opening larger than 40 acres, using even-aged vegetation management. The project proposed action and alternatives would not create openings greater than 40 acres.

Irreversible and Irretrievable Commitments of Resources

Irreversible Commitments

There are no anticipated long-term irreversible commitments of the forest vegetation since it is renewable as long as the soil productivity is maintained. There may be short-term losses of growth related to soil compaction, but compaction is to be kept below 20% of the forest area, and the growth reduction on compacted ground is about 15%. This would result in a total maximum growth loss of approximately 3% per year of the growth potential until the compaction gradually diminishes (about 50 years). The gain from thinning can be expected to off-set this growth loss.

Irretrievable Commitments

There are irretrievable commitments of the growth of forest vegetation for about 5 years due to the new landings and roads that are built for the salvage operation. They are to be rehabilitated after use, but there would be a lag in reforestation and growth since the sites are impacted more heavily than the surrounding forestland.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives can be found in the Silviculture Specialist Report located in the project record.

Fire and Fuels

Introduction

Fuels management is a process of managing the hazard in relation to the size and severity of a potential fire event. The objective of fuels management is to reduce the fire hazard to a level where cost effective resource protection is possible should a wildfire ignite. Fire behavior is a function of fuels, weather, and topography. Of these three components affecting wildland fire behavior, only fuels can be manipulated.

Regulatory Framework

Malheur National Forest Plan

The Malheur National Forest Plan includes Fire Management Direction to ensure that fire use programs are cost-effective, compatible with the role of fire in forest ecosystems, responsive to resource management objectives, and that fire presuppression and suppression programs are cost-effective and responsive to the Forest Plan (Appendix G).

The goals for fire management are to: 1) initiate management action that provides for the most reasonable probability of minimizing fire suppression costs and resource damage, consistent with probable fire behavior, resource impacts, safety, and smoke management, and 2) identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction (Forest Plan, pg IV – 4).

The following applicable forest-wide direction is provided for fire management: manage residue profiles at a level that will minimize the potential of high intensity wildfire and provide for other resources (Forest Plan, pg IV – 44). Air quality standards require that air quality impacts be minimized, especially to Class I airsheds and smoke sensitive areas, design measures be used when appropriate, and burning is conducted in accordance with the State Smoke Management Plan (Forest Plan, pg IV – 40).

The Malheur National Forest Fire Management Plan (FMP) provides operational guidance on how to carry out fire management policies that will help achieve resource management objectives. The FMP is updated annually or as policy and Land and Resource Management Plans change. A fire management planning system that recognizes both fire use and fire protection as inherent parts of natural resource management will ensure adequate fire suppression capabilities as well as support fire reintroduction efforts.

The fuels management portion states that the appropriate type and amount of fuel treatment is tiered to the Forest Plan Management Area specific Standards and Guidelines. Levels and methods of fuel treatment will be guided by the protection and resource objectives of each management area. Emphasis will be on ecological restoration treatments. Where appropriate, fuels treatments will allow for the utilization of wood residues.

National Fire Plan

The National Fire Plan (USDA Forest Service (FS) & USDI Bureau of Land Management 2001) provides national direction for hazardous fuel reduction, restoration, rehabilitation, monitoring, applied research, and technology transfer. The USDA FS and Department of Interior are developing a common strategy for reducing fuels and restoring land health in fire-prone areas.

The USDA FS prepared a document outlining strategies for protecting people and the environment by restoring and sustaining land health; Protecting People and Sustaining Resources in Fire-adapted Ecosystems – A Cohesive Strategy (Laverty 2000). The purpose of the strategy is to:

- Establish national priorities for fuel treatment; ensuring funding is targeted to the highest risk communities and ecosystems;
- Evaluate tradeoffs between programs that emphasize wildland urban interface and those emphasizing ecosystem restoration and maintenance;
- Measure the effectiveness of strategic program options at different funding levels;
- Recommend a strategic program to best achieve national fuel treatment objectives for community protection and ecosystem restoration and maintenance; and
- Emphasize landscape-scale, cross-boundary treatments that reduce hazards while providing benefits to other ecosystem values.

The Grant County Community Fire Protection Plan (2005) is the result of a county-wide effort initiated to reduce forest fire risk to citizens, the environment, and the quality of life within Grant County including the Grant County WUI (Wildland Urban Interface) area. A portion of the Crawford Project Area falls in the Grant County WUI Area. Highway 26 and Highway 7 (Austin to Tipton Summit) are identified in the protection plan as safety corridors.

The strategy will emphasize improved working relationships between federal land managers, as well as with multiple key disciplines inside the various land management and regulatory agencies and bureaus across geographic scales. National Fire Plan goals and objectives include:

- Reducing the number of small fires that become large,
- Restoring natural ecological systems to minimize uncharacteristically intense fires,
- Creating new jobs in both the private and public sectors,
- Improving capabilities of state and volunteer fire organizations, and
- Reducing threats to life and property from catastrophic wildfire.

The 10 – Year Comprehensive Strategy (reflects the views of a broad cross-section of governmental and non-government stakeholders). It outlines a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration and rehabilitation on Federal and adjacent State, tribal, and private forest and range lands. Congress directed the Secretaries of Interior and Agriculture to work with the Governors to develop this strategy in the FY 2001 Interior and Related Agencies Appropriations Act (P.L. 106 – 291). The primary goals of the 10 – Year Comprehensive Strategy are:

1. Improve prevention and suppression,
2. Reduce hazardous fuels,
3. Restore fire adapted ecosystems, and
4. Promote community assistance.

The Implementation Plan (May 2002) outlines specific performance measures for each of the primary goals listed above: Only the goals to reduce hazardous fuel are listed below.

Goal Two – Reduce Hazardous Fuels

a. Number of acres treated that are (i) in the wildland urban interface, or (ii) in condition classes 2 or 3 in Fire Regimes 1, 2, or 3 (or Fire Regimes I, II, and III) outside the wildland urban interface, and are identified as high priority through collaboration consistent with the Implementation Plan, in total, and as a percent of all acres treated.

b. Number of acres treated per million dollars gross investment in Measures a.(i) and a.(ii) respectively.

c. Percent of prescribed fires conducted consistent with all Federal, State, Tribal and local smoke management requirements.

Air Quality Regulatory Framework

Clear Air Act. The framework for controlling air pollutants in the United States is mandated by the 1970 Clean Air Act (CAA), as amended in 1977 and 1990 (42 U.S.C. §7401 et seq.). The CAA was designed to "protect and enhance" the quality of the Nation's air resources, and encourages reasonable Federal, state, and local government actions for pollution prevention. State Implementation Plans (SIPs) are developed by each state to implement the provisions of the CAA. The SIPs describe the state's actions to achieve and maintain the National Ambient Air Quality Standards (NAAQS).

Section 160 of the CAA requires measures "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value." Stringent requirements are therefore established for areas designated as "Class I." These areas include Forest Service and Fish and Wildlife Service wilderness areas over 5,000 acres that were in existence before August 1977, and National Parks in excess of 6,000 acres as of August 1977. Designation as a Class I area allows only very small increments of new pollution above existing air pollution levels.

National and State Ambient Air Quality Standards. Environmental Protection Agency (EPA) developed the NAAQS for a specific set of "criteria" pollutants designed to protect public health. States can adopt standards even more stringent than the Federal standards. NAAQS are defined as the amount of a criteria pollutant above which detrimental effects to public health (or welfare) may result. NAAQS have been established for the following air pollutants: particulate matter (PM10 and PM2.5), sulfur dioxide (SO2), nitrogen dioxide (NO2), ozone, carbon monoxide, and lead. NAAQS are set at a conservative level with the intent of protecting even the most sensitive members of the public including children, asthmatics, and people with cardiovascular disease. If an area consistently violates one of the NAAQS, that area becomes federally designated as a "non-attainment" area. States must demonstrate to the public and the EPA how a non-attainment area would meet the NAAQS, based upon the control of emission sources. Such demonstrations employ control plans that are part of each SIP, including emissions from prescribed fire.

Regional Haze Rule (1990 Clean Air Act Amendments) 40 CFR Part 51. In 1999, EPA promulgated the Regional Haze Rule (40 CFR 51.308-309) which calls for states to establish goals for improving visibility in mandatory Class I areas and to develop long-term strategies for reducing the emissions of air pollutants that cause visibility impairment. Class I areas include wilderness or national parks greater than 5,000 acres which existed on August 7, 1977. The Regional Haze Rule requires states to demonstrate "reasonable progress" toward improving visibility in each Class I area over a 60-year period (to 2064), during which visibility should be returned to natural conditions.

The Regional Haze Rule also requires states to address visibility impairment in mandatory Class I areas due to emissions from fire activities. The preamble to the rule emphasizes the "implementation of smoke management programs to minimize effects of all fire activities on visibility." The rule requires states to address visibility effects from all fire sources contributing to visibility impairment in mandatory Class I areas.

The Interim Air Quality Policy on Wildland and Prescribed Fires (U.S. EPA 1998). The Interim Policy suggests that air quality and visibility impact evaluations of fire activities on Federal lands should consider several different items during planning (EPA 1998). In a project level NEPA document, it is appropriate to consider and address to the extent practical, a description of applicable regulations, plans, or policies, identification of sensitive areas (receptors), and the potential for smoke intrusions in those sensitive areas. Other important disclosure items include applicable smoke management techniques, participation in a basic smoke management program, and potential for emission reductions. Typically, ambient air quality, visibility monitoring and cumulative impacts of fires on regional and sub-regional air quality are not explained to the same level of detail. Ambient air quality and visibility monitoring (for Class I areas) are typically done collaboratively with the states. Impacts to regional and sub-regional air are addressed operationally through a coordinated smoke management program. The EPA urges states to develop, implement, and certify smoke management programs that meet the recommended requirements of the Interim Policy. If a "certified" program is in place and smoke exceeds the particulate standard, it may not be considered a violation by EPA (Dzomba 2005).

State Regulations. Prescribed burning in Oregon's forests is managed by the State Department of Forestry (ODF) under the Oregon Smoke Management Plan (OSMP). The OSMP is intended to minimize smoke impacts by conducting forest burning under weather conditions that disperse smoke and steer it away from populated areas. Burning on National Forest System Lands would not occur unless prior approval has been granted by the ODF. The Malheur National Forest is voluntarily complying with the Regional Haze Rules set forth for Central Oregon and Class I Airsheds. Refer to Smoke Management Plan OAR 629-48-001 for regional haze requirements. Currently Bend, John Day, Burns, and Baker City are listed smoke sensitive receptor areas but at this time no restrictions are in place concerning air pollutants as listed above.

Local Regulations. The Forest Plan provides the direction for management activities on the Malheur National Forest. Forest-wide management goals and specific management area direction embody the desired future condition that management actions are designed to achieve. The following goals and standards are applicable to the Forest as a whole, followed by Management Area direction specific to the project area relevant to air quality.

Analysis Methods

The Integrated Forest Resource Management System (INFORMS) software program was used for this project's analysis. INFORMS was designed for such project level analysis and provides an interface to a variety of analysis tools such as the Most Similar Neighbor (MSN), Forest Vegetation Simulator (FVS), and the Fuels and Fire Extension for FVS (FFE – FVS). The Most Similar Neighbor (MSN) was used to fill in missing vegetation data within the project area based on existing vegetation data of similar stands. This information was verified by specialists with knowledge of the area and changes were made. FVS, using the Blue Mountain variant, was used to simulate stand growth and the compare stand characteristics and structural stages between alternatives. FFE – FVS was used for fire and fuels effects. Torching and crowning indices were determined by the FVS based on stand information and are used to create a torch code and a crown code in Informs. Crown fire potential was determined using Fuels Tool of INFORMS.

Canopy base height and crown bulk density are used to compare differences alternatives (See Affected Environment – Crown Fire Hazard Indices for discussion of terminology used here). The Fire Regime Condition Class (FRCC) was derived from the use of the FRCC tool within INFORMS for the landscape. Stand level FRCC was from the forest wide FRCC coverage. Additional information including assumptions and constraints about FVS and FFE – FVS can be found at www.fs.fed.us/fmsc/fvs/index and additional information on the INFORMS software can be found at www.fs.fed.us/informs. Long-term projections become estimates at best; however, results do show trends and are useful for comparing different alternatives. With this analysis it should be remembered that, for any one stand, the total set of attributes will describe the stand pretty well but any one attribute cannot be depended upon to be accurate (Informs User Guide). To assess smoke management, differences in smoke emissions that are required to be monitored, (PM 10, PM 2.5) will be compared by alternative. Communities affected by wildfire or prescribed fire will be identified based on topography and prevailing winds. The following definitions for short-term, mid-term, and long-term are used to facilitate discussion of effects: short term is 0 to 5 years, mid-term is 5 to 25 years, and long-term is 25+ years. Most discussion is focused on the short and long term.

Affected Environment

Weather

Weather patterns are important for thunderstorm generation, for precipitation, and wind patterns that affect fire behavior. The weather patterns are influenced by several factors including the position and intensity of upper level wind currents, the high and low pressure systems over the Pacific Ocean, and the variations in the topography. Two major frontal zones affect the Malheur National Forest. One, a relatively moist Pacific air mass, and two a drier continental air mass. There is a thermal trough that migrates northward during the spring and summer with occasional intrusions of monsoon moisture from the southwest. Strong convection occurring during this time period sets the stage for multiple ignitions. In early summer the drier continental air mass results in a prolonged drying trend.

The Blue Mountains experience hot, dry east winds several times a month during the summer and fall. These winds can be strong, have low relative humidity, and can quickly dry the fine fuels that carry fire. Valleys that run east-west and have low saddles at their crest are likely to be affected by these winds, more than north-south valleys or areas with more topographic definition. Local winds, associated with differential heating of the landscape, are important throughout the Blue Mountains: up-valley winds during the day, down-valley at night. Topographic influences interact with weather patterns, but have direct effects on fire as well. Steep slopes are more likely to burn than flat slopes, southerly aspects more than northerly, and ridgelines more than valley bottoms.

Fire Risk

Fire risk is the chance of a fire starting from any ignition source and is determined by using the frequency of past fire starts. Fire frequency is expressed statistically as the number of fire starts per one thousand acres per year. Lightning is the dominate fire ignition source in the southern Blue Mountains. Lightning ignitions vary by elevation, aspect, and fuel type. Low risk = 0 to 0.49. At least one fire expected every 20 or more years per thousand acres. Moderate risk =

0.50 to 0.99. At least one fire expected in 11 to 20 years per thousand acres. High risk = 1.0 or greater. At least one fire expected in 0 to 10 years per thousand acres.

From the Upper Middle Fork John Day Watershed Analysis, fire frequency is 1.0 fire per one thousand acres per decade. For the Mill Creek Subwatershed the fire frequency is slightly greater than 1.0 putting the subwatershed and the project into the high fire risk rating. Approximately 78% of the fire starts that have occurred within the subwatershed have been caused by lighting, and 22% have been human caused.

Fire Hazard

Fire hazard most commonly refers to the difficulty of controlling potential wildfire. Fire behavior characteristics such as rate-of-spread, intensity, torching, crowning, spotting, fire persistence, or resistance to control, are generally used to determine and describe fire hazard. As Brown et al. (2003) indicated fire severity can be considered an element of fire hazard.

The influences of fine fuels such as litter, duff, grasses and small woody fuels (less than 3 inches diameter) have the most affect on spread rate and intensity of fires. These fuels are used in fire behavior models developed for predicting the fire behavior of the initiating fire (Rothermel 1983). Coarse Woody Debris (less than 3 inches) has little influence on spread and intensity of the initiating fire; however, they can contribute to development of large fires and high fire severity. Fire persistence, resistance-to-control, and burnout time (affects to fire fighter and public safety, soil heating, and tree mortality) are significantly influenced by loading, size, and decay state of large woody fuel. Torching, crowning, and spotting contribute to large fire growth and are greater where large woody fuels have accumulated under a forest canopy. Large woody fuel, especially containing large decayed pieces, are a suitable fuelbed for firebrands and can hold smoldering fire for extended periods of time (Brown et al. 2003). Spot fires can also be started in rot pockets of standing snags. The distance a firebrand travels is dependent on size of the firebrand, wind speed, and height above ground of the source.

Fire behavior and severity depend on the properties of the various fuel strata and the continuity of those fuel strata. The fire hazard can be characterized by the potential for fuels to cause specific types of behavior and effects. Fuelbeds can be classified into six strata: 1) tree canopy, 2) shrubs/small trees 3) low vegetation, 4) woody fuels 5) moss, lichens, and litter, and 6) ground fuels (duff) (Graham et al. 2004). This project primarily addresses four of the six fuelbed strata listed above, tree canopy, small trees, woody fuel, and litter.

Ground fuels burn typically by smoldering and may burn for extended periods of time. Long duration smoldering can lead to soil damage, tree mortality, and smoke impacts. Ground fuels, especially rotten material, are ignitable by firebrands falling ahead of an advancing fire. Prescribed burning with this project will address ground fuels. Surface fuels consist of low vegetation (grasses and shrubs), litter, and woody material in contact with the ground surface. Surface fuel density and size class distribution are critical to fire spread rate and intensity. Other characteristics of surface fuels that determine surface fire behavior are fuel depth, continuity, and chemistry. Prescribed burning with this project will address surface fuels. Crown fuels are those suspended above the ground and are the biomass available for crown fires. The shrub/small tree stratum is involved in crown fires by and serving as the ladder fuels that carry a surface fire into the crowns. Thinning (commercial and precommercial) and prescribed fire with this project address crown fuels.

The probability of ignition is related to fine fuel moisture content, air temperature, the amount of shading of surface fuels, and an ignition source (lightning or human). Open stands generally offer a drier and warmer microclimate than closed, denser stands. The denser stands usually have more shading of the fuels, keeping humidity higher and air temperature lower. Open stands also tend to allow higher wind speeds. Historic stand structure played an important role in maintaining fire-dependent forest types, such as ponderosa pine. (Graham et al. 2004).

Current fuel conditions in the project area are a result primarily of the exclusion of fire, timber harvest and livestock grazing. The lack of fire has allowed a build up of crown, surface and ground fuels. Grazing has reduced grasses, a fine fuel and primary fire carrier. Past harvest activities have changed the structure and species composition so higher levels of fire susceptible species and greater numbers of smaller trees are now present on the landscape.

Fire Regimes and Condition Classes

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). Coarse scale definitions for natural (historical) fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. The five regimes include:

- I – 0 – 35 year frequency and low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced);
- II – 0 – 35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);
- III – 35 – 100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced);
- IV – 35 – 100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced); and
- V – 200+ year frequency and high (stand replacement) severity.

There is science (Baker et al 2006, Hessberg 2004) indicating areas within a high frequency low severity fire regime have a mixed-severity component including some stand replacement. In agreement and specific to the Blue Mountains, fire regimes have been identified for all plant associations. In addition, fire frequency with the percent of any fire that may be mixed severity or stand replacing has been identified for all plant associations in the Blue Mountains. This information is displayed in Table F – 1. See the vegetation section for more information on the Plant Association Groups.

Table F – 1. Mill Creek Subwatershed Fire Regime Summary for Upland Forests.

Fire Regime Group	Plant Association Group	Mean Fire Interval and Replacement Fire %	Percent within Mill Subwatershed
I	Hot–dry Upland Forest	15 years and 10%	4%
I	Warm–dry Upland Forest	22 years and 24%	61%
III	Cool–moist Upland Forest	59 years and 30%	Less Than 1%
IV	Cool–dry Upland Forest	111 years and 67%	4%
IV	Cold–dry Upland Forest	143 years and 57%	21%

Note - The Fire Regimes for non-forested vegetation is dependent upon the moisture regime and whether it is upland or riparian. Sufficient data was not available for all shrublands, grasslands, or herblands. The Fire Regime for these areas can be I, II, III, or IV.

A Fire Regime Condition Class (FRCC) is a classification of the amount of departure from the natural regime (Hann and Bunnell 2001). Coarse-scale condition classes (CC) have been defined and mapped by Hardy et al. (2001) and Schmidt et al. (2001). They include three condition classes for each fire regime. The classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure results in changes to one (or more) of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and diseased mortality, grazing, and drought). All wildland vegetation and fuel conditions or wildland fire situations fit within one of the three classes. The three classes are based on low (CC 1), moderate (CC 2), and high (CC 3) departure from the central tendency of the natural (historic) regime (Hann and Bunnell 2001, Hardy et al. 2001, Schmidt et al. 2002). The central tendency is a composite estimate of vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances. Low departure is considered to be within the natural range of variability, while moderate and high departures are outside.

Characteristic vegetation and fuel conditions are considered to be those that occurred within the natural (historic) fire regime. Uncharacteristic conditions are considered to be those that did not occur within the natural fire regime, such as invasive species (e.g. weeds, insects, and diseases), "high graded" forest composition and structure (e.g. large trees removed in a frequent surface fire regime), or repeated annual grazing that maintains grassy fuels across relatively large areas at levels that will not carry a surface fire.

Determination of amount of departure is based on comparison of a composite measure of fire regime attributes (vegetation characteristics; fuel composition; fire frequency, severity and pattern) to the central tendency of the natural fire regime. The amount of departure is then classified to determine the fire regime condition class.

A fire under current conditions would not burn as a low severity surface fire. Fires would be mixed severity to stand replacing with detrimental effects to other resources that did not historically occur. Another ecological component that has changed and is contributing to the departure from the natural fire regime includes the vegetation condition. Tree densities are much higher, and species composition has shifted to have a higher proportion of shade tolerant, fire susceptible fir. Insect and disease are contributing to tree mortality in the area that then contributes to surface fuel loading as trees fall to the ground.

At the landscape scale, the appropriate scale at which to evaluate fire regimes and ecological departure for CC determination (Hann et al. 2003), the current condition class is 2 at 35% departure. The percentage range defining moderate departure is 33 to 66%. There is a low-moderate level of departure from historic conditions. The uncharacteristic conditions include; several of the structural stages being outside the range of historic variability, and the fire frequency having been altered.

The Forest CC coverage indicates that approximately 43% of the subwatershed is in Fire Regime I and a Condition Class 3 and 14% is Fire Regime I and a Condition Class 2.

Fuel Models and Fuel Loadings

Fuel models (FM) are used to help describe and quantify surface fuel situations and estimate fire behavior. Criteria for choosing a fuel model involves assessing the fuel strata that will support the fire as it spreads and generates heat intensity. Where fuel beds are fairly continuous with similar fuel characteristics, one model can provide a realistic representation of expected fire behavior. A description of the Fuel models, their characteristics and their representation in the project area follows:

Fuels in FM 1 areas consist mainly of grass and herbaceous plants. Very little shrub or tree vegetation is present, generally less than 1/3 of the area. Fires in this model are mainly on the surface, move rapidly, and cause very little mortality in established stands but serve to limit seedling development in the understory. The natural mosaic pattern of fire allows even aged clumps of trees to form across the landscape. Average fuel loading for this fuel model is less than one ton per acre.

FM 2 includes open shrub lands, ponderosa pine stands, and grasslands being encroached by conifers. Light understory development is typical in this fuel model. These stands may include clumps of fuels or small concentrations of dead down material that could generate higher intensity fire and may produce firebrands. Fire spread is primarily through the fine curing grass, dead herbaceous fuels, and litter. Historically, much of the area within the Crawford Project Area would have been represented by fuel model 2.

FM 5 represents short shrubs or young green stands with no dead wood. Fire is generally carried in the surface fuels made up of litter cast by shrubs, grasses, and forbs. Fires are usually not intense due to light fuel loads and little volatile material contained in the foliage.

FM 8 represents a closed canopy of short-needle conifers with a compact surface-fuel litter layer. Representative vegetation types are mixed conifers of lodgepole, Douglas-fir, sub-alpine fir, white fir, and larch. The surface-fuel layer is mainly needles and occasional twigs with very little undergrowth. Fires are typically slow burning with low flame lengths. An occasional heavy fuel concentration may cause a flare up, but the chance of any erratic fire behavior is small. Only under severe weather conditions with high temperatures, extremely low relative humidity, and high wind speeds does this fuel bed pose a high fire hazard.

FM 9 areas consist of mature stands with small amounts of understory development. Fires spread through surface litter that has accumulated under more dense stands of ponderosa pine. Concentrations of dead-down woody material will contribute to possible torching of overstory trees.

FM 10 represents an area in which there is a moderate loading of larger size fuel at the surface layer. In this model, fires burn in the surface and ground fuels with greater fire intensity than the other fuel models. The fuel bed contains a moderate loading of large size fuels from insect/ disease, wind damage, or natural mortality. High heat intensity, torching, spotting, and crowning may be expected during wildfire events; resistance to control is high.

FM 12 is similar to FM 10 in that the primary fire carrier is larger woody debris but it has heavier loadings than FM 10. High heat intensity, torching, spotting, and crowning may be expected during wildfire events and resistance to control is high.

Within the project area, many stands identified as FM 2 have a component of FM 10 where there are areas of higher fuel loadings due to insect caused or density induced mortality has occurred.

FMs 3, 4, 6, 7, and 11 are not represented in the subwatershed. The following table displays fuel models for the project area. FM 12 is not represented in the existing condition. Average flame lengths for each fuel model are also displayed.

Flame lengths are an indicator of fire intensity and the type of fire attack that can be used on a fire. A flame length less than four feet can be attacked with hand tools, and fire fighters can work close to the flame. Flame lengths of 4 to 8 feet will require heavy equipment, such as bulldozers, and fire size will be larger and more costly to suppress. Flame lengths greater than 8 feet usually require air attack and again the fire size will be larger and more costly to suppress. In short, the probability of suppressing fires at small acreages decreases as flame length increases. Currently, a fire on approximately 39% of the area could be controlled solely by hand crews based only on the predicted flame length displayed in Table F – 2.The surface fuels are often characterized by fuel loading. There are size classes used to measure fuel loadings, 0 to .25 inches, .25 to 1 inches, 1 to 3 inches, and 3 inches and larger. Since most of the area where treatment is proposed with this project is Fire regime 1 or within the warm-dry and hot-dry plant association groups (PAGs), the fuel loading discussion is limited to Fire Regime I areas. The project is only affecting other PAGs to a small degree. For the warm-dry and hot-dry PAGs, a close representative photo to show desired surface fuel conditions is (4–PP–4) from the Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest (May 1980). The photo indicates that the desired surface fuels would have been less than 10 tons per acre with disturbance from the natural fire regime. The 3 inch plus size class of fuels would make up a majority of the loading. Duff accumulations would be fairly low and loading would vary depending on where in the natural fire cycle the area was located.

Table F – 2. Crawford Project Area Fuel Model Summary.

Fuel Model	Acres	% of Area	Average Flame Length
1	1460	8%	5
2	8649	41%	7
5	153	1%	3
8	6696	38%	4
9	828	5%	5
10	1460	8%	5

Table F – 3. Existing Average Tons per Acre by Fuel Size Class.

Fuel Size Class	Average Tons/Acre	Desired Surface Fuel – Tons/Acre
0–.25	0.30	.2
.25–1	0.56	1.2
1–3	0.98	2.3
3+	6.35	4.7
Total	8.19	8.4

The current condition of the average tons per acre indicates surface fuel loads are at the desired condition. However, not taken into account in these averages are, stands identified as FM 2 have a component of FM 10 where there area areas of higher fuel loadings due to insect caused or density induced mortality has occurred. The fuel loading in these areas can be up to 20 tons per acre, with 13 tons per acre in the 3 inch plus size class.

Crown Fire Hazard Indices

Crown fires are generally considered the primary threat to ecological and human values; they occur when surface fires create enough energy to preheat and combust fuels well above the surface (Peterson, 2005). Crown fires are typically faster moving than surface fires, more difficult to suppress, and pose the greatest threat to fire fighter safety from increased fire line intensities and long distance spotting. These risks force an indirect suppression strategy, which increases acres burned, and thus increases fire severity on the landscape, resulting in more tree mortality, and smoke production. Torching and crowning indices are used to measure crown fire hazard. Torching index is the 20 foot wind speed in miles per hour at which a surface fire is expected to ignite the crown layer. Torching index depends on surface fuels, surface fuel moisture, canopy base height, slope steepness, and wind reduction by the canopy. As surface fire intensity increases, or canopy base height decreases, it takes less wind to cause a surface fire to become a crown fire. Crowning index is the 20 foot wind speed needed to support an active or running crown fire. Crowning index depends on canopy bulk density, slope steepness, and surface fuel moisture content. As a stand becomes denser, active crowning occurs at lower wind speeds and the stand is more vulnerable to crown fire (Reinhardt et al. 2003). As stated earlier, slopes within the project area are gentle to moderately steep so slope steepness is not a major component of crowning index.

The current potential for crown fire is displayed in Table F – 4. Approximately 40% of the subwatershed has at least a high potential for crown fire should a fire start.

Table F – 4. Current Crown Fire Potential.

Crown Fire Initiation Potential	% of Mill Creek Subwatershed
Extreme	1%
Very-High	19%
High	20%
Medium	43%
Low	7%

Sixty four percent of the subwatershed consists of plant associations within Fire Regime I. These systems historically had short fire free periods that prevented high fuel loads from accumulating and limited the layers within the stand. The crown fire potential for areas of Fire Regime I would be low under historical conditions. Currently, the amount of area with a high to extreme potential for crown fire is greater than would have occurred historically.

Air Quality

The project area is adjacent to Austin, Bates, and a large high mountain valley with the Middle Fork John Day River draining the surrounding area. The lowest elevation of the valley is at Austin/Bates, where the river flows from the valley to the west. The prevailing winds are from the west and southwest. During the day, diurnal heating forces air up the valley and up the slope out of the valley. During the night, air follows the drainages in the valley towards Austin/Bates. Inversions affect air quality mostly during winter months, but during the rest of the year inversions sometimes develop in the morning hours, but dissipate by noon. There are several homes scattered in the Austin/Bates area that are often affected by smoke from nearby burning.

The Strawberry Mountain Wilderness is a Class I airshed and is located 20 miles to the south-west of the project area. The State has designated all Class I airsheds sensitive to smoke during the visibility protection periods which is defined as the period between July 1st to September 15, during which restrictions on agricultural and forestry burning apply for purposes of visibility protection (OAR 340-200-0040, Section 5.2). At this time, these protection periods have not been set for Class 1 airsheds in Eastern Oregon. State of Oregon monitoring has not shown that visibility has been degraded, therefore, the Strawberry Mountains in the short-term or long-term strategy, have not been listed. Refer to Smoke Management Plan OAR 629-48-001 for regional haze requirements.

Environmental Consequences

Fire suppression and other forest management practices have altered forest types, primarily in the warmer and drier upland forests, resulting in a higher composition of fire intolerant species, more vertical and horizontal tree crown and canopy continuity, and higher levels of surface fuels. Reduced horizontal and vertical forested stand continuity and reduced surface fuel loadings will reduce potential wildfire intensity and severity. The stands proposed for treatment were selected primarily for the silvicultural need and while fuel reduction is accomplished at the same time, not all stands would necessarily show a substantial change in the measures of fuel reduction to address the reduction of fuel hazards used below:

- Percent change in crown fire initiation potential within treatment areas,
- Acres and percent change in areas treated to reduce vertical and horizontal fuel continuity.

Alternative 1 – No Action

Introduction

This alternative does not treat any stands by commercial harvest, precommercial thinning, mechanical fuel treatment, or prescribed fire. Ongoing management practices and activities such as travel management, road maintenance, dispersed recreation, invasive/noxious weed management, fire protection, and livestock grazing would continue within the project area.

This alternative does not treat vertical or horizontal fuel continuity. There would be a 2% increase in the area with a high or greater crown fire potential over the next 50 years (Table F – 7). This may be a small increase, however, currently much of the area has a higher potential for crown fire than would have occurred historically.

Direct and Indirect Effects

If no action is taken, the fuels (surface, ladder, and canopy) in the project area would continue to increase. The potential for a fire to be a stand-replacing wildfire rather than a low-intensity and low severity fire that historically occurred would increase. Fuels, including downed-woody material, needle litter, and duff accumulation would increase from current levels. Fuel ladders caused by live crowns near the ground are common throughout the stands and would remain as places where surface fires can move into the tree crowns. Dense seedlings and saplings would continue to be present at high levels in those stands that have not undergone a recent silvicultural treatment. Areas would remain in their current Condition Class (CC) for a time period but would eventually move into the next higher CC or show a further departure within the same CC.

Large ponderosa pine would continue to be vulnerable to mortality from wildfires due to deep accumulations of duff that has built up around the base of the boles. Forested areas on Douglas-fir and grand fir sites that historically were dominated by ponderosa pine would continue toward their climax vegetation. This would eventually result in a transition from fire resistant ponderosa pine forests to more fire susceptible Douglas-fir and grand fir forests in all except the driest plant communities that can support only ponderosa pines. Conifers would continue to slowly encroach into small meadows in the project area, resulting in an overall loss of dry meadows as an ecosystem component. Native shrubs and other native ground vegetation in the project area are adapted to low severity fire. This vegetation has been adversely impacted by the shading from increased canopy cover and competition from conifers. The absence of fire has resulted in higher levels of surface fuels which would increase the duration and temperature of fire. Increase fire severity due to increased fuel levels, would cause mortality in species that historically re-sprouted or were stimulated by low severity fire.

If a wildfire would occur, many stands would experience a passive crown fire or torching (some crowns burn as individual trees or groups of trees) with high levels of stand mortality (up to 99% of the basal area). In stands within fire regime 1, an uncharacteristic high intensity fire can be expected with passive or active crown fires and spotting. Fire severity is expected to be high with damage to soils and mortality in all size classes of trees (up to 99% of the basal area).

Fire Regimes and Condition Classes

A fire under current conditions would not burn as a low severity surface fire. Fires would be mixed severity to stand replacing with detrimental effects to other resources that did not historically occur.

The vegetation condition is another ecological component that would continue to contribute to the departure from the natural fire regime. Tree densities would continue to increase and species would continue the shift to having higher proportions of shade tolerant, fire susceptible fir. Stand conditions would increase susceptibility to insect and disease effects at levels that are highly departed from the natural fire regime. The Fire Regime Condition Class for the project area would continue to increase showing the increasing departure from the natural fire regime.

Fuel Models and Fuel Loadings

Without treatments to reduce surface fuel loads (prescribed fire and piling and burning) including downed-woody material, needle litter, and duff accumulation would increase from current levels.

Table F – 5. Change in Fuel Model from Existing Condition over 50 years.

Fuel Model	Acres Existing Condition	% of Forested Area – Existing Condition	Acres - in 50 Years	% of Forested Area – in 50 years	% Change
1	1460	8%	1411	7%	–1%
2	8649	41%	3997	22%	–19%
5	153	0%	0	0%	0%
8	6696	38%	1401	7%	–31%
9	828	5%	1049	5%	0%
10	1460	8%	8827	49%	+41%
12	0	0%	1100	6%	+6%

The representation of fuel models across the project area changes over time as does the fuel loading of each fuel model. Most notably are the 41% increase in FM 10 and the 6% increase in FM 12 as displayed in Table F – 5. The increases in these fuel models mean more area with larger size down woody material comprising the surface fuels. This indicates fires would burn with higher intensities and crowning and spotting would occur. The severity on the landscape would increase resulting in high levels of mortality.

As displayed in Table F – 6, the amount of fuels (tons/acre) would increase compared to the existing condition. Fuel loading in each size class would increase and there would be a total increase of approximately 10.5 tons per acre. The 6 to 12 inch trees and 12 inch and large trees that have died would become surface fuels in the next 50 years.

Table F – 6. Change in Average Tons per Acre by Fuel Size Class over 50 years.

Fuel Size Class	Average Tons/Acre Existing Condition	Average Tons/Acre in 50 years	Change over 50 years
0–.25	0.30	0.75	+.45
.25–1	0.56	2.02	+1.46
1–3	0.98	2.37	+1.39
3+	6.35	13.4	+10.76
Total	8.19	18.54	+10.35

These departures from the existing condition models and fuel loadings, describe fires that would burn with high intensity and severity. As surface and ladder fuels increase the stands become more vulnerable to a stand replacement fire. High heat intensity, torching, spotting, and crowning may be expected during wildfire events; resistance to control is high.

Crown Fire Hazard Indices

Over the next 50 years there would be an increase in the amount of area where it is more likely that a surface fire would ignite the crown layer and an increase in the area that becomes more vulnerable to a sustainable crown fire. The amount of area that is at high to extreme potential for crown fire increases 2% over the next 50 years as displayed in Table F – 7 and this potential would characterize 42% of the subwatershed. Change is slow over 50 years as the changes in stand structure and density occur gradually, especially when stands are overstocked. See the vegetation section for more information on stand structure and composition.

Table F – 7. Crown Fire Initiation Potential.

Crown Fire Initiation Potential	Existing Condition – % of subwatershed	In 50 years – % of subwatershed	Change over 50 years
Extreme	1%	5%	+4%
Very – High	19%	15%	–4%
High	20%	22%	+2%
Medium	43%	43%	No change
Low	7%	4%	–3%

Overstocked stands would continue to grow gradually, slowing stand structure change. Stand density would increase and tree vigor would decrease. Late seral species would continue to increase in mixed species stands. Fires would burn as crown fires or with torching (some crowns burn as individual trees or groups of trees) resulting in high levels of stand mortality (up to 99% of the basal area) and damage to soils. Most of the area historically had rather short fire free periods that prevented high fuel loads from accumulating and limited the layers within the stand. Although the change over 50 years is a small percentage change in increased crown fire potential, there is currently and would continue to be in the future much of the area with a higher potential for crown fire than would have occurred historically.

Air Quality

The No Action Alternative would have the least immediate impact on air quality due to no prescribed or pile burning. All biomass does remain available for consumption by wildfires and would continue to accumulate, increasing the potential for large amounts of smoke during the summer months, when diurnal inversions can concentrate smoke at low elevations. Since wildfires tend to occur at the driest time of the year, fuels are more completely consumed and typically produce three to five times more emissions than early or late season prescribed fires. There is potential during a wildfire for approximately 440 pounds per acre of PM 2.5 emissions. These concentrations of smoke can have high particulate levels that can cause health problems or violate summertime Class I air quality visibility standards for wilderness areas. The communities of Austin, Bates, and Unity would be impacted by smoke from a wildfire in this area.

Cumulative Effects

The activities in Appendix D – "Cumulative Activities Considered" have been considered for the incremental impact of this alternative when added to other past, present, and reasonably foreseeable future actions for the cumulative effects on fuels. The area considered for cumulative effects is the Mill Creek Subwatershed and the immediately adjacent subwatersheds.

The past harvest activities as listed in Appendix D have been incorporated into the existing condition. The selective removal of large diameter ponderosa pine in past harvests has contributed to converting the forest to late seral species or to overstocked stands of ponderosa pine that are not as resistant to fire. More recent harvest (since 1990) has largely reduced the stand density and favored the early seral ponderosa pine when possible. This has helped stands become more fire resistant, as they were under historical conditions. Wrac Lodgepole Thinning, as listed in Appendix D, doesn't have a fuels reduction objective and will have little effect on fuels. Ground and crown fuels will be reduced but on a small area (approximately 60 acres) in a location that doesn't have other adjacent treatments. The Wrac Lodgepole area is within a Fire Regime IV (stand replacing), which is not a high priority area for fuel reduction projects. Past grazing reduced fine fuels likely decreasing a fire's rate of spread, flame length, and potential size. Ongoing grazing can also reduce the fine fuels. Fire in an area that has been grazed may have decreased rates of spread and decreased flame lengths.

Alternative 2

Introduction

Most treatment is planned within the hot-dry and warm-dry plant association groups also classified as Fire Regime I. These areas are most in need of restoration to return the forest to a more resilient and sustainable condition. Stands not receiving treatment would have effects similar to those discussed under the No Action Alternative. Crown or canopy fuels and ladder fuels would be treated by commercial harvest treatments and precommercial thinning. Surface fuels would be treated by hand or grapple piling and burning the piles, and/or underburning. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity.

This alternative reduces the horizontal and vertical fuel continuity on more acres than the other alternatives, mechanically treating 2,192 acres and utilizing prescribed fire on approximately 4,800 acres of the 5,300 acres burning perimeter. As a result of the treatments proposed under Alternative 2, there would be an immediate decrease (approximately 6% of the subwatershed) of the area with a high potential for crown fire.

Direct and Indirect Effects

Mechanical thinning (including commercial and precommercial) can be effective in reducing the vertical fuel continuity that contributes to the initiation of crown fires, especially when the thinning removes smaller trees. The net effect of removing ladder fuels is that surface fire burning through treated stands are less likely to ignite the overstory canopy fuels (Graham et al. 2004). Thinning is effective at reducing the probability of crown-fire spread because specific trees are targeted and removed from the fuels bed. In some cases, removing trees from the canopy and understory could conceivably increase surface wind movement and facilitate drying live and dead fuel. Commercial and precommercial thinning should mitigate these factors by reducing the fuel load and potential for fire spread (Peterson et al. 2004). Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to mortality from insect and disease. See the vegetation section for more information on benefits to the residual stands.

Slash created through thinning and existing surface fuels would be treated by one of, or a combination of the following: yarding tops attached, hand piling and burning, and grapple piling and burning. This reduces the surface fuel load that existed prior to thinning as well as fuel loads resulting from the thinning activity. The commercial and precommercial treatments result in a short term increase in surface fuel loading when trees are cut and material is put on the ground. This is a short term increase since thinning will be followed (within approximately 1 – 2 years) by hand piling, grapple piling, or underburning.

The beneficial effects of prescribed fire on altering fuel structure and wildfire behavior and effects have long been observed and reported. Prescribed fire is a useful tool to alter potential fire behavior by influencing multiple fuelbed characteristics, including:

- Reducing loading of fine fuels, duff, large woody fuels, rotten material, shrubs, and other live surface fuels, which together with compactness and continuity change the fuel energy stored on the site and potential spread rate and intensity.
- Reducing the horizontal fuel continuity (shrub, low vegetation, and woody fuel strata), which disrupts growth of surface fires, limits the buildup of intensity, and reduces spot fire ignition probability.
- Increasing compactness of surface fuel components, which retards combustion, rates (Graham et al. 2004).

Prescribed burning often consumes some of the lowest ladder fuels, and kills the lower tree branches, which raise the live crown above the ground surface. Prescribed burning can reduce fire intensity and severity from wildfires (Omi, Martinson 2002, Pollet, Omi, 1999). The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999). Prescribed burning reduces downed woody material and ladder fuels, including removal of some understory trees and increasing the ground to crown distance through scorch. In a study of the effects of low intensity fires on ponderosa pine forests in Zion National Park, the needle/litter fuel load layer was reduced by 54%, duff loading was reduced by 35%, and pole sized trees were reduced by 18% (Bastian 2001). With the reduction in ladder fuels, there would be a reduced probability of a surface fire moving into the crowns.

Large diameter ponderosa pines that have developed a deep accumulation of duff because of the lack of surface fire for many decades area at the greatest risk of sustaining root and root-crown cambial injury when underburned by prescribed fire. Observations that as duff depth increases beneath the tree canopy especially around large diameter trees, the greater likelihood of cambium damage to those trees through basal girdling and damage to roots during prescribed fire (Scott, 2002). Scott (2002) recommendations include some pre-treatment removal or movement of large woody fuel accumulations away from boles of large trees, spring underburning and gradual reduction of duff through a series of burns. The parameters of prescribed fire, including acceptable mortality with this project are described below and in Chapter 2 under the Alternative 2 – Proposed Action section and with elements of Table 2.11 that relate to prescribed burning.

Fire Regimes and Condition Classes

Fire Regime I, a low severity and high frequency regime, comprises approximately 64% of the Mill Creek Subwatershed, most of which is in the project area. Proposed treatments would change vegetation characteristics including stand density, species composition, structural stage, and would change fuel composition and potential fire severity, components relating to change from reference conditions. Mechanical treatment areas that are also being prescribed burned make up approximately 1,200 acres. After completion of all treatments, these stands would be changed to FRCC 1; maintenance burning in these stands would be needed to maintain FRCC 1.

Mechanical treatment of stands not followed by prescribed burning would improve the stand Condition Class but stands wouldn't be considered to be FRCC 1 until prescribed fire is applied. Untreated stands would remain in the existing FRCC and most would depart further from the reference conditions resulting in changes from FRCC 2 to FRCC 3.

At the landscape scale, the appropriate scale at which to evaluate fire regimes and ecological departure for FRCC determination (Hann et al. 2003), the project area moves closer to the reference condition but remains in the same FRCC. Future prescribed burning and as more stands reach old forest structural stages would help move the project area into a FRCC 1.

Fuel Models and Fuel Loadings

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. There are two burning objectives as described below. Within the 5,300 acres, not all acres would be burned and there are different objectives for areas with resource concerns. Burning would be accomplished in the spring and fall seasons when weather and moisture conditions are appropriate and after much of the mechanical work is completed. Multiple prescribed burning entries may be needed to reduce the ladder and surface fuels to reach the desired fuel composition, which has increased beyond historical conditions and allowed for future management of natural ignitions. Ignition would be by hand or would be by ATVs. The prescribed fire perimeter is comprised of roads and all other interior control lines would be primarily roads. An estimated 1.5 miles of hand line may be used as a control line around and adjacent to private lands and to tie road to road.

Prescribed Fire

Prescribed burning – 5,300 acre perimeter which includes:

- Excluding fire from approximately 753 acres
    - 450 acres of DOG (including 03134PW and a portion of 03335PP)
    - 14 aspen sites of approximately 27 acres
    - 11 research plots (approximately 11 acres)
    - 265 acres of RHCA (Category 1 and 4)
- Allowing fire to back into approximately 1,100 acres (RHCAs, non-forested stands)
- Lighting approximately 3,400 acres

Within the 5,300 acre burn boundary, approximately 67% is within the warm-dry plant association group and approximately 9% is within the hot-dry plant association group. This 76%

(warm-dry and hot-dry plant association groups) of the burn area is Fire Regime 1, historically with low intensity, frequent fire. The other stands are within the cold-dry plant association group (approximately 10%), cool-dry plant association group (approximately 3%), and non-forest (approximately 10%). Under this alternative approximately 675 acres would be commercially thinned and 325 acres would be both commercially and precommercially thinned prior to burning.

No more than 3,000 acres would be burned using prescribed fire during any one year. Burning would occur in three pastures (see Table RL – 3. Prescribed Burning Acres by Allotment) and be limited during any one year to one grazing pasture. The recovery of vegetation, including forage production and species diversity, would be monitored after prescribed burning to ensure the areas are ready to support livestock grazing on a sustainable level. These burn operations would be coordinated with the Grazing Permittee and the Range-land Management Specialist administering the affected allotments. Where possible the burning would be fitted to the grazing systems being used on the affected allotments to minimize impacts to the permittee's operations. It is anticipated that after an area is burned, live-stock grazing will resume after a rest period of one full growing season in accordance with the Forest's Post Fire Interim Grazing Guidelines (2003). Following this rest a District IDT will determine if forage recovery and species diversity is sufficient to resume grazing.

During project implementation, underburning will adhere to the Oregon Smoke Management Plan and the State implementation Plan of the Clean Air Act.

General burning objectives

The objectives of utilizing prescribed fire are to reduce surface fuels, reduce litter depth, and increase canopy base height. Prescribed fire is not being utilized to change the structural stage of any the stands. Some tree mortality is expected and acceptable in forested stands. Acceptable mortality ranges are as follows:

- Trees 0 – 5 inch dbh, tree mortality is expected to range from 5 to 15%.
- Trees 5 – 10 inch dbh, tree mortality is expected to range from 5 to 10%.
- Trees 10 – 20+ inches and larger dbh, tree mortality is expected to range from 1 to 5%.

These mortality levels are based on averages over the whole burning area and recognize the fact that fire is a relatively inexact tool and that there would be some localized areas where mortality reaches 100%. Mortality patches should be kept to less than 2 acres wherever possible and preferably to the ¼ to ½ acre size that was thought to exist under historic conditions (Agee, 1993).

Methods used to exclude fire include but are not limited to the use of roads as control lines, fire line construction, or using water to wet-line.

RHCAs, Replacement old-growth (ROG), late and old structure (LOS), and satisfactory cover burning objectives

- RHCAs – approximately 595 acres
  - 122 acres of Category 1
  - 19 acres of Category 2
  - 512 acres of Category 4
- ROG – 340 acres

- Late and old structure – 425 acres
- Satisfactory cover – 135 acre

Within the RHCAs identified to let fire back into, ROGs, late and old structure stands, and satisfactory cover stands, the objective of utilizing prescribed fire is to reduce surface fuels and litter depth. Prescribed fire is not being utilized to change the structural stage or canopy cover of the stands in these identified areas. Some tree mortality is still expected and acceptable in these forested stands but is less than in the general forest. Acceptable mortality ranges are as follows:

- Trees 0 – 10 inch dbh, acceptable tree mortality is up to 5%.
- Trees 10 inches and larger dbh, acceptable tree mortality is up to 2%

Also within the 5,300 acres, lighting would not occur but fire would be allowed to back into approximately 500 acres of non-forested stands and into RHCAs. The non-forested acres typically have minimal fuel loads which are discontinuous and therefore rarely burn. Past district experience has shown that when fire is allowed to back into RHCAs the effects are dependent on the existing vegetation. As soon as vegetative species and moisture regimes within the RHCA change and become more shaded with more moisture and higher humidity, the fire would not burn, so riparian vegetation is rarely affected. Shrubs and conifers providing streamside shade and riparian vegetation are rarely affected because they do not burn with enough intensity to cause mortality.

Approximately 340 acres of ROG are within the 5,300 acres. Prescribed fire in this area would also minimize loss of snags and large down wood.

Approximately 425 acres of late and old structure (LOS) are within the 5,300 acres and not within the DOG. Methods to protect large trees can include raking the litter and bark accumulation away from the base of the tree, not burning areas where concentrations of large trees exist, and burning when duff moistures under the larger trees is 120% or greater which has been determined to not cause damage to the base of the tree (Scott, 2002).

Approximately 135 acres providing satisfactory cover are within the 5,300 acres. Much of the identified satisfactory cover is also LOS. Underburning in these areas would retain multi-storied stand characteristics and high canopy closures. After implementation, these areas would still meet the requirements of satisfactory cover. Emphasis would be placed on minimizing understory tree mortality since the understory is currently providing big game security cover. If moisture conditions or other burn parameters for meeting the acceptable mortality limits can not be met in any given year, the burn boss may decide to exclude fire from these 135 acres. This is acceptable, although surface fuels will not be reduced in these stands.

The RHCAs where fire is allowed to back in are comprised of; in general, conditions are similar to the upland vegetation within most of the RHCA to the point of the green line where riparian vegetation is present. Past district experience has shown that when fire is allowed to back into RHCAs the effects are dependent on the existing vegetation. Where the vegetation is the same as the uplands, the effects of prescribed fire will be similar to that of the uplands. This includes reduced surface fuel loading, increased crown base height, and broken-up continuity of surface fuels. As soon as vegetative species and moisture regimes within the RHCA change and become more shaded with more moisture and higher humidity, the fire would not burn, so riparian vegetation is rarely affected. Shrubs and conifers providing streamside shade and riparian vegetation are rarely affected because they do not burn with enough intensity to cause mortality.

Thinning (commercial and precommercial) and treating slash (when a method other than prescribed fire is proposed) allows implementation of prescribed fire to occur under drier conditions while staying within the acceptable mortality ranges described above. Prescribed burning with an average flame length of 1 to 3 feet can reduce surface fuel loadings to desirable levels. There are desirable direct effects resulting from prescribed burning including decreased surface loadings and increased canopy base heights. These results are sustained for variable lengths of time. Other treatments that reduce surface fuel loading proposed under this alternative include hand piling, grapple piling and burning of all piles. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Treatments of the proposed action roughly maintain the current condition of acres of each Fuel Model as displayed in Table F – 8, but decrease the overall fuel loading as displayed in Table F – 9.

With the treatments that reduce surface fuels (prescribed fire, piling, and burning the piles) there is an approximate 4 tons per acre decrease from the existing condition. As one of the primary stand attributes that control fire behavior is surface fuel condition, the reduced fuel loadings would contribute to less wildfire intensity and severity.

Table F – 8. Alternative 2 – Acres of Fuel Models after Treatments.

Fuel Model	Acres	% of Forested Area Existing Condition	Acres	% of Forested Area After Treatment
1	1460	8%	1412	7%
2	8649	41%	7729	43%
5	153	1%	757	4%
8	6696	38%	5975	33%
9	828	5%	505	2%
10	1460	8%	1413	7%

Table F – 9. Alternative 2 – Change in Average Tons per Acre by Fuel Size Class.

Fuel Size Class	Average Tons/Acre – Existing Condition	Average Tons/Acre – After Treatment	Change
0–.25	.3	0.15	–.15
.25–1	.56	0.34	–.22
1–3	.98	0.59	–.39
3+	6.35	3.02	–3.33
Total	8.19	4.10	–4.09

Crown Fire Hazard Indices

Commercial and precommercial thinning overstocked stands would reduce ladder fuels, increase the average distance between the ground and the crown, and increase the distance between the crowns. Created slash and existing surface fuels would be treated by one of or a combination of the following: yarding tops attached, hand piling and burning, grapple piling and burning, and through the application of understory prescribed fire. These treatments reduce the surface fuel load. Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to natural disturbance from insects and disease. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased. See vegetation section for additional effects on composition and density, and structural stages.

As a result of the treatments in Alternative 2, there is an immediate decrease of approximately 6% of the subwatershed with at least a high potential for crown fire.

In order to compare the differences between the action alternatives, the crown fire initiation potential for the area proposed for treatment, mechanical and prescribed burning is displayed. This is displayed as a percentage of approximate 5,700 acres of treatment (4,800 of burning including the harvest and 900 acres of harvest outside the burn boundary). The alternatives can then be compared using the acres proposed with Alternative 2. The existing condition is also displayed in Table F – 10.

Table F – 10. Alternative 2 – Crown Fire Initiation Potential.

Crown Fire Initiation Potential	Existing Condition (percent)	% After Treatment	% Change
Extreme	1%	0%	–1%
Very-High	17%	2%	–15%
High	19%	7%	–12%
Medium	49%	50%	+1%
Low	14%	41%	+27%

Note - Existing Condition displays Crown Fire Initiation Potential percent of the 5,700 acres that are proposed for treatment in Alternative 2. Existing Condition in Table F – 7 displays percent of the subwatershed.

Within the stands proposed for treatment, canopy base height (an important measure of crown fire potential) is substantially changed. Units that are being mechanically treated (2,195 acres) have an average increase of 15 feet in crown base height. Treatment of these stands would also result in a decrease in crown bulk densities and the amount of tree crowns over an area. The resultant crown bulk densities would be sufficiently lowered so even if surface flame length were high enough to reach the crown; fire wouldn't spread in a stand replacing type of crown fire.

Reducing the stand density would encourage natural regeneration to occur in the thinned stands. Observations show that when stand densities are below 50 ft^2/acre basal area, ponderosa pine regenerates quite readily and can form another understory. Periodic prescribed fire would be needed to maintain lower levels of surface fuels, limit regeneration and ladder fuels. Stands not treated, would have effects as discussed under the No Action Alternative which results in an increase in the areas of high to extreme crown fire potential.

This alternative treats more stands and results in more fuel reduction than the other alternatives. It increases forest resiliency to disturbance by fire, insects, and disease more than the other alternatives. Within the treated area the potential for high severity fire would be decreased. Although Alternative 2 treats the most acres, it only mechanically treats approximately 14% of the forested acres within the subwatershed

Air Quality

Approximately 100 – 140 lbs/acre of PM 2.5 emissions and 120 – 180 lbs/acre of PM 10 emissions are produced from prescribed burning. Approximately 21 – 42 lbs/acre of PM 2.5 emissions and 24 – 46 lbs/acre of PM 10 emissions are produced from hand piles and grapple piling. Alternative 2 would produce more smoke from pile burning than the other alternatives as it treats more acres. Under Alternative 2, 1,050 acres of pile burning would occur. Alternative 2 would also create more landing piles to be burned, again because more acres are being treated. Approximately the same amount of smoke would be produced from prescribed burning under this alternative as the other action alternatives. The first entry of prescribed burning would be scheduled for spring when fuel moisture conditions are generally higher which reduces emissions when compared to fall burning or summer wildfires. Pile burning generally occurs in the late fall and early winter when moisture conditions allow minimal to no spread outside the pile area. The emissions from pile burning are during a different time of year than the underburning with this project.

The communities of Austin and Bates and surrounding residences would be impacted by smoke from any prescribed burning proposed with this alternative. Past experience of prescribed burning in this area has shown that diurnal winds settle smoke in low areas and valley bottoms. The lowest elevation of the valley is at Austin/Bates, where the river flows from the valley to the west. During the night, air follows the drainages in the valley towards Austin/Bates. During the day, diurnal heating forces air up the valley and up the slope out of the valley.

Prescribed burning would also likely impact highway visibility and potentially impact driver's safety. Signing has proven to reduce this risk during the impacted times of the burn which is typically 3 to 4 days. However, if driving conditions worsen, ODOT can be contracted to flag traffic or use pilot car drivers to control traffic.

Smoke sensitive areas, (see Affected Environment, Air Quality for more explanation of smoke sensitive areas) the La Grande Basin (approximately 45 air miles to the northeast of the project area) and the north half of Ada County, Idaho (approximately 150 air miles southeast of the project area) would not be affected by prescribed burning proposed with Alternative 2. The Strawberry Mountain Wilderness would also not be affected by prescribed burning proposed with Alternative 2 during the visibility protection periods from July 1st to September 1

Cumulative Effects

The activities in Appendix D – "Cumulative Activities Considered" are considered in the incremental impact of the actions proposed under this alternative. The cumulative effects of past activities and ongoing actions are described under Alternative 1 – the No Action Alternative.

With the planned mechanical and prescribed fire treatments, the risk of large-scale disturbances to forested stands would be reduced. Prescribed fire occurring under this alternative would reduce the ground and ladder fuels in the project area. A maintenance burning program would be needed when desired fuel loadings were met to maintain those fuel loadings. Disturbances within treated stands are expected to reduce in intensity and duration, as a result of reduced surface, ladder, and canopy fuels. Foreseeable future actions are anticipated to reduce the potential for crown fires and increase the overall resiliency of the forest, especially those activities planned in nearby subwatersheds. By creating large blocks of land with a matrix of treatments, the risk of large-scale disturbances would be reduced over the landscape.

Wrac Lodgepole Thinning, as listed in Appendix D, doesn't have a fuels reduction objective and will have little effect on fuels. Ground and crown fuels will be reduced but on a small area (approximately 60 acres) in a location that doesn't have other adjacent treatments. The Wrac Lodgepole area is within a Fire Regime IV (stand replacing), which is not a high priority area for fuel reduction projects.

Past grazing reduced fine fuels likely decreasing a fire's rate of spread, flame length, and potential size. Ongoing grazing can also reduce the fine fuels. Fire in an area that has been grazed may have decreased rates of spread and decreased flame lengths.

Personal use firewood would have an incidental increase in slash fuels associated with any bole wood removal which will not affect overall potential fire hazard.

The present and ongoing actions listed in Appendix D – "Cumulative Activities Considered" are expected to have minimal cumulative effects on air quality. Any burning of fuels on private land would potentially add to the emission amounts described above but would only increase the amounts slightly. Pile burning that would occur within the area, either of federal or private land, generally happens in the late fall and early winter when moisture conditions don't allow spread outside from the pile area. These pile burns result in low emission levels and are during a different time of year than the underburning with this project.

Alternative 3

Introduction

This alternative reduces the horizontal and vertical fuel continuity by mechanically treating 1,506 acres and utilizing prescribed fire on up to approximately 4,800 acres of the 5,300 acre burning perimeter. When compared to Alternative 2, Alternative 3 commercially treats approximately 686 fewer acres (or 33% less area) of overstocked timber stands including the 119 acres of shelterwood harvest. This alternative also precommercially thins 269 fewer acres than Alternative 2.

Treatments under Alternative 3 would have a 19% decrease in area with at least a high crown fire initiation potential compared to the treatments under Alternative 2 which would have a 28% decrease.

Direct and Indirect Effects

The beneficial effects of prescribed fire and mechanical treatment are the same as discussed under Alternative 2. Stands that are not treated would be subject to the same effects as discussed for the No Action Alternative.

Fire Regimes and Condition Classes

The proposed acres treated are less than those of Alternative 2, but the treatments would change vegetation characteristics including stand density, species composition, structural stage, and would change fuel composition and potential fire severity components relating to change from reference conditions. Mechanical treatment that also being prescribed burned would occur on approximately 960 acres. After completion of all treatments, these stands would be changed to Condition Class 1; maintenance burning in these stands would be needed to maintain them in this class.

Mechanical treatments of stands not followed by prescribed burning would improve the stand Condition Class but stands wouldn't be considered to be FRCC1 until prescribed fire is applied. Untreated stands would remain in the existing FRCC and most would depart further from the reference condition resulting in changes from FRCC 2 to FRCC 3.

At the landscape scale, the appropriate scale at which to evaluate fire regimes and ecological departure for FRCC determination (Hann et al. 2003), the project area moves closer to the reference condition but remains in the same Condition Class. The move closer to the reference condition compared to Alternative 2 is reduced due to fewer acres being treated.

Fuel Models and Fuel Loadings

The prescribed burning design would be the same as discussed in Alternative 2. The effect of treatments to reduce surface fuels, prescribed fire, and piling and burning are the same as discussed in Alternative 2, but with fewer acres. Under this alternative approximately 415 acres would be commercially thinned and 310 acres would be both commercially and precommercially thinned prior to burning. Compared to Alternative 2, there are approximately 260 fewer acres of commercial thinning and 15 fewer acres of both commercial and precommercial thinning.

There would also be approximately 280 acres less of piling (hand or grapple) and burning piles prior to burning, compared to Alternative 2. There are also approximately 230 acres less of yarding tops attached due to less harvest under this alternative. Burning that occurs within the acres not being thinned under Alternative 3 may result in higher mortality than if they had been thinned as under Alternative 2 but because the difference in acres are primarily commercial thinning that doesn't need precommercial thinning the effects of burning between the Alternatives 2 and 3 would very similar. The mortality would still be within the acceptable range as burning would occur under conditions that would meet these ranges.

Crown Fire Hazard Indices

Commercial and precommercial thinning in overstocked stands proposed with this alternative reduce the ladder fuels, increase the average distance between the ground and the crowns of the trees, and increase the distance between the crowns. Created slash and existing surface fuels would be treated by one of or a combination of the following: yarding tops attached, hand piling and burning, grapple piling and burning, and through the application of understory prescribed fire. These treatments would reduce the surface fuel load. Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to disturbance from insects and disease. Observations by Cram (2006) show that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased. See the vegetation section for additional effects on composition and density, and structural stages.

In order to compare the differences between the action alternatives, the crown fire initiation potential for the area proposed for treatment, mechanical and prescribed burning is displayed in Table F – 11. This is displayed as a percentage of approximate 5,700 acres of treatment (4,800 of burning, including the harvest and 900 acres of harvest outside the burn boundary). The alternatives can then be compared using the acres proposed with Alternative 2. Treatments under Alternative 3 would have a 19% decrease in area with at least a high crown fire initiation potential compared to the existing condition while the treatments under Alternative 2 would have a 28% decrease.

Within stands that are treated, canopy base height, (an important measure of crown fire potential) is substantially changed. Units that are being mechanically treated (1,506 acres, 33% less than Alternative 2) have an average increase of 15 feet in crown base height. In these units, the crown base height would be maintained at sufficient height from frequent fires that only occasional torching may occur. Treating these stands also decreases crown bulk densities, the amount of tree crowns over an area. The resultant crown bulk densities would be sufficiently low that even if surface flame length were high enough to reach the crown, fire wouldn't spread in a stand replacing type of crown fire.

Over the next 50 years, periodic burning would be needed to maintain lower levels of surface fuels and limit regeneration. The effects on stands that are not mechanically treated would be similar to those discussed under the No Action Alternative and would result in an increase in the areas of high and extreme crown fire potential.

Table F – 11. Alternative 3 – Crown Fire Initiation Potential.

Crown Fire Initiation Potential	Existing Condition (percent)	% After Treatment	% Change
Extreme	1%	0%	-1%
Very-High	17%	6%	-9%
High	19%	10%	-9%
Medium	49%	50%	+1%
Low	14%	34%	+20%

Note - Existing Condition displays Crown Fire Initiation Potential percent of the 5,700 acres that are proposed for treatment in Alternative 2. Existing Condition in Table F – 7 displays percent of the subwatershed.

Air Quality

Approximately 100 – 140 lbs/acre of PM 2.5 emissions and 120 – 180 lbs/acre of PM 10 emissions are produced from prescribed burning. Approximately 21 – 42 lbs/acre of PM 2.5 emissions and 24 – 46 lbs/acre of PM 10 emissions are produced from hand piles and grapple piling. Alternative 3 would produce less smoke from pile burning than Alternative 2 as approximately 280 acres less would be piled. Under Alternative 3, approximately 770 acres of pile burning would occur. Alternative 3 would create fewer landing piles that would be burned, again since more acres would be treated, compared to Alternative 2. Approximately the same amount of smoke would be produced from prescribed burning under all the alternatives. The first entry of prescribed burning would be scheduled for spring when fuel moisture conditions are generally higher which reduces emissions compared to fall burning or wildfires in the summer. Pile burning generally occurs in the late fall and early winter when moisture conditions allow minimal to no spread of fire outside the pile area. The emissions from pile burning are during a different time of year than the underburning with this project.

The communities of Austin and Bates and surrounding residences would be impacted by smoke from any prescribed burning proposed with this alternative. Past experience of prescribed burning in this area has shown that diurnal winds settle smoke in low areas and valley bottoms. The lowest elevation of the valley is at Austin/Bates, where the river flows from the valley to the west. During the night, air follows the drainages in the valley towards Austin/Bates. During the day, diurnal heating forces air up the valley and up the slope out of the valley.

Prescribed burning would also likely impact highway visibility and potentially impact driver's safety. Signing has proven to reduce this risk during the impacted times of the burn which is typically 3 to 4 days. However, if driving conditions worsen, ODOT can be contracted to flag traffic or use pilot car drivers to control traffic.

Smoke sensitive areas, (see Affected Environment, Air Quality for more explanation of smoke sensitive areas) the La Grande Basin (approximately 45 air miles to the northeast of the project area) and the north half of Ada County, Idaho (approximately 150 air miles southeast of the project area) would not be affected by prescribed burning proposed with Alternative 3. The Strawberry Mountain Wilderness would also not be affected by prescribed burning proposed with Alternative 3 during the visibility protection periods from July 1st to September 1.

Cumulative Effects

The activities in Appendix D – “Cumulative Activities Considered” are considered in the incremental impact of the actions proposed under this alternative when added to other past, present, and reasonably foreseeable future actions. The cumulative effects of past activities and ongoing actions are as described under Alternative 1 – the No Action Alternative.

The planned mechanical and prescribed fire treatments would reduce the risk of large-scale disturbances to forested stands but less than in Alternative 2. The prescribed fire occurring with this alternative would reduce the ground and ladder fuels in the project area. A maintenance burning program would be needed when desired fuel loadings were met to maintain those fuel loadings. Disturbances within treated stands are expected to reduce in intensity and duration, as a result of reduced surface, ladder, and canopy fuels. Foreseeable future actions are anticipated to reduce the potential for crown fires and increase the overall resiliency of the forest, especially those activities planned in nearby subwatersheds. Compared to Alternative 2, the reduced amount of treatment in Alternative 3 would leave a larger proportion of forested stands at risk to large scale disturbances, increasing the risk to forested areas outside the project area.

Wrac Lodgepole Thinning, as listed in Appendix D, doesn’t have a fuels reduction objective and will have little effect on fuels. Ground and crown fuels will be reduced but on a small area (approximately 60 acres) in a location that doesn’t have other adjacent treatments. The Wrac Lodgepole area is within a Fire Regime IV (stand replacing), which is not a high priority area for fuel reduction projects.

Past grazing reduced fine fuels likely decreasing a fire’s rate of spread, flame length, and potential size. Ongoing grazing can also reduce the fine fuels. Fire in an area that has been grazed may have decreased rates of spread and decreased flame lengths.

Personal use firewood would have an incidental increase in slash fuels associated with any bole wood removal which will not affect overall potential fire hazard.

Alternative 4

Introduction

This alternative proposes no commercial timber harvest and treats the lowest number of stands identified as needing treatment, to meet the desired condition. There are 795 acres of precommercial thinning and the acres of prescribed burning remain the same as in Alternative 2. When compared to Alternative 2, Alternative 4 treats approximately 1,400 fewer acres of overstocked forested stands. When compared to Alternative 3, this alternative treats approximately 710 fewer acres. In addition to fewer acres being treated, precommercial thinning is expected to be much less effective than a commercial entry followed by precommercial treatments, as proposed under Alternatives 2 and 3, at reducing horizontal and vertical fuel continuity.

Treatments under Alternative 4 would have a 19% decrease in area with at least a high crown fire initiation potential compared to the treatments under Alternative 2 which would have a 28% decrease.

Direct and Indirect Effects

Precommercial thinning would reduce ladder fuels to some degree but would not open the canopy to increase the distance between tree crowns. Although the beneficial effects of prescribed fire are the same as discussed in Alternative 2, Alternative 4 thins fewer acres mechanically prior to burning and, in stands being thinned prior to burning; only precommercial thinning is occurring. This changes the parameters under which burning would occur to meet the acceptable tree mortality ranges (see the description under Fuel Models and Fuel Loading in Alternative 2).

Fire Regimes and Condition Classes

This alternative does the least to improve Condition Class. Precommercial thinning only partially changes vegetation characteristics including stand density and species composition. Thinned stands are only expected to marginally respond to the thinning as the stands would still be in an overstocked condition with the stand basal area only slightly reduced. Structural stage would not change. After completion of the mechanical treatment, which is also being prescribed burned on the 318 proposed acres, the stands will not change to a FRCC 1 as under Alternatives 2 and 3 since the stands would still be overstocked and structural stages would not change. Pre-commercial thinning of stands not followed by prescribed burning (approximately 475 acres) will slightly improve the stand Condition Class. Untreated stands would remain in the existing FRCC and most, however, would depart further from the reference condition resulting in changes from FRCC 2 to FRCC 3.

At the landscape scale, the appropriate scale at which to evaluate fire regimes and ecological departure for FRCC determination (Hann et al. 2003), Alternative 4 does the least to improve FRCC. The move closer to the reference condition compared to Alternative 2 is reduced due to fewer acres being treated and Alternative 3 since there is no commercial removal proposed to reduce stand density and change structural stages.

Fuel Models and Fuel Loadings

The prescribed burning design would be the same as discussed in Alternative 2.

Since Alternative 4 only precommercial thins stands identified for commercial and precommercial thinning, canopy fuels are not reduced under this alternative. In addition, as stated in the vegetation section, the thinned stands are only expected to marginally respond to the thinning as the stands would still be in an overstocked condition with the stand basal area only slightly reduced. Because of the higher tree density over more of the prescribed burn area, when compared to Alternatives 2 and 3, burning would occur under wetter conditions. If burning occurs under wetter conditions to keep within the acceptable mortality ranges, the surface fuel loadings won’t be reduced as much with the first entry. It is more likely to take an additional burn entry to reduce the surface loading as fuels with higher moisture content will not consume completely.

This alternative treats the least number of stands, identified as needing treatment to meet the desired condition, than the other action alternatives. This is a decrease of approximately 60% from the area proposed to be treated by Alternative 2, plus precommercial thinning is expected to be less effective than the commercial entries proposed for Alternative 2, for improving forest resiliency and sustainability, as only trees less than 9 inches dbh would be cut. The stands not treated would have the same effects as discussed under the No Action Alternative.

This alternative is the farthest from meeting the desired condition for a sustainable forest of the action alternatives. It thins the least amount of stands to the desired density.

The effect of treatments to reduce surface fuels, prescribed fire and piling, and burning are the same as discussed in Alternative 2, but with fewer acres. Approximately 975 acres less than Alternative 2 and 640 acres less than Alternative 3 are proposed to be thinned prior to burning. Some 250 acres less of piling (hand or grapple) and burning are proposed compared to Alternative 2 and approximately the same acres as Alternative 3. There are no acres of yarding tops attached proposed due to no harvest under this alternative.

Crown Fire Hazard Indices

Precommercial thinning in overstocked stands would reduce ladder fuels and increase the average distance between the ground and the crowns of the trees. Thinning slash and existing surface fuels would be treated by one of, or a combination of the following: hand piling and burning, grapple piling and burning, and through the application of understory prescribed fire. These treatments would reduce the surface fuel load. See the vegetation section for additional effects on composition and density, and structural stages.

In order to compare the differences between the action alternatives, the crown fire initiation potential for the area proposed for treatment, mechanical and prescribed burning is displayed in Table F – 12. This is displayed as a percentage of approximate 5,700 acres of treatment (4,800 of burning including the harvest and 900 acres of harvest outside the burn boundary). The alternatives can then be compared using the acres proposed with Alternative 2.

Treatments under Alternative 4 would have a 13% decrease in area with at least a high crown fire initiation potential compared to the existing condition while the treatments under Alternative 2 would have a 28% decrease and under Alternative 3, a 19% decrease.

Within stands that are treated, units that are being mechanically treated (795 acres, 1,400 acres less than Alternative 2 and 710 acres less than Alternative 3) canopy base height, changes but less than under Alternatives 2 and 3 with an average increase of 5 feet.

Table F – 12. Alternative 4 Crown Fire Initiation Potential.

Crown Fire Potential Code	Existing Condition	% After Treatment	% Change
Extreme	1%	1%	0%
Very-High	17%	8%	-9%
High	19%	15%	-4%
Medium	49%	55%	+6%
Low	14%	21%	+7%

Note - Existing Condition displays Crown Fire Initiation Potential percent of the 5,700 acres that are proposed for treatment in Alternative 2. Existing Condition in Table F – 7 displays percent of the subwatershed.

Over the next 50 years, periodic fire would maintain lower levels of surface fuels and limit regeneration. Stands that are not mechanically treated would have effects similar to those described under the No Action Alternative. Stands that are not treated would increase the areas of high and extreme crown fire potential. Removing the understory would facilitate the reintroduction of fire into these stands resulting in a slight shift towards historical conditions.

Air Quality

Approximately 100 – 140 lbs/acre of PM 2.5 emissions and 120 – 180 lbs/acre of PM 10 emissions are produced from prescribed burning. Approximately 21 – 42 lbs/acre of PM 2.5 emissions and 24 – 46 lbs/acre of PM 10 emissions are produced from hand piles and grapple piling. Alternative 4 would produce less smoke from pile burning than Alternative 2 or

Alternative 3 as fewer acres are being piled and/or only the precommercial created material would be piled. Alternatives 2 and 3 would treat some of the slash created during the commercial harvest as well as the subsequent slash created during the precommercial entry. Under Alternative 4, approximately 790 acres of pile burning would occur while Alternative 2 proposes 1,050 acres and Alternative 3 proposes 770 acres. Alternative 4 would not create any landing piles that would be burned. Approximately the same amount of smoke would be produced from prescribed burning under each alternative. The first entry of prescribed burning would be scheduled for spring when fuel moisture conditions are generally higher, which reduces emissions when compared to fall burning or wildfires in the summer. Pile burning generally occurs in the late fall and early winter when moisture conditions allow minimal to no spread of fire outside of the pile area. The emissions from pile burning occur at a different time of year than the underburning. More biomass would be available during a wildfire under Alternative 4, as it treats the least acres.

The communities of Austin and Bates and surrounding residences would be impacted by smoke from any prescribed burning proposed with this alternative. Past experience of prescribed burning in this area has shown that diurnal winds settle smoke in low areas and valley bottoms. The lowest elevation of the valley is at Austin/Bates, where the river flows from the valley to the west. During the night, air follows the drainages in the valley towards Austin/Bates. During the day, diurnal heating forces air up the valley and up the slope out of the valley.

Prescribed burning would also likely impact highway visibility and potentially impact driver's safety. Signing has proven to reduce this risk during the impacted times of the burn which is typically 3 to 4 days. However, if driving conditions worsen, ODOT can be contracted to flag traffic or use pilot car drivers to control traffic.

Smoke sensitive areas, (see Affected Environment, Air Quality for more explanation of smoke sensitive areas) the La Grande Basin (approximately 45 air miles to the northeast of the project area) and the north half of Ada County, Idaho (approximately 150 air miles southeast of the project area) would not be affected by prescribed burning proposed with Alternative 4. The Strawberry Mountain Wilderness would also not be affected by prescribed burning proposed with Alternative 4 during the visibility protection periods from July 1st to September 1.

Cumulative Effects

The activities in Appendix D – "Cumulative Activities Considered" are incorporated into the incremental impact of the actions of this alternative to determine the cumulative effects on fuels. Cumulative effects of past activities and ongoing actions are as described under Alternative 1 – No Action. The fire hazard would remain relatively high to large-scale disturbances and could affect adjacent subwatersheds since this alternative proposes to mechanically treat the fewest acres.

Wrac Lodgepole Thinning, as listed in Appendix D, doesn't have a fuels reduction objective and will have little effect on fuels. Ground and crown fuels will be reduced but on a small area (approximately 60 acres) in a location that doesn't have other adjacent treatments. The Wrac Lodgepole area is within a Fire Regime IV (stand replacing), which is not a high priority area for fuel reduction projects.

Past grazing reduced fine fuels likely decreasing a fire's rate of spread, flame length, and potential size. Ongoing grazing can also reduce the fine fuels. Fire in an area that has been grazed may have decreased rates of spread and decreased flame lengths.

Personal use firewood would have an incidental increase in slash fuels associated with any bole wood removal which will not affect overall potential fire hazard.

The present and ongoing actions listed in Appendix D – "Cumulative Activities Considered" is expected to have minimal cumulative effects on air quality. Any burning of fuels on private land would potentially add to the emission amounts described above but would only increase the amounts slightly. Pile burning that would occur within the area, either of federal or private land, generally happens in the late fall and early winter when moisture conditions don't allow spread outside from the pile area. These pile burns result in low emission levels and are during a different time of year than the underburning with this project.

Consistency with Direction and Regulations

Forest Plan

The No Action Alternative does not meet the Forest Plan direction to: 1) Initiate initial management actions that provide for the most reasonable probability of minimizing fire suppression costs and resource damage, consistent with probable fire behavior, resource impacts, safety, and smoke management and 2) Identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction (Forest Plan IV– 4). The No Action Alternative also does not meet forest-wide direction to manage residue profiles at a level that will minimize the potential of high intensity wildfire and provide for other resources (Forest Plan IV – 44).

Alternative 2 includes 2,192 acres of commercial harvest, 935 acres of precommercial thinning, and prescribed fire within a 5,300 acre perimeter. Alternative 3 includes 1,506 acres of commercial harvest, 666 acres of precommercial thinning, and prescribed fire within a 5,300 acre perimeter. Alternative 2, by treating the most acres mechanically followed by the use of prescribed fire best meets the purpose to promote a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands, the purpose to reduce the fire fuels by primarily reducing density of standing vegetation, surface fuels, and fuel ladders, and the Forest Plan direction as described above.

Alternative 4 includes 795 acres of precommercial thinning and prescribed fire within a 5,300 acre perimeter. The burning would have to occur under wetter conditions and the surface fuel loadings wouldn't be reduced as much compared to the other action alternatives. This alternative does the least to meet the purpose to promote a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands, the purpose to reduce the fire fuels by primarily reducing density of standing vegetation, surface fuels, and fuel ladders, and the Forest Plan direction as described above of the action alternatives.

National Fire Plan

Alternative 1 is not responsive to the National Fire Plan. Alternatives 2, 3, and 4 are responsive to the National Fire Plan in moving towards restoring natural ecological systems to minimize uncharacteristically intense fires.

Air Quality Laws and Regulations

In compliance with the Clean Air Act and the Oregon State Smoke Management Plan, burning of any kind would not occur unless prior approval is granted by Oregon Department of Forestry.

All amounts of PM10 and PM2.5 emissions would be calculated using the CONSUME software in the SmokeTracs reporting system, which is also submitted with planned burn operations to the Oregon Department of Forestry to determine compliance with the Clean Air Act. • All burning would occur outside visibility-protection periods set for Central Oregon of July 1 to September 15. Burning would be planned for times when transport winds are sufficient to displace much of the smoke from the area.

All action alternatives propose to prescribe burn the same number of acres so are equally responsive to the Clean Air Act and the Oregon State Smoke Management Plan with respect to prescribed burning. Alternative 2 would produce more smoke from pile burning than the other action alternatives followed by Alternative 3 then Alternative 4 but all are responsive to the Clean Air Act and the Oregon State Management Plant. The emissions from pile burning are during a different time of year than the underburning with this project. No action alternative would have the least immediate impact on air quality due to no prescribed or pile burning. All biomass does remain available for consumption by wildfires and would continue to accumulate, increasing the potential for large amounts of smoke during the summer months with high particulate levels that can cause health problems or violate standards.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from implementing the alternatives with respect to fire and fuels.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives can be found in the Fire and Fuels Specialist Report located in the project record.

Soil

Regulatory Framework

The Malheur Forest Plan meets all legal and regulatory requirements for soil conservation. Forest Service Manual R6 Supplement No. 2500.98 – 1, section 2520.2 states the objectives of soil management are "To meet direction in the National Forest Management Act of 1976 and other legal mandates. To manage National Forest System lands ... without permanent impairment of land productivity and to maintain ... soil ... quality. .... Soil quality is maintained when soil compaction, displacement puddling, burning, erosion, loss of organic matter, and altered soil moisture regimes are maintained within defined standards and guidelines." Therefore, if an action maintains detrimental impacts within the standards and guidelines of the Forest Plan, legal requirements for soil conservation would be met.

Forest-Wide Standards

101. Harvest timber from slopes which are less than 35% using ground skidding equipment and from slopes greater than 35% using cable or aerial systems. Approve exceptions through the environmental analysis process, which will include a logging feasibility analysis (Forest Plan, pg IV – 37).

125. Evaluate the potential for soil displacement, compaction, puddling, mass wasting, and surface soil erosion for all ground-disturbing activities (Forest Plan, pg IV – 40).

126. The total acreage of all detrimental soil conditions shall not exceed 20% of the total acreage within any activity area, including landing and system roads. Consider restoration treatments if detrimental conditions are present on 20% or more of the activity area. Detrimental soil conditions include compaction, puddling, displacement, and severely burned soil, and surface erosion (Forest Plan, pg IV – 40).

127. Minimum percent effective ground cover following land management activities (Forest Plan, pg IV – 40):

Table S – 1. Malheur Plan Effective Ground Cover Standards.

Soil Erodibility	First Year %	Second Year %
Very High	60 to 75	75 to 90
High	50 to 60	65 to 75
Moderate to High	45	60
Moderate	38	50
Low to Moderate	30	40
Low	20	30

128. Seed all disturbed soil that occurs within 100 – 200 feet of a stream or areas farther than 200 feet that could erode into a stream (Forest Plan, IV – 40).

129. Seed all skid trails with slopes greater than 20% (Forest Plan, IV – 40).

Analysis Methods

The project soils specialist trained a technician to collect data on the existing condition of soils on all units where harvest is proposed. The technician collected data about detrimental impacts on transects in all stands. These assessments reveal all impacts from past and ongoing activities, including timber harvest, landings, roads, livestock grazing, fuel treatments, and off-highway vehicles (OHVs). In addition, they reveal if any special design measures are needed during logging. The field sheets documenting survey transects are in the project record.

The project soils specialist formed professional judgments on the probable effects based on monitoring, personal observation (including observation in similar areas), scientific literature, the Forest Plan Environmental Impact Statement, and professional contacts. These professional judgments are summarized in the "Quantitative Logging Effects on Detrimental Soil Conditions" part of soils report in the project record. However, the quantitative effects cannot be precisely predicted. Soil science is not advanced enough to make precise predictions. In addition, effects of management depend on unknowns, such as weather, details of implementation, and whether a wildfire will occur.

Spatial boundaries for soil effects (including cumulative effects) are proposed unit boundaries. Unless otherwise stated, effects are described for the time period immediately after the proposed actions, when effects are at a maximum.

Affected Environment

Soil Series

The area was surveyed for an Ecological Unit Inventory (EUI) about 1995 – 2003. The EUI is not in final form, but much of the information is available, although it is preliminary and subject to change. See Appendix B for the EUI Soils Map for the area where harvest would occur. The amount of each soil type can be gauged from this map. Table S – 2 shows the soil types found in the area. Soil hazard ratings for surface erosion, compaction, displacement, puddling, and stability are in soils report in the project record. All of these soils, excluding Lemonex, formed on basaltic parent material. Bennett Creek formed from andesitic tuff and breccia as well as basalt. All these soils, except Gaib and Lemonex, have more than 35% coarse fragments and less than 35% clay (loamy-skeletal family).

Table S – 2. Soil Types Found in the Project Area.

Series	Days with dry soil (number per summer)	Typical Vegetation	Volcanic Ash Thickness (inches)	Total Soil Depth (inches)	Surface Erosion Hazard
Alfic Udivitrands	30 to 45	mixed conifer	14 to 26	20 +	L
Alfic Vitrixerands	45 to 60	mixed conifer	14 to 26	20 +	L
Bennett Creek	45 to 60	mixed conifer	8 to 13	20 to 40	L
Bigcow	45 to 60	mixed conifer	8 to 11	40 +	L
Bocker	60 to 120	scab	0	< 10	H
Deardorf	30 to 45	mixed conifer	14 to 18	20 to 40	L
Denny creek	45 to 60	mixed conifer	7 to 14	40 to 60	L
Fivebit	60 to 80	JUOC[a]	0	10 to 20	M-H
Gaib	60 to 90	scab	0	10 to 20	H
Klicker	60 to 75	PSME, PIPO[a]	0	20 to 40	L-M
Lemonex	60 to 80	PIPO, PSME[a]	0	20 to 40	M-H
Limberjim	20 to 40	mixed conifer	14 to 26	40 to 60	L
McWillis	45 to 60	mixed conifer	14 to 26	60 +	L
Mountemily	30 to 45	PICO[a]	14 to 22	60 +	L
Olot	45 to 60	mixed conifer	15 to 19	20 to 40	L
Poguepoint	30 to 45	mixed conifer	15 to 22	40 to 60	L
Rebarrow	30 to 45	mixed conifer	15 to 24	60 +	L

Series	Days with dry soil (number per summer)	Typical Vegetation	Volcanic Ash Thickness (inches)	Total Soil Depth (inches)	Surface Erosion Hazard
Syrup creek	30 to 45	mixed conifer	14 to 24	20 to 40	L
Trout meadows	30 to 45	PICO[a]	14 to 22	20 to 40	L
Wonder	45 to 60	mixed conifer	9 to 16	20 to 40	L

a - JUOC = juniper; PICO = lodgepole pine; PIPO = ponderosa pine; PSME = Douglas-fir
b - For slopes less than 30% (> 90% of the tractor units' area). L=low, M=medium, H=high

The driest, shallowest soils (Bocker, Fivebit, and Gaib) support non-forest “scab” vegetation, with low amounts of ground cover. Due to the low amount of ground cover, these tend to be the most erodible soils Lemonex is more erodible than most forest soils because of its high clay content and resulting low infiltration rate. In forested areas within the project area, abundant ground cover combined with the relatively dry climate and gentle to moderately steep topography means erosion is rarely, if ever a problem. (In the proposed units, 57% of the land has a slope of 15% or less, and 2% has a slope of 35% or more.) The forest soils with the least available water holding capacity are the Klicker and Lemonex series, which have little or no volcanic ash. Volcanic ash holds a relatively large amount of water, so soils with volcanic ash can usually support moister mixed-conifer vegetation. Soils with volcanic ash are the most abundant soils in the Crawford Project Area. Deeper soils and soils at relatively high elevation also tend to be moist.

Soil Quality - Effects of Past and Ongoing Actions

Detrimental impacts (see Glossary) exist on tractor units, resulting from one to three previous timber sales (on each unit) and fuel treatments (Table S – 3, Alternative 1 column). Existing detrimental impacts in the units range from 0 to 14%, and average 6%. Many of the stands with zero or small impacts have not been entered since railroad logging, 60 or more years ago. All units are well below the Forest Plan Standard of 20%. Most of the detrimental impacts are from compaction and associated puddling although some displacement also exists. In addition, roads contribute a large part of detrimental impacts in some stands. Erosion and detrimentally burned soil are negligible in forested areas.

Table S – 3. Post Treatment Detrimental Soil Conditions.

Unit	Alt. 1 % of unit	Alt. 2 % of unit	Alt. 3 % of unit	Alt. 4 % of unit	Design Measure*
012	8	18	18	10	
014	4	18	18	6	
022	9	18	18	9	
024	7	17	17	7	
032	6	19	19	8	
038	0	14	2	2	
039	0	14	2	2	
040	4	18	6	6	
041	3	17	5	5	
049	14	18	18	14	subsoil
052	1	9	9	1	
053	1	10	10	1	
054	2	13	13	2	
056	2	13	4	4	

Unit	Alt. 1 % of unit	Alt. 2 % of unit	Alt. 3 % of unit	Alt. 4 % of unit	Design Measure*
058	4	14	4	4	
060	5	15	15	5	
062	3	14	14	3	
064	10	18	10	10	
066	7	15	15	7	
068	8	18	18	10	dry, frozen or snow covered
069	12	18	18	12	dry, frozen or snow covered
070	12	18	18	12	dry, frozen or snow covered
072	11	18	18	11	dry, frozen or snow covered
074	5	14	14	5	
076	5	15	15	5	
077	5	14	5	5	
078	10	18	18	12	dry, frozen or snow covered
079	5	17	7	7	
080	12	18	18	14	subsoil
082	2	15	15	2	
083	6	15	15	6	
084	4	15	15	4	
088	8	18	18	8	
090	11	18	18	11	dry, frozen or snow covered
091	2	13	13	2	
094	4	15	15	4	
95+96	7	17	17	7	
100	0	11	0	0	
102	0	15	0	0	
103	8	17	17	8	
105	8	17	17	8	
106	8	17	17	8	
108	3	15	15	3	
110	1	12	12	3	
112	9	19	19	11	
113	9	19	9	9	
116	4	15	15	4	
118	9	17	17	9	
120	6	15	15	6	
122	4	13	4	4	
124	13	19	19	15	subsoil
126	5	18	18	7	
128	8	18	18	10	
130	1	13	1	1	
131	1	14	1	1	
132	6	17	17	8	
133	8	18	18	10	
134	1	13	1	1	
135	4	19	4	4	
136	4	14	4	4	
138	8	19	19	10	

Unit	Alt. 1 % of unit	Alt. 2 % of unit	Alt. 3 % of unit	Alt. 4 % of unit	Design Measure*
142	9	19	11	11	dry, frozen or snow covered
144	3	11	11	3	
146	9	19	19	11	dry, frozen or snow covered
148	13	16	16	13	frozen or snow covered
149	9	17	17	9	
150	9	20	20	11	dry, frozen or snow covered
152	1	13	1	1	

* Design Measures are described in greater detail in Chapter 2, Management Requirements, Constraints, and Design Measures. Subsoil - Following logging, the skid trails will be sub-soiled unless logging is under frozen or snow-covered conditions. Dry - Skidding is limited to dry, frozen, or snow covered soil. Winter – Skidding is limited to frozen or snow covered soil.

The assessments reveal all impacts on proposed units from past and ongoing activities, including timber harvest, landings, roads, livestock grazing, fuel treatments, and OHVs. Appendix D lists the activities that produced these effects. The major effects are from 24 timber sales and associated slash treatments on 4,300 acres since 1978. Almost all the harvest was ground based. Some of the 4,300 acres overlap with each other, and most of them do not affect the proposed units. Some compaction and displacement also remain from timber sales prior to 1978. Effects from most other activities, including livestock grazing (in forests), power line construction and maintenance (except existing roads), and fires, are negligible.

Nitrogen and forest floor organic matter has accumulated since fire suppression became effective so their levels are higher than in the 1800s. Fire usually decreases the amount of forest floor organic matter and nitrogen on the land (though easily available nitrogen often increases for one to a few years). Significant fires have not burned in the area for many decades, so the loss of nitrogen and forest floor organic matter during fires has not occurred. Nitrogen rebuilds after fire as nitrogen from the atmosphere accumulates in the organic matter of biomass, forest floor, and soil, especially due to the fixation of nitrogen by *Ceanothus*.

Trees have suppressed pine grass and other ground vegetation since fire suppression became effective. This has resulted in vegetation putting more organic matter and nutrients on the surface forest floor, and less into the mineral soil, where they are less susceptible to loss during fire. Soil microorganisms probably have changed as a result.

Forest soil is in good enough condition to support mycorrhizal fungi since trees and most other plants can't survive without it. The climate on Malheur National Forest is relatively unfavorable for decomposer organisms, compared to many other forests, since the Malheur is dry during the summer. This slow decomposition explains the accumulation of fuels in the absence of fire.

Environmental Consequences

Effects to soils, which are not described below, would be so small as to be negligible. These negligible effects include effects on mass movement, on detrimentally burned soil, and on soil microbes. Effects are negligible because none of the alternatives would significantly affect these variables.

For all alternatives, compaction from past harvest would slowly decrease over the course of decades due to natural recovery. Natural recovery results from roots pushing through compacted soil, from the digging of soil invertebrates and vertebrates, and from the expansion of water as it freezes in the soil.

For all alternatives, some ongoing and foreseeable actions listed in Appendix D (grazing, fire-wood cutting, and OHV use) would continue to compact a negligible amount of soil, at about the same very low rate as in the past. This compaction would be counter-balanced by recovery from similar impacts in the past, so the level of detrimental impacts from these ongoing and foreseeable actions would remain at about current levels.

For all alternatives, if no wild fire occurs, ground cover standards would be met, since the cumulative effects of all past, ongoing, and future actions on ground cover would be small.

If a wildfire does occur, the hazard of erosion would greatly increase on severely burned areas for 2 or 3 years due to low ground cover and possibly hydrophobic soils. The hazard from severe wildfire would be higher under this alternative than the action alternatives, as shown in the Fire and Fuels section of Chapter 3.

Alternative 1

Direct and Indirect Effects

For the first decade, soil quality would remain at the same as described in the Affected Environment section directly above, and displayed in the Alternative 1 column of Table S – 3, if no severe wildfire occurs. No detrimental impacts would result from roads, tractor harvest, or mechanical fuels treatment.

Cumulative Effects

Existing impacts include the impacts from all past and ongoing actions. Quantitatively, existing impacts are shown below under Alternative 1 in Table S – 3, Post Treatment Detrimental Soil Conditions. Past actions include timber harvest, landing and road construction, fire suppression, livestock grazing, fuel treatments, and OHV use, as described in the Affected Environment section above and in Appendix D.

Alternatives 2 & 3

The effects of Alternatives 2 and 3 are similar, except they differ in extent, as described in Chapter 2. For instance, Alternative 2 proposes 2,192 acres of logging, whereas Alternative 3 proposes 1,506 acres.

Direct and Indirect Effects

Roads

During temporary road construction and use, soil may be eroded from the road surface. The sediment would be deposited within 20 feet of the edge of the road. The loss of productivity from erosion would be minor compared to the loss from displacement and compaction. On subsoiled temporary roads, most productivity lost to compaction would be restored; perhaps half the area of the roads would be in a restored condition. Productivity lost to displacement and untreated compaction would recover over the course of several decades; about 1/2 the area of the roads would be in this detrimental condition immediately following road decommissioning. Productivity would be greatly reduced on approximately 11 acres under Alternative 2 and 4 acres under Alternative 3, by displacement and compaction from temporary road construction. Where temporary roads cross shallow soil areas, such as where the road to unit 077 crosses 750 feet of a shallow soil, subsoiling is not feasible, but the road surface would be drained to prevent erosion.

For Alternatives 2, 3, and 4, road decommissioning would increase productivity on about 53 acres of former roads, when they are subsoiled. Subsoiling increases productivity because compaction is reduced. All the roads proposed for decommissioning are of native surface. Subsoiling would slightly increase the erosion risk for about 2 years, as described below in the Subsoiling section. The road surfaces would be subsoiled where feasible, seeded and mulched, and drainage provided. Conifers would be planted on segments located in RHCAs where conditions will support establishment and growth. After about 5 years, conifers would help maintain ground cover and infiltration rate. As described in the Aquatics and Water Quality section of Chapter 3, this risk is acceptable due to the long-term benefit to aquatic resources after about 3 years.

Tractor Harvest

Displacement and erosion from skidding on slopes steeper than 35% would be limited since slopes steeper than 35% occupy a small proportion of tractor units and extensive ground cover in forests absorb sediment. Soil management requirements (Chapter 2), including directional felling and winching, would also help to limit displacement and erosion. Skidding on steep slopes or unsuitable land, and water bar construction, often causes displacement. Skidding also bares soil, decreases infiltration, and channels overland flow, and thus can accelerate erosion. This acceleration occurs especially on steep slopes and on soil where ground cover would be slow to recover, including scab soil. As described in the soils report in the Project Record, Quantitative Logging Effects on Detrimental Soil Condition section, sites that have steeper slopes are expected to be more impacted than sites with flatter slopes. Units that may have small slopes steeper than 35% are 12, 22, 40, 41, 49, 82, 83, 84, 88, 90, 91, 95 128, 130, 131, 133, 134, 135, 148, 149, and 150. It is not feasible to log these small inclusions by skyline or helicopter. The experience of the project soil specialist indicates damage on small slopes less than 45% is acceptable because only moderate amounts of displacement occur, and because of the small size of the area affected.

On roads used for haul, sediment risk will slightly increase as the road surface is disturbed. This increase will be partially offset by road maintenance to drain runoff off the road surfaces.

Usually erosion of skid trails decreases through one to three years, until it stops. Decreased productivity due to severe displacement and erosion can last hundreds of years. Soil management requirements (Chapter 2) would keep displacement and erosion to a minimum, within acceptable levels. Management requirements that effectively control displacement and erosion include prohibitions on skidding on steep slopes (greater than 45%), limitations on skidding in draws, and water bar requirements. The same slope limitations apply to all soil types because ash soil on steep slopes is easily displaceable and non-ash soil on steep slopes is relatively easily erodible.

Skidding would cause negligible sediment export from the units, despite sediment movement within units as described in the preceding paragraph. Sediment normally is deposited less than 15 feet down slope from skid trails as the water is slowed by ground cover and percolates into the soil.

Except for areas that are harvested under winter conditions, much of the skid trail area would be compacted, and some of the soil tracked only once or twice would be compacted. As described in the soils report in the project record, Quantitative Logging Effects on Detrimental Soil Condition section, moist soil or ash soil are probably more susceptible to compaction than dry or non-ash soil. Rocky soil is less susceptible. Compaction usually lasts more than 20 years; some compaction lasts more than 50 years. The soils report in the project record explains the calculations used to predict detrimental impacts, most of which are compaction, and presents the results of the calculations. If the unit happens to be harvested over deep snow or on deeply frozen soil, compaction would be about 0.5%. Soil management requirements that are effective at limiting compaction include prohibiting skidding under wet conditions, requiring skid trails to be widely spaced, allowing skidding only under dry or frozen conditions in certain units, allowing only low ground pressure machinery off skid trails and requiring skid trails to be subsoiled in certain units. These management requirements would keep compaction to a practical minimum and indicate the Forest Plan Standard would be met in most units without subsoiling. For instance, Davis and coworkers (2001) examined several units on the Summit Fire, where similar design measures were used in a similar environment, and found none where standards appeared to be violated.

Puddling is associated with compaction, and statements about compaction also apply for puddling.

Subsoiling

Subsoiling of skid trails is planned for units 049, 080, and 124 because they are expected to exceed 20% detrimental impacts without subsoiling (Chapter 2). Site-specific observations indicate most of the soil in these sub-units is suitable for subsoiling in terms of slope, depth, and stoniness, but there are inclusions of unsuitable soils. Subsoiling would mostly, but not entirely, loosen compacted soil. Subsoiling skid trails would reduce detrimental impacts by about 6%. This decrease will ensure these sub-units would meet the Forest Plan Standard.

Landings would also be subsoiled where suitable. Since landings occupy only a small proportion of land (perhaps 3%), and since parts of landings occupied by slash would not be subsoiled, and since much of the detrimental impact on landings is due to displacement as well as compaction, subsoiling landings would decrease detrimental impacts by about 1%.

Subsoiling bares soil, forms channels, makes soil particles more easily detachable, and disrupts roots, thus raising the risk of erosion for a few years. However, subsoiling also increases infiltration which decreases the risk of erosion. Increased infiltration and subsoiling management requirements means that sediment production from erosion due to subsoiling would be negligible.

Mechanical Fuels Treatments

Management requirements (Table 2.5) require grapple piling equipment to have a low ground pressure, to operate on dry soil and on skid trails where possible, therefore the project soils specialist expects grapple piling would compact about 1% of each unit where it is used. Feller bunchers of similar ground pressure operating off skid trails caused about 1.5% compaction (McNeil 1996). This would be in addition to impacts caused by harvest. Perhaps 0.2% of the units would be impacted by detrimental burning of soil beneath grapple piles. Effects from hand piling and burning would be negligible, because no heavy equipment is used.

Summary of Detrimental Impacts

As shown by the difference between Alternative 1 (the existing condition) and Alternative 2 in Table S – 3, increases in detrimental impacts in the Alternative 2 logging units range from 3 to 15%, and average 10%. These impacts are from temporary road construction, logging, and subsoiling.

Prescribed Burning

Soil effects from prescribed burning would be minor because of the low severity of prescribed fire. Ground cover would decrease, especially during fall burns. However, burning would take place so as to avoid decreasing ground cover below Forest Plan Standards (Chapter 2), so erosion would not be noteworthy.

Pile burning would cause detrimentally burned soil on perhaps 0.5% of some units.

Nutrients

Design measures would keep nutrient loss, by displacement, and erosion to a minimum, so it would be negligible. However, logging would remove nutrients and organic matter in logs, and fuel control would remove nutrients and organic matter during burning. The removal, especially removal of nitrogen, may decrease site productivity by a few percent on some sites. Removing organic matter and nutrients by logging and fuel control likely would move many sites back toward their fertility status before European-Americans arrived, because nutrient and organic matter loss in fires was common then. Also, on most sites, productivity likely is not limited by nutrients or organic matter. A relatively small amount of nutrients is predicted to be removed because wood has a low concentration of nutrients (compared to foliage, small branches, and the remaining forest floor), a large amount (about 2100 lb/ac) of nitrogen is in mineral soil (Geist and Strickler 1978), and since many trees would be left. After logging and fuel control, woody fuel loads would be more similar to conditions before Euro-Americans arrived. Little dead wood existed before fire suppression became effective. The ecosystems persisted for thousands of years with low levels of dead wood, so removal of the excess dead wood would have only a small adverse effect. According to the Wildlife section of Chapter 3, design measures protect existing large down logs that would be counted in Forest Plan Standards, so only incidental loss would be expected.

Thinning and prescribed burning would increase openings in the forest, with more pine grass and other ground vegetation, more similar to what conditions were in the 1800s. So nutrient cycling would be more like it was in the 1800s, with the ground vegetation putting more organic matter and nutrients below ground, and trees putting less on the soil surface.

Mycorrhizal Fungi and Other Soil Organisms

Logging and prescribed fire would reduce the abundance of mycorrhizal fungi, by removing trees with the fungi, or by killing it with fire. This reduction would not affect tree growth since enough mycorrhizal fungi would inhabit soil, remaining trees, forest floor, and down wood.

Logging, precommercial thinning, and prescribed fire would affect the community of other soil organisms. Thinning and prescribed burning would also increase openings in the forest, with more pine grass and other ground vegetation, and these changes would also affect the soil community. The effects of these activities and vegetation changes are mostly unknown. No reason exists to believe these effects would have noticeable effects on productivity, because plants continue to grow normally after harvest and fire, and no scientific evidence exists to indicate adverse effects.

Cumulative Effects

Detrimental impacts from the proposed operations (temporary road construction, harvest, subsoiling, activity fuel treatments, and prescribed burning) add to past actions. The Post Treatment Detrimental Soil Conditions Table S – 3 shows what the expected site-specific condition would be when proposed activities are added to past impacts. For Alternative 2, detrimental impacts in the units would range from 9 to 20%, averaging 16%. For Alternative 3, detrimental impacts would range from 0 to 20%, averaging 13%, because logging is less extensive. Forest Plan soil protection standards would be met under all alternatives for all logging units.

Fuels treatment would decrease the hazard of a crown fire occurring (see the Fire & Fuels section of Chapter 3). If a wildfire occurs, the hazard of erosion would greatly increase on severely burned areas for 2 or 3 years due to low ground cover and possibly hydrophobic soils. However, the proposed fuels treatments would decrease soil fire severity (Vihnanek & Ottmar 1994), and decrease the hazard of erosion, compared to Alternatives 1 and 4.

Foreseeable actions listed in Appendix D do not include any additional harvest within the life of the project, so there would be no additional cumulative effect from additional harvest. Wrac Lodgepole does not overlap any of the Crawford logging units.

For all alternatives, compaction from past harvest would slowly decrease over the course of decades due to natural recovery. Natural recovery results from roots pushing through compacted soil, from the digging of soil invertebrates and vertebrates, and from the expansion of water as it freezes in the soil.

For all alternatives, some ongoing and foreseeable actions listed in Appendix D (grazing, firewood cutting, and OHV use) would continue to compact a negligible amount of soil, at about the same very low rate as in the past. This compaction would be counter-balanced by recovery from similar impacts in the past, so the level of detrimental impacts from these ongoing and foreseeable actions would remain at about current levels.

For all alternatives, if no wildfire occurs, ground cover standards would be met, since the cumulative effects of all past, ongoing, and future actions on ground cover would be small.

Alternative 4

Direct and Indirect Effects

Effects of Alternative 4 would be similar to the effects described under Alternative 1. One difference is that mechanical fuels treatment (grapple piling) would compact about 2% of the area where it is applied, this is greater than the 1% for harvest units, since piling machines would not be able to use skid trails. This effect is discussed under Alternatives 2 and 3 above.

Road decommissioning would slowly increase the productivity of the former roads. Prescribed burning would remove some ground cover, nutrients and mycorrhizal fungi, and would change the vegetation and soil organisms as described under Alternatives 2 and 3.

Cumulative Effects

Detrimental impacts from grapple piling would add to existing impacts, which are described under the Existing Condition section. The "Post Treatment Detrimental Soil Conditions" table shows what the expected site-specific conditions would be. Detrimental impacts would range from 0 to 15%, averaging 7%. Forest Plan soil protection standards would be met under all alternatives for all units.

Fuels treatment would decrease the hazard of a crown fire and the resulting soil erosion, less than Alternatives 2 and 3 and more than Alternative 1 (compare Tables F – 10 to F – 12 in the Fire and Fuels section).

For all alternatives, compaction from past harvest would slowly decrease over the course of decades due to natural recovery. Natural recovery results from roots pushing through compacted soil, from the digging of soil invertebrates and vertebrates, and from the expansion of water as it freezes in the soil.

For all alternatives, some ongoing and foreseeable actions listed in Appendix D (grazing, firewood cutting, and OHV use) would continue to compact a negligible amount of soil, at about the same very low rate as in the past. This compaction would be counter-balanced by recovery from similar impacts in the past, so the level of detrimental impacts from these ongoing and foreseeable actions would remain at about current levels.

For all alternatives, if no wild fire occurs, ground cover standards would be met, since the cumulative effects of all past, ongoing, and future actions on ground cover would be small.

Consistency with Direction and Regulations

All alternatives would be consistent with Forest Plan soil protection standards, because all the Forest-wide Standards mentioned above under the "Regulatory Framework" section would be met, as explained in all the preceding sections.

Irreversible and Irretrievable Commitments of Resources

No irreversible or irretrievable commitment of soil resources would occur under any alternative.

More Detailed Information or Analysis

Additional details about the affected environment and effects of the alternatives on soil can be found in the Soil Specialist Report located in the project record.

Aquatics & Water Quality

Regulatory Framework

The Malheur National Forest Plan (USDA 1990), as amended, provides direction to protect and manage resources.

Forest Plan Goals for Aquatic Resources

- Assist in the identification, protection, and recovery of threatened, endangered and sensitive species (Forest Plan, Goal 15, pg IV – 2).
- Provide improved fish habitat conditions to support increased populations of anadromous and resident fish (Forest Plan, Goal 18, pg IV – 2).
- Provide a diversity of habitat sufficient to maintain viable populations of all species (Forest Plan, Goal 19, pg IV – 2).
- Provide a favorable flow of water (quantity, quality, and timing) for off-forest users by improving or maintaining all watersheds in a stable condition (Forest Plan, Goal 27, pg IV – 2).
- Maintain or enhance water quality to meet State of Oregon standards, considering down-stream uses and protection of other riparian and floodplain values (Forest Plan, Goal 28, pg IV – 2).

Forest Plan Objectives for Aquatic Resources

Forest Plan Objectives state how resources will be managed under the Forest Plan:

Fish

- Manage fish habitat and riparian areas to achieve increases in fish habitat capability. This habitat improvement will be accomplished by a combination of the following:
  (a) Implementation of livestock management strategies to achieve better distribution of livestock, and better control of forage utilization in riparian areas. This will help achieve a more diverse and abundant riparian vegetation condition and geomorphic recovery of the stream channel.
  (b) Implementation of the riparian timber management prescriptions, which will provide improved stream shading and a better supply of large woody material to the stream channel.
  (c) Implementation of watershed and fish habitat improvement structures, to improve habitat conditions and accelerate geomorphic recovery of the stream channel.

Riparian Areas

- All riparian areas will be managed to protect or enhance their value for water quality, fish habitat, and wildlife.

Water

- Manage water resources to maintain or enhance long-term productivity.

- Management activity will be directed toward improving those riparian areas which are in undesirable condition.
- Integrate mitigation into management activities.

Forest Plan Forest-Wide Standards

The following are summaries of the most applicable parts of the Standards. The whole Standard will be followed.

- 117. Comply with State requirements in accordance with the Clean Water Act....
- 118. Select and design BMPs (Best Management Practices) based on site-specific conditions.
- 119. Implement the ... Memoranda of Understanding (MU)....
- 120. Projects that will not meet Oregon water quality standards shall be redesigned, rescheduled, or dropped.
- 121. Conduct a watershed cumulative effects analysis
- 122. Rehabilitate disturbed areas that could contribute sediment to perennial streams.

Clean Water Act

Compliance with the "Memorandum of Understanding, between USDA Forest Service and Oregon Department of Environmental Quality, to meet State and Federal water quality rules and regulations" (2002) (hereafter, the MU), will meet State and Federal water quality rules and regulations. The MU identifies policies and practices that ensure attainment of Federal and State water quality laws and regulations, and implementation of the MU satisfies State and Federal point and non-point source pollution control requirements.

The MU states the Forest Service has several responsibilities. Two responsibilities apply to the Crawford Project.

One responsibility is that the Forest Service will develop and implement strategies to protect and restore water quality conditions when actions have the potential to affect 303(d) listed waters. The "FS/BLM Protocol for Addressing Clean Water Act Section 303(d) Listed Waters" (May 1999) is the guidance for meeting this responsibility. The Middle Fork John Day River, and Clear, Crawford, and Mill Creeks are on the 303(d) list for water quality-limited water bodies for high summer temperatures. The FS/BLM protocol lists four ways to address impaired waters. One way is to implement sufficiently stringent management measures. Thus, if the Crawford Project has sufficiently stringent measures so that it does not increase temperatures above current temperatures, this responsibility would be met.

The second responsibility is that the Forest Service will implement site specific BMPs as specified in the "Forest Service R6 General Water Quality Best Management Practices" (1988) document and in standards and guidelines in forest plans. The R6 BMP document contains methods and procedures that will be used to ensure compliance with the Clean Water Act (BMP document, pg 1).

The site specific BMPs are in the descriptions of the alternatives (Chapter 2), in Tables 2.6 & 2.7, in PACFISH Standards and Guidelines (as described a few paragraphs below), in Appendix F, and in standard timber sale contracts.

Designated Beneficial Uses in the John Day Basin are Public & Private Domestic Water Supply, Industrial Water Supply, Irrigation, Livestock Watering, Fish & Aquatic Life, Wildlife & Hunting, Fishing, Boating, Water Contact Recreation, and Aesthetic Quality. The Forest Service is coordinating with the State of Oregon on Total Maximum Daily Load development for the Middle Fork John Day River.

Forest Plan Management Area 3B – Anadromous Riparian Areas

Riparian habitats are directly affected by water and exhibit either visible vegetation or physical characteristics reflecting influence from water. The following standards for MA–3B are applicable for the Crawford Project:

- Standard 5: Provide the necessary habitat to maintain or increase populations of management indicator species with special emphasis on steelhead.
- Standard 8: Manage the composition and productivity of key riparian vegetation to protect or enhance riparian-dependent resources. Emphasis will be on reestablishment of remnant hardwood shrub and tree communities.
- Standard 10: Improve the rate of recovery in riparian areas that are not in a condition to meet management objectives by eliminating or reducing impacts of management activities that may slow riparian recovery.
- Standard 34: Emphasize natural regeneration but plant when needed to meet riparian management objectives.
- Standard 41: Avoid locating roads in riparian areas while providing adequate local road access for management activities. Minimize the density of opens roads in this management area by obliterating, revegetating, or closing unnecessary roads or any roads causing significant resource damage.
- Standard 42: Design and maintain roads to protect fisheries values and riparian area habitat.
- Standard 43: Provide seasonal closures to reduce sedimentation.
- Standard 44: Leave stream channels of Class I to IV streams undisturbed by roads, except for crossings. Minimize adverse impacts to water and fisheries resources when designing necessary crossings.
- Standard 45: Apply erosion seeding on: (a) all disturbed soil that occurs within 100 – 200 feet of a Class I, II, III, or IV stream where eroded material could reach a stream; and (b) on compacted skid trails with slopes greater than 20%.

Amendments to the Forest Plan

Amendment 29 (1994)

Amendment 29 amended the Forest Plan in 1994 to incorporate recommendations for managing and restoring aquatic habitat from the Columbia River Basin Anadromous Fish Habitat Management Policy and Implementation Guide (January 25, 1991). Amendment 29 of the Malheur National Forest Plan established numeric desired future conditions (DFCs) for aquatic habitat by modifying Forest Plan Standard 5 for MA–3B, anadromous riparian areas. Modification included incorporation of numeric DFCs for the following aquatic habitat elements: sediment/substrate, water quality, channel morphology and riparian vegetation. Numeric DFCs were designed to manage designated habitat elements within their natural ranges of variability on the forest.

PACFISH (1995)

The Malheur National Forest Plan was amended in 1995 by direction of the Regional Forester with the Interim Strategy for Managing Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and Portions of Nevada (INFISH) and the Interim Strategy for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). Activities in the Crawford Project Area fall under direction of PACFISH because the project area is located within the range of anadromous fish.

PACFISH Riparian Goals

The PACFISH riparian goals establish an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. The goals are to maintain or restore:

1. water quality to a degree that provides for stable and productive riparian and aquatic ecosystems;
2. stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems developed;
3. instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood events;
4. natural timing and variability of the water table elevation in meadows and wetlands;
5. diversity and productivity of native and desired non-native plant communities in riparian zones;
6. riparian vegetation to:
    a) provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems;
    b) provide adequate summer and winter thermal regulation within the riparian and aquatic zones; and
    c) help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.

7) riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region; and
8) habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate population that contribute to the viability of riparian-dependent communities.

PACFISH Riparian Habitat Conservation Areas

PACFISH amended the Forest Plan by establishing riparian habitat conservation areas (RHCAs), establishing numeric riparian management objectives (RMOs), and establishing standards and guidelines for managing activities in RHCAs. PACFISH replaced existing direction contained in the Forest Plan except where the Plan provided more protection for anadromous fish habitat.

Riparian-dependent resources receive primary emphasis in RHCAs, and management activities are subject to specific standards and guidelines.

RHCAs are differentiated by the following four categories (Table AW – 1). PACFISH establishes default buffers for RHCAs on the Forest (USDA 1995).

Buffer widths for PACFISH RHCAs are based on slope distances. When the Malheur National Forest created the Forest GIS cover for RHCAs, RHCAs were delineated using an average slope of 35% which resulted in a buffer width of 283 feet for Category 1 RHCAs, 142 feet for Category 2 RHCA, and 93 feet for Category 4 RHCAs. These widths are used for planning purposes only. During layout of unit boundaries, RHCA buffer widths are based on actual slope distances. Where slopes are greater than 35% actual RHCA buffer widths will be narrower than displayed by the Forest's RHCA GIS cover and where slopes are less than 35% actual RHCA buffer widths will be greater than the Forest's RHCA GIS cover. Therefore, there will likely be slight differences in acreages between planning documents and actual implementation of projects for RHCAs and units adjacent to RHCAs.

Table AW – 1. PACFISH RHCA Buffer Widths.

RHCA Category	Description	RHCA Width (Feet)
1	Fish bearing streams that are either perennial or intermittent	300
2	Non-fish bearing streams that are perennial	150
3	Ponds, lakes, reservoirs, and wetlands less than 1 acre	150
4	Non-fish bearing streams that are intermittent, ponds, lakes, or wetlands less than 1 acre.	100

PACFISH Standards and Guidelines:

- Prohibit timber harvest, including fuelwood cutting, in RHCAs except where:
  - Catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuelwood cutting in RHCAs only where present and future woody debris needs are met, where cutting would not retard or prevent attainment of other RMOs, where adverse effects on listed anadromous fish can be avoided. For watersheds with listed salmon or designated critical habitat, complete Watershed Analysis prior to cutting in RHCAs (PACFISH Standard TM– 1a).
  - Apply silvicultural practices for RHCAs to acquire desired vegetation characteristics where needed to attain RMOs. Apply silvicultural practices in a manner that does not retard attainment of RMOs and that avoids adverse effects on listed anadromous fish (PACFISH Standard TM – 1b).
- For each existing or planned road, meet RMOs and avoid adverse effects on listed anadromous fish by minimizing road and landing locations in RHCAs (PACFISH Standard RF – 2b).
- For each existing or planned road, meet RMOs and avoid adverse effects on listed anadromous fish by avoiding sidecasting of soils or snow. Sidecasting of road material is prohibited on road segments within or abutting RHCAs in watersheds containing designated critical habitat for listed anadromous fish (PACFISH Standard RF – 2f).
- Determine the influence of each road on RMOs. Meet RMOs and avoid adverse effects on listed anadromous fish by:

  - o Reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards, or that have been shown to be less effective than designed for controlling sediment delivery, or retard attainment of RMOs, or do not designated critical habitat for listed anadromous fish from increased sedimentation (PACFISH Standard RF – 3a).
  - o Prioritizing reconstruction based on the current and potential damage to listed anadromous fish and their designated critical habitat, the ecological value of the riparian resources affected, and the feasibility of options such as helicopter logging and road relocation out of RHCAs (PACFISH Standard RF – 3b).
  - o Closing and stabilizing or obliterating, and stabilizing roads not needed for future management activities. Prioritize these actions based on the current and potential damage to listed anadromous fish and their designated critical habitat, and the ecological value of the riparian resources affected (PACFISH Standard RF – 3c).
- Trees may be felled in RHCAs when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives (PACFISH Standard RA – 2).
- Prohibit storage of fuels and other toxicants within RHCAs. Prohibit refueling within RHCAs unless there are no other alternatives. Refueling sites within a RHCA must be approved by the Forest Service and have an approved spill containment plan (PACFISH Standard RA – 4).
- Locate water drafting sites to avoid adverse effects to listed anadromous fish and instream flows, and in a manner that does not retard or prevent attainment of RMOs (PACFISH Standard RA – 5).
- Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of RMOs, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long–term ecosystem function, listed anadromous fish, or designated critical habitat (PACFISH Standard FM – 1).
- Design prescribed burn projects and prescriptions to contribute to the attainment of RMOs (PACFISH Standard FM – 4).

PACFISH Key Watersheds

The intent of designating Key Watersheds is to provide to provide a pattern of protection across the landscape where habitat for anadromous fish would receive special attention and treatment. Priority within these watersheds would be to protect, or restore habitat for listed stocks, stocks of special interest or concern, or salmonid assemblages of critical value for productivity or biodiversity. Criteria considered to designate Key Watersheds are:

1. Watersheds with stocks listed pursuant to the Endangered Species Act (ESA), or stocks identified in the 1991 American Fisheries Society report as “at risk” or subsequent scientific stock status reviews; or
2. Watersheds that contain excellent habitat for mixed salmonid assemblages; or
3. Degraded watersheds with a high restoration potential.

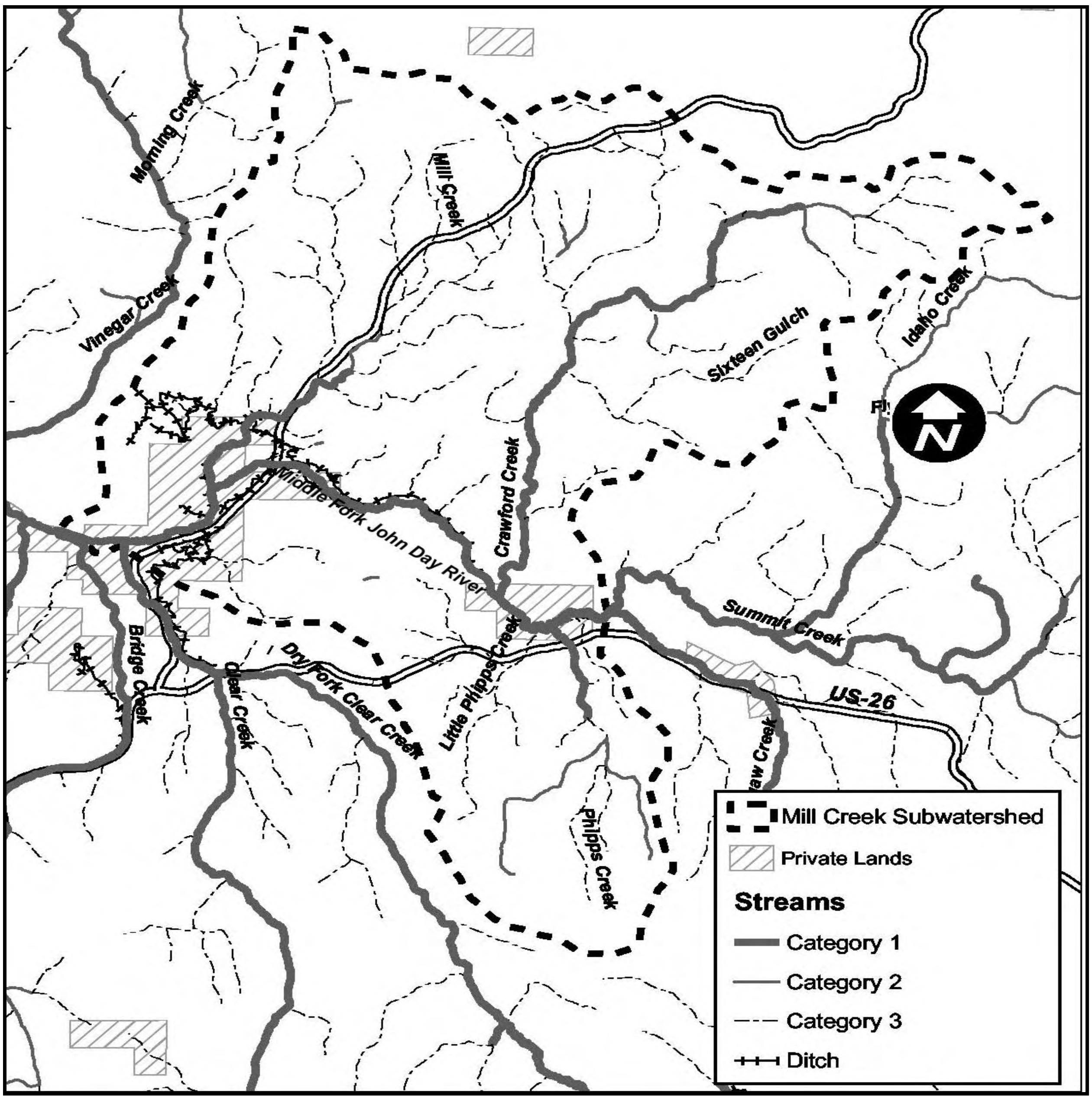
All subwatersheds in the Upper Middle Fork John Day Watershed, including Mill Creek Subwatershed, meet the three criteria for PACFISH Key Watersheds.

Analysis Methods

Aquatic Habitat & Water Quality Analysis Area

The analysis area encompasses all fish habitats that have the potential for effects from the Crawford Project. The analysis area for aquatic habitat and cumulative effects includes the following streams: Mill Creek to its confluence with the Middle Fork John Day River, (the Middle Fork), Crawford Creek to its confluence with the Middle Fork, and the Middle Fork from the confluences of Summit Creek and Squaw Creek downstream to the confluence of Bridge Creek (Figure AW – 1). Measurable effects from proposed activities are unlikely to extend downstream of this point. There will be no activities or associated effects in the upper elevations (south part) of the Mill Creek Subwatershed that lies south of the Highway 26 and drains into the project area.

Figure AW – 1. Aquatic Analysis Area for the Crawford Project.



Affected Environment– Effects of Past and Ongoing Actions

Timber Harvest Activities

Harvest

The majority of the Crawford Project Area was logged during the early 1900s. Based on old photos of the area it appears that the majority of the area was essentially clear-cut with a few seed trees left for regeneration. From 1978 through 1994, 304 acres were harvested in current RHCAs, including about 63 acres in Category 1 RHCAs (Table AW – 2). All 63 acres in Category 1 RHCAs occurred along Crawford Creek. These harvest activities likely reduced the amount of Large Woody Debris (LWD) currently in Crawford Creek.

Table AW – 2. Acres of harvest in Category 1 RHCAs in the Crawford Analysis Area.

Project	Year	Stream	Acres
Meadow LP	1978	Crawford	16.2
Cogo	1981	Crawford	3.0
Tipton	1985	Crawford	5.6
WPM	1985	Crawford	2.7
Crawpole	1986	Crawford	8.5
Nippon	1987	Crawford	16.8
16 Gulch	1989	Crawford	8.0
Pitwood	1983	Phipps	2.0

Roads

Roads can account for most of the sediment problems in some watersheds because they are a link between sediment source areas (skid trails, landings, and cut slopes, etc.) and stream channels. However the effects of current roads are difficult to disentangle from other sediment sources, such as past road sediment, channel modification from railroad logging, channel erosion, erosion from “scabs” (shallow soil areas where ground cover standards are not met), and livestock grazing (especially past grazing). Roads directly affect the channel morphology of streams by accelerating erosion and sediment delivery and by increasing the magnitude of peak flow (Furniss et al. 1991). However, the Equivalent Roaded Area Analysis described in the Cumulative Effects section below indicates this probably is not happening in Mill Creek Sub-watershed. Wemple (1994) focused on the interaction of forested roads with stream networks in western Oregon and found that nearly 60% of the road network drained into streams and gullies, and are therefore, hydrologically connected with the stream network. However, the Mill Creek Subwatershed is not as steep or wet as the area studied by Wemple (1994), so hydrological connection is not as high. For instance, the project soil specialist, working on the Malheur National Forest in an area with slopes and precipitation similar to the Crawford Project, found that sediment from 70% of roads travels less than 10 feet from the edge of the road, and sediment from 90% of roads travels less than 50 feet (McNeil 1999). Similarly, the project soil specialist looked for connections between roads and streams while he was checking stream categories and doing soil assessments, and found few connections. In addition, the project soil specialist examined the 2620 Road for signs of sediment production. The 2620 Road is probably the road with the most sediment production in the project area. There are 15 places on 4.1 miles of road where sediment may enter Crawford Creek or a tributary. Total sediment production from these 15 places is probably less than 1.5 cubic yards per year. In addition to this visible sediment production, the 2620 Road probably produces sediment that cannot be easily seen, by sheet erosion from segments of road immediately adjacent to streams. This could amount to 5 cubic yards per year. However, these quantities of sediment are small compared to the hundreds of cubic yards in interstices between gravel and cobbles of the stream bed, and in pools.

The following assumptions can be used as general indicators of sediment delivery risk associated with roads: 1) the higher the road density the higher the potential for sediment yield increases due to the larger acreage of exposed surfaces, 2) the more drainage ways that are crossed the higher probability that direct sediment introduction will occur, and 3) the greater the distance, or higher on the slope, that the road is from the drainage network, the less probability for delivered sediment to occur (erosion may occur but is less likely to be routed to the stream).

Road Surface Type

Surface erosion is highly dependant on soils, road surfacing and condition, road grade, traffic volumes, and the effectiveness and spacing of drainage structures. The greatest surface erosion problems occur in highly erodible terrain, particularly landscapes underlain by granitic soils, soils of the Clarno formation, and certain highly fractured or weathered rock types. Studies have found that sediment delivery to stream systems is highest in the initial years after road construction, although raw ditch-lines and road surfaces with little binder can remain chronic sources of sediment. Native surface roads (mostly Maintenance Level 1 and 2 roads) are generally greater chronic sediment sources than surfaced, higher standard roads.

Drainage structure, function, and spacing are keys to minimizing the amount of surface flow, which directly affects surface erosion. The spacing of drain or ditch relief structures depends on the road gradient, road surface and ditch soil types, runoff characteristics, and the effects of concentrated runoff on slopes below the road. Forest Service Handbooks and other manuals provide guidelines for drainage structure spacing. Drainage structures should be close together on silt-sand soils with little to no binder on steep slopes and farther apart on gravel road surfaces with moderate binder and little to no fines on flat or minimum grades.

The majority of open and closed roads, 92%, that are located in RHCAs in the analysis area are native surface roads (Table AW – 3). Native surface roads are more likely to contribute fine sediment to streams that can adversely affect aquatic habitat compared to roads with other surface types. Most native service roads, if used other than during dry or frozen conditions cannot tolerate much traffic without rutting causing other resource problems. Adverse affects are more likely to occur where native surface roads are located adjacent to Category 1 streams. About 86% of roads located in Category 1 RHCAs in the analysis area are native surface roads (Table AW – 3). High densities of native surface roads in the Mill Creek Subwatershed are likely sources for the high fine sediment levels in Mill Creek and Crawford Creek.

Many of these roads located in RHCAs are used for recreation purposes. Elevated use of these roads occurs during hunting seasons. During dry periods typical of bow season, elevated use of native surface roads results in a breakdown of the road surface and creation of fine dust layers. During wet periods that are typical during the fall hunting seasons for deer and elk, rutting and breakdown of drainage structures (i.e. drain dips and water bars) occurs resulting in the transport of fine sediment to adjacent stream channels if effective filter strips (thick herbaceous vegetation, woody debris, etc.) are not present between the road surface and the stream channel. However, due to the hard surface and low gradient of Road 2620, only a little rutting and break-down occurs on it, and increases of fine sediment transport to Crawford Creek are small.

Table AW – 3. Miles of open and closed roads in RHCAs by surface type in the analysis area.

Surface Type	Miles in Cat 1 RHCAs	Miles in Cat 2 RHCAs	Miles in Cat 4 RHCAs	Total
Crushed Rock	0.0	0.0	0.0	0.0
Improved Native	2.7	0.0	2.1	4.8
Native Material	4.8	2.1	11.5	18.4
Asphalt	0.8	0.0	0.7	1.5
Total	**8.3**	**2.1**	**14.3**	**24.7**

Road Density

Storage and movement of water through the soil profile as subsurface flow regulates and sustains base flows. Roads expand the channel network, convert subsurface flow to surface flow, and reduce infiltration on the road surface. All of these factors affect the overall hydrology in a watershed, particularly the quantity and timing of flow.

When road ditches are constructed, they become artificial channels that expand the natural channel network. Road cuts also intercept subsurface flow and convert it to surface flow. An expanded channel network augments peak flows, since water traveling as concentrated surface flow reaches the channel faster than water traveling as subsurface flow (Wemple et al. 1996). Reduced infiltration contributes to additional surface flow, since water does not infiltrate for storage in the soil profile, but rather runs off as overland or surface flow. When roads disrupt these processes, more water becomes available during peak flows, and less water is available to sustain base flows. However, the gentle topography and dry climate of the Mill Creek Subwatershed, compared to the area studied by Wemple et al. (1996), indicates these effects are negligible to small.

While the effects of roads on the hydrology of an area depend largely on local factors, road density is an indicator of the road system's relative potential for modifying surface and subsurface hydrology; the higher the road density, the greater the potential for the road system to affect the hydrology. Mid-slope and lower-slope roads generally have a greater potential to intercept subsurface flow than roads on the upper slope.

During the Forest Roads Analysis, GIS queries were used to determine total road density (Maintenance Level 1 – 5) and the density of Maintenance Level 1 and 2 roads of each subwatershed. An assumption made was that Maintenance Level 3 – 5 roads receive more frequent maintenance and are generally a lower risk of significantly affecting aquatic resources, whereas, Level 1 and 2 roads receive less maintenance and generally less use, and are more likely to have inadequate or poorly maintained drainage. Many of the Level 1 and 2 roads were built between 1950 and 1980 and did not incorporate BMPs later developed to reduce impacts to streams. For this reason, it is assumed that the Level 1 and 2 roads have the greatest potential for affecting aquatic resources; this is consistent with road condition surveys across the Forest. *Mill Creek Subwatershed was rated as high risk for road density during the Forest Roads Analysis process.*

Recent studies from eastern Washington (Schiess et al. 2000) indicate that road density alone can be a poor indicator of sediment delivery to streams, and that other factors (e.g. road surfacing and use) may be far more important. An alternative to relying on road density standards is to identify the actual road impacts through an analysis process like a roads analysis or watershed analysis, and to monitor accomplishments of the restoration needs identified through the analysis. *Twenty six roads of concern were identified in the Crawford Roads Analysis (2001),* *and some of them contribute to impacts to aquatic resources due to fine sediment. Part or all of 18 of these roads are closed, and 2 are decommissioned.*

Road Proximity to Stream Channels (200 feet)

Roads are disturbed areas that are a potential source of sediment to the stream system, especially when there is a pathway that connects water and sediment from the road system to the local stream network. This Forest Roads Analysis used the miles of road within 200 feet of stream courses (perennial and intermittent streams) to identify the potential for connected disturbed areas, other than road-stream crossings. The following assumptions were made:

- The closer the road is to a stream or channel the higher the probability that drainage structures are connected to the stream system, especially during spring runoff or intense thunderstorm events.
- Where roads are located on flatter grades there is a possibility that dispersed campsites have developed between the road and the stream system, and that runoff from the dispersed sites reaches the stream network.
- On steeper slopes, water and sediment from drainage relief structures have a higher likelihood of reaching the stream system due to higher velocities.

Roads can directly affect physical channel dynamics when they encroach on floodplains or restrict channel migration. Floodplains help dissipate excess energy during high flows and recharge soil moisture and groundwater. Floodplain function is compromised when roads encroach on or isolate floodplains. This can increase peak flows. When peak flow increases, more water is available for in-channel erosion, which, in turn, affects channel stability. However, these effects are minor in Mill Creek Subwatershed, because the Crawford and Mill Creek flood plains are narrow – usually less than 30 feet from the stream centerline. Restricting channel migration can cause channel straightening which increases the stream energy available for channel erosion. This can also result in channel instability. These processes may have occurred during railroad construction. Altering channel pattern affects a stream's ability to transport materials, including wood and sediment. Although most roads in the Mill Creek Sub-watershed are more than 50 feet from the stream channel and are on relatively flat terrain, the subwatershed was rated as extreme risk for roads within 200 feet of stream channels during the Forest Roads Analysis process.

Road Crossings

Road-stream crossings have the potential to directly and indirectly affect local stream channels and water quality. Poorly designed crossings directly affect hydrologic function when they constrict the channel, when they are misaligned relative to the natural stream channel, or when improperly sized culverts are installed. Road-stream crossings also act as connected disturbed areas where water and sediment are delivered directly to the stream channel. However, on Road 2620, several factors (the low gradient, the ruts about 1 inch deep that often carry runoff past the stream, the hard packed and somewhat bumpy aggregate road surface, and the numerous places where runoff leaves the road), reduce sediment production to a relatively small amount. Increasing peak flows through the extended channel network could increase the energy available for in-channel erosion, which affects stream stability and increases sedimentation. However, increases in peak flows in Mill Subwatershed are negligible to small, as shown by the ERA analysis. The biggest sediment concern associated with the road system is sediment delivered to the stream system through connected disturbed areas.

Road-stream crossings act as connected disturbed areas. Connected disturbed areas are defined as high runoff areas, like roads and other disturbed sites, which discharge surface runoff into a stream. The higher the density of road-stream crossings, the higher the potential for increased sedimentation to the stream networks. Mill Creek Subwatershed was rated as extreme risk for the number of road crossings during the Forest Roads Analysis process. However, the road and stream GIS layers that were used in the Forest Roads Analysis were not precise, and this resulted in an over-estimate of the number of crossings in Mill Creek Subwatershed.

Roads cross Crawford Creek nine times in the lower 2.7 miles. Eight of the crossings are culverts of which four are rated as fish passage barriers. The ninth crossing of Crawford Creek (FSR 2620190) has been effectively closed to all vehicles and this road is proposed for decommissioning. No culverts on Mill Creek were identified as passage barriers during the Forest culvert survey.

Of the nine crossings on Crawford Creek, seven are culverts located along FSR 2620. Four of the culverts are impassable to all life stages of salmonids. These culverts impede the movement of adult steelhead and redband trout attempting to spawn in Crawford Creek and prevent the movement of juvenile steelhead and redband trout.

Adverse impacts to aquatic habitat due to FSR 2620 have been documented in the past. These impacts include decreased fish passage, sediment production, possible temperature increases, and possible Large Woody Debris decreases. Forest aquatics specialists have recommended that the road be relocated. However, this road is a main thoroughfare and was identified to be retained during the Forest Roads Analysis. A viable alternative to this road was not identified and as a result the FSR 2620 will be maintained as a Level 2 road.

Overall Watershed/Aquatics Risk from Roads

A numerical system was used to determine the overall or cumulative watershed risk of the different factors such as road density, road proximity, etc. Each factor was given a numerical value, and the values for the individual factors were added together to come up with an overall watershed risk rating. The risk rating represents the road system's potential to degrade watershed function and aquatic habitat. *Mill Creek Subwatershed was rated as High Risk for overall watershed risk and for overall aquatics risk.*

Livestock Grazing

Livestock grazing has occurred in the project area since the 1800s. Prior to the 1930s, grazing on public land was unregulated and occurred all season long, which resulted in adverse environmental consequences such as soil erosion, loss of vegetation and changes in species composition and watershed modifications. Some impacts are still observable today. Some sites where shallow soil eroded, may take well over a hundred more years for the soil profile to recover.

During the mid 1900s, the Forest Service took significant action to regulate numbers, establish workable grazing seasons, and set up allotments. This action continued into the latter half of the 1900s when emphasis shifted to development of management systems and regulation of effects on specific resources.

In 1950, Congress enacted the Granger-Thye Act (P.L. 81 – 478) to establish controls and stewardship toward the public land grazing resource. The core of the Granger-Thye Act was to link the use of public land to an established private landowner who would bring stability to the community and produce a sustainable level of forage and wildlife habitat. This law established the direction for National Forest System allotment management, including the authorization to issue grazing permits for terms up to 10 years; authorization to use grazing fee receipts for rangeland improvement; and the establishment of grazing advisory boards.

Improved grazing systems and pasture designs were implemented in the late 1970s and throughout the 1980s to accelerate allotment recovery. There were also reductions in allowable use during this same period. Implementation of the Forest Plan in the early 1990s again reduced the amount of allowable use by livestock to accelerate the rate of recovery in riparian areas, and limited utilization of shrubs. The Forest Plan was amended by PACFISH in 1995 to further protect and restore aquatic habitat. In the mid to late 1990s, bull trout and mid-Columbia River steelhead were listed as "Threatened" under the Endangered Species Act (ESA). Design measures associated with ESA consultation for grazing activities were implemented in an effort to further protect riparian areas and associated aquatic habitat.

Portions of two active grazing allotments are located within the Mill Creek Subwatershed; these include Upper Middle Fork C&H and Blue Mountain C&H Allotments. Portions of two additional allotments are located within the Mill Creek Subwatershed, Austin On/Off and Sullens C&H. In 2007, decisions were made not to graze the Austin On/Off or Sullens C&H Allotments.

The analysis area east of Highway 7 is located in the Blue Mountain allotment. The Blue Mountain allotment is an active allotment but has not been grazed since 2005. Monitoring conducted in 2004 on the Middle Fork, Squaw Creek, and Summit Creek found that these streams were functioning at risk but with an upward trend in condition. Some areas of concern have been identified along Crawford Creek.

The analysis area west of the Highway 7 is located in the Upper Middle Fork allotment. This allotment has been rested at least seven of the last 15 years and has transferred between three different permit holders. There are no fish bearing streams within the project area except for about 1000 feet of Mill Creek.

Private lands in the analysis area are also used for livestock grazing. The Middle Fork in the private land portion of Phipps Meadow has been fenced to exclude livestock grazing. This reach of the Middle Fork exhibits stable stream banks with a high proportion of late seral vegetation. Grazing management practices on private land along the Middle Fork in the vicinity of Bates and Austin may be impacting the river and aquatic habitat because the shrub component is lacking as observed from Highway 7.

Past grazing management practices (prior to the adoption of the Forest Plan in 1990) likely impacted aquatic habitat and water quality due to reductions in shading and bank-stabilizing wetland vegetation, stream bank alteration, increases in width-to-depth ratios and fine sediment levels. Improved management practices, on both private land (such as the corridor fence along the Middle Fork in Phipps Meadow) and Forest Service land, have resulted in improved aquatic conditions. Recent range monitoring indicates that there is an upward trend in channel and stream bank vegetation in the Upper Middle Fork John Day Watershed.

General Existing Stream Conditions

Information used to summarize the current watershed conditions included stream surveys, visits to the project area, project records for the Flat Timber Sale and Crawford Timber Sale EA (2002), and information from the Upper Middle Fork John Day River Watershed Analysis (1998). There are three Category 1 streams in the analysis area: the Middle Fork, Mill Creek, and Crawford Creek. Stream surveys have been conducted on all three streams (Table AW – 4).

Table AW – 4. Stream Habitat Surveys Conducted in the Crawford Analysis Area.

Stream	Survey Year	Agency	Reach No's in the Analysis Area	Survey Length (mi)
M.F. John Day River	1992/96	ODFW	11–16	6.4
Mill Creek	1993	USFS	1	1.1
Crawford Creek	1993	USFS	1, 2	3.8

1) ODFW=Oregon Dept. Fish and Wildlife, USFS=U.S. Forest Service

PACFISH RMOs and Forest Plan Amendment 29 DFCs

Important aquatic habitat elements as defined by PACFISH and/or Forest Plan Amendment 29 include: pool frequency, water temperature/stream shading, large woody debris, bank stability, width to depth ratio, and embeddedness. These habitat elements are important in maintaining aquatic habitat function and health. Stream survey information was analyzed to compare existing habitat conditions to Forest Plan RMOs / DFCs for aquatic habitat (Table AW – 5).

Table AW – 5. Fish Habitat Summary Data for Category 1 Streams in the Crawford Analysis Area.

Stream Name	Pools/ Mile	Pieces LWD[1]/Mile	% of Units Embedded	% of Particles < 2mm	Wetted W/D Ratio	% Stable Banks
Crawford Creek	17[1]	13.6	100	—	7.9	99
Mill Creek	31[1]	0.0	100	—	9.1	91
M.F. John Day River	17[2]	0.3	—	28	12.7	79
PACFISH RMO	96[1] 56[2]	20	—	—	<10	>80
Amend 29 DFC	75–132[1] 38–66[2]	80–120[3]	<20	—	<10	>90

Notes: 1) channels of <10 feet in width, 2) channels of >10 to 20 feet in width, 3) mixed conifer ecosystem.

Channel Types

Region 6 uses the Rosgen classification system (Rosgen 1996) to classify channel types. Fish-bearing streams in the analysis area are composed of B4/5 and C4 channel types, although the lower reaches of Mill and Crawford Creeks have characteristics of Fb channels. B channels are normally present where valley gradients are less than 4% and the valley floor is moderately constrained by valley sidewalls. B channels have step-pool channel morphology and a relatively narrow floodplain. Generally, B channels are considered one of the most stable channel types and one of the most resistant to management induced changes in channel morphology (Table AW – 6). However, B4/5 channels may be more susceptible to management activities due to the finer material that can compose their bed and banks. Steelhead and redband trout typically spawn and rear in second to fourth order streams in forested environments which typify B channels. Even when small streams are not accessible to migrating fish due to barriers or steep gradients, they are vitally important to the quality of downstream habitats.

C channels are normally present where valley gradients are relatively low with little to no constraint by valley sidewalls. C channels have pool-riffle morphology with a floodplain wide enough to accommodate meandering. C channels are less stable than B channels and vegetation is important for maintaining the stability of the bed and banks (Table AW – 6). Spring Chinook salmon usually spawn and rear in C channels.

Table AW – 6. Sensitivity of Channel Type to Disturbance, Bank Erosion Potential and Influence of Vegetation for Channel Types Present in the Crawford Project Area. Adapted from Rosgen 1996.

Channel Type	Sensitivity to Disturbance	Bank Erosion Potential	Vegetation Influence on Bank Stability
B4	Moderate	Low	Moderate
C4	Very High	Very High	Very High

In the analysis area, Reaches 1 and 2 of Mill Creek and Crawford Creek would be expected to be B4/5 channel types based on their valley types (Table AW – 7). Currently these reaches exhibit characteristics of Rosgen Fb channels and wider pool spacing (i.e. number of bankfull channel widths between pools) than would be expected, which indicates they have been altered by management activities, including grazing, channel modifications from railroad logging, riparian logging and riparian road construction. The F channel type probably is also partly due to the intermittent to very low perennial flows, which reduces the amount of bank stabilizing wetland vegetation in the channel and flood-prone-zones. Rosgen F channel types are undesirable in that their peak flows are more powerful than B types (making establishment of flood-prone-zone and channel vegetation more difficult), they have high bank erosion rates and produce more sediment than B types, and have high width/depth ratios (which lead to increased temperatures). The intermittent flow of Crawford Creek and very low flows in Mill Creek make establishment and growth of riparian vegetation even more difficult.

Reach 14 of the Middle Fork would be expected to be a C4 channel with some smaller areas of B4 channel type in the more confined areas of the valley based on its valley type (Table AW – 7). Reaches 11 through 13 would be expected to be a C channels. Reaches 15 and 16 would be expected to be C or E channels. All reaches of the Middle Fork in the analysis area appear to have been altered by management activities as evidenced by wide width-to-depth ratios and wider than expected pool spacing for four of the six reaches.

Activities that have resulted directly in these changes in channel types are construction and use of logging railroad systems from the early 1900s to the late 1940s and the construction and use of the truck logging road system since the late 1940s. Livestock grazing along the Middle Fork has also likely contributed to the alteration of the channel.

Table AW – 7. Comparison of Current Channel Features to Expected Channel Characteristics.

Stream	Reach	Expected Reach Type	Current Width to Depth Ratio[1]	Current Pool Spacing[2]	Expected Pool Spacing[2]
Crawford Creek	1	B4	8.4	23	4 to 6
	2	B5	—	137	4 to 6
Mill Creek	1	B4	6.1	19	4 to 6
Middle Fork	11	C4	22.7	14	5 to 7
	12	C4	29.7	8	5 to 7
	13	C4	12.9	17	5 to 7
	14	C/B4	31.6	41	5 to 7
	15	C/E4	22.7	5	5 to 7
	16	C/E4	19.0	11	5 to 7
Notes: 1) bankfull, 2) Number of bankfull channel widths between pools.					

Affected Environment and Environmental Effects – Aquatic Habitat and Water Quality

Pool Frequency – Affected Environment

Pool frequency is a gage of aquatic habitat diversity, and is an indicator of the degree to which streams are capable of supporting a varied and complex community of fish species. Pools are important for providing rearing habitat for juvenile fish and cool-water refuge areas for adult fish during periods of low flow and elevated temperatures. Pool spacing varies by channel type (Rosgen 1996). Deep pools also provide important habitat for adult Chinook salmon, steelhead, and fluvial bull trout during migration and holding periods prior to spawning.

Pool habitat can be reduced where management activities result in reductions of pool forming elements (e.g. LWD), changes in bedload (e.g. large increases in fine sediment), or changes in channel morphology (e.g. widening or straightening). Pool frequencies may have been lower in Crawford and Mill Creeks naturally than many other streams because the supply of LWD is probably naturally low.

Stream surveys indicate that the Forest Plan DFC/RMO for pool frequency is not being met in the Middle Fork, Mill Creek, and Crawford Creek (Table AW – 5). Pool spacing is higher for most stream reaches compared to potential channel types in the analysis area (Table AW – 7). This indicates a loss of pool habitat as a result of past management activities, especially riparian logging and channel modification during railroad logging and road building.

Pool Frequency – Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of pool habitat. Existing levels of pool habitat are below the potential levels for all streams in the analysis area (Tables AW – 5 and AW – 7) and limit important habitat for salmonids, especially for adults migrating prior to spawning.

Alternative 2 – Proposed Action

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under the proposed action. Restricting these activities to areas outside of RHCAs will prevent adverse impacts to existing pool habitat and future pool habitat. RHCA widths for Category 1 streams are sufficient to prevent removal of trees that have the potential to fall into stream channels and create pool habitat.

Approximately 5.6 miles of haul routes and approximately 4.9 miles (Table AW – 8) of road maintenance will occur in RHCAs. Felling of danger trees for human safety along haul routes in RHCAs has the potential to reduce the supply of LWD to stream channels and therefore pool habitat. Under PACFISH, trees may be felled in RHCAs when they pose a safety risk (PACFISH Standard RA-2). Brushing out and/or conifer removal, in conjunction with road reconstruction activities, will occur within approximately 0.7 miles within Category 4 RHCAs. Brushing out and/or conifer removal would be limited in scope and would only occur to improve sight distance for safety reasons, for curve widening, and/or to restore road running surface width. Where large danger trees within RHCAs can only safely be felled across the road, that portion of the tree within the roadway will be removed if merchantable or placed out of the roadway. Proposed road maintenance, road reconstruction and/or haul activities would not likely result in a reduction of LWD to Category 1, 2, or 4 stream channels because in most cases, trees that can only safely be felled across the road, often have a lean away from the stream channel and would be less likely to fall into stream channels where they could function in the formation of pools and/or contribute coarse particulate organic matter directly to the stream.

Table AW – 8. Miles of Haul Routes and Maintenance/Reconstruction Activities in RHCAs Proposed Under Alternative 2.

Activity	Miles in Cat 1 RHCAs	Miles in Cat 2 RHCAs	Miles in Cat 3 RHCAs	Miles in Cat 4 RHCAs
Haul	2.4	<0.1	0.0	3.2
Maintenance	2.4	<0.1	0.0	2.5
Reconstruction	0.0	0.0	0.0	0.7

Prescribed Fire Activities

Prescribed fire activities in RHCAs would mimic low intensity fires that are characteristic of natural burning patterns that tend to occur in riparian areas. This would be accomplished by not actively lighting fires in RHCAs but, allowing fires to back into RHCAs from adjacent upslope areas. This technique would result in a patchy distribution of burned and unburned areas in RHCAs based on the forest's experience with past prescribed burning activities in RHCAs using the same technique. Using these techniques, mortality of understory trees would occur in burned patches but few overstory trees would be killed. Fire intensities would not be high enough to consume trees or downed wood large enough to function as LWD (greater than 20 inch diameter) in stream channels. Therefore, burning activities would not result in a reduction of pool habitat. The reduction in stocking densities following burning activities would increase the vigor of larger trees in the overstory for future LWD.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities are proposed under Alternative 2. About 1.5 miles of road would be closed including less than 0.1 mile in a Category 4 RHCA. Closed roads are those roads on which motorized traffic has been excluded by regulation, barricade blockage, or by obscuring the entrance. A closed road is still an operating facility on which motorized traffic has been removed (year-long or seasonal) and remains on the Forest Road Transportation System. Roads would be closed using gates or signs. Closed roads would be left in a stable condition and maintained.

Road decommissioning results in the removal of a road from the permanent transportation system of the Forest. The impacts of the road on the environment are eliminated or reduced to an acceptable level; the goal is to leave the road in a "hydrologically disconnected" state and convert the former roadway to other resource use. The National Forest Management Act (NFMA) requires "re-establishing vegetative cover" on decommissioned roads within 10 years {16 USC 1608(b)}. To accomplish this, techniques such as posting and installing barriers and barricades, installing drainage structures (e.g., drain dips, waterbars), ripping/subsoiling and seeding, and converting the road to a trail, can be used.

Proposed decommissioning activities consist of removal of one culvert on FSR 2620156, ripping/subsoiling and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use and ensure proper drainage occurs over time.

Road closure/decommissioning activities would not include removal of trees that could function as LWD in stream channels; therefore reductions in existing pool habitat would not occur.

About 5.8 miles of road would be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek. Conifers would be planted in decommissioned road segments in RHCAs as part of the decommissioning process. Over the long-term (70 to 100 years) LWD would increase as planted conifers become established and grow to a size that enables them to function as LWD and therefore increase pool habitat in the future.

Alternative 3

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 3. Temporary roads would be limited to short segments (less than 500 feet) to access landings and would not be constructed in RHCAs. The miles of haul route in RHCAs, 5.5 miles under Alternative 3, would remain essentially the same compared to Alternative 2. Felling of danger trees along haul routes, number and locations would be the same as under Alternative 2.

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2. See effects discussion for Alternative 2.

Alternative 4

Timber Harvest Activities

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities. There would be no effects from timber harvest activities on the pool frequency.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

The hazard from severe wildfire would be lower under this alternative than Alternative 1, and higher than Alternatives 2 and 3, as shown in the Fire and Fuels section of Chapter 3. Effects of a severe wildfire would be the same as described for Alternative 1.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 4 would be the same as Alternative 2.

Large Woody Debris – Affected Environment

LWD plays an important role in forested stream reaches. LWD aids in dissipating stream energy, trapping sediment and the formation of pools and associated aquatic habitat. Stream surveys and field reconnaissance indicate that the Forest Plan DFC/RMO for LWD quantity is not being met in the Middle Fork, Mill Creek, or Crawford Creek (Table AW – 5). Both Mill and Crawford Creeks were likely typical Rosgen B channel types prior to being altered by management activities. LWD and large rocks are the main components of fish habitat (e.g. pools, pocket pools, and cover) in B channel types. Natural supply of LWD for the three streams is probably low, due to the stringer meadow vegetation that is common along them. Reduction of LWD in B channels can result in a decrease in pool frequencies and a reduction in cover.

Quantity of LWD in streams can be altered by removal of streamside trees for timber production or firewood, or salvage of instream pieces. Timber has been harvested from areas adjacent to streams in the analysis area (see Effects of Past and Ongoing Action section above). In the past, firewood could be taken from streamside areas. Illegal cutting of snags or down wood for firewood may still be taking place. In extreme cases, large increases in peak flows and/or large increases in channel width can result in destabilization of instream pieces and subsequent transport downstream thus resulting in a decrease in LWD. However, increases in peak flows in Mill Creek Subwatershed are negligible to small.

Large Wood Debris – Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of LWD. Current levels of LWD are below desired levels in Crawford Creek, Mill Creek, and the Middle Fork (Table A – 5) and are likely resulting in decreases in pool habitat. Replacement LWD would be recruited into stream channels as conifers die and fall into streams. Large trees (21 to 32 inch dbh) accounted for 15% of floodplain vegetation along Mill Creek. Within 25 years, LWD would likely increase over current levels in Mill Creek because large trees are present in the floodplain. No large trees were present along the floodplain of Reach 1 of Crawford Creek. Only large trees were present in the floodplain along Reach 2 of Crawford Creek. It is unlikely that LWD levels would increase over current levels in Reach 1 Crawford Creek within 25 years due to the lack of large trees near the creek. FSR 2620 is located near Crawford Creek – about 1.4 miles is located within 50 feet of the channel which decreases the area available for LWD growth, and makes it more likely that firewood cutters would illegally remove wood.

The hazard from severe wildfire would be higher under this alternative than the action alternatives, as shown in the Fire and Fuels section of Chapter 3. If a severe wildfire does occur, a pulse of large wood likely would fall in Mill Creek and Reach 2 of Crawford Creek. The development of large wood along Reach 1 of Crawford Creek would be postponed for a few more decades. This describes the effect of severe wildfire under all alternatives.

Alternative 2

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 2. Restricting these activities to areas outside of RHCAs would prevent adverse impacts to LWD supply and future pool habitat.

Approximately 5.6 miles of haul routes and approximately 4.9 miles of road maintenance (Table AW – 8) will occur in RHCAs. Felling of danger trees for human safety along haul routes in RHCAs has the potential to reduce the supply of LWD to stream channels. Under PACFISH, trees may be felled in RHCAs when they pose a safety risk (PACFISH Standard RA-2). Brushing out and/or conifer removal, in conjunction with road reconstruction activities, will occur within approximately 0.7 miles within Category 4 RHCAs. Brushing out and/or conifer removal would be limited in scope and would only occur to improve sight distance for safety reasons, for curve widening, and/or to restore road running surface width. Where large danger trees within RHCAs can only safely be felled across the road, that portion of the tree within the roadway will be removed if merchantable or placed out of the roadway. Proposed road maintenance, road reconstruction and/or haul activities would not likely result in a reduction of LWD to Category 1, 2, or 4 stream channels because in most cases, trees that can only safely be felled across the road, often have a lean away from the stream channel and would be less likely to fall into stream channels where they could function in the formation of pools and/or contribute coarse particulate organic matter directly to the stream.

Prescribed Fire Activities

Prescribed fire activities would occur in RHCAs to a limited degree. Burning activities would mimic low intensity fires that are characteristic of natural burning patterns in riparian areas. This would be accomplished by not actively lighting fires in RHCAs while allowing fires to back into RHCAs from adjacent upslope areas. This technique would result in a patchy distribution of burned and unburned areas in RHCAs. Using these techniques, mortality of understory trees would occur in burned patches but few overstory trees would be killed. Fire intensities would not be high enough to consume trees or downed wood large enough to function as LWD (greater than 20 inch dbh) in stream channels therefore burning activities would not result in a reduction of pool habitat. The reduction in stocking densities following burning activities would increase the vigor of larger trees in the overstory.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities would not result in removal trees that could function as LWD. About 5.8 miles of road will be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek (Table AW – 9). Conifers would be planted in decommissioned road segments as part of the decommissioning process. Over the long-term (50 to 70 years) the supply of LWD would increase as planted conifers become established and grow to a size that where they would provide LWD to stream channels.

Table AW – 9. Miles of Roads Proposed for Decommissioning in RHCAs.

Miles in Cat 1 RHCAs	Miles in Cat 2 RHCAs	Miles in Cat 3 RHCAs	Miles in Cat 4 RHCAs
1.6	0.2	0.0	4.0

Alternative 3

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 3. Timber harvest activities would be reduced under Alternative 3 compared to Alternative 2.

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2. See effects discussion for Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2. See effects discussion for Alternative 2.

Alternative 4

Timber Harvest Activities

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities. There would be no effects from timber harvest activities on LWD.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

The hazard from severe wildfire would be lower under this alternative than Alternative 1, and higher than Alternatives 2 and 3, as shown in the Fire and Fuels section of Chapter 3. Effects of a severe wildfire would be the same as described for Alternative 1.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 4 would be the same as Alternative 2.

Bank Stability – Affected Environment

The Forest Plan DFC for stream bank stability is for 90% of the banks to be stable. Channel types differ in their sensitivity to management activities due to differences in bank erosion potential and the influence of streamside vegetation on bank stability (Table AW – 6). Mill Creek and Crawford Creek are meeting the Forest Plan DFC for bank stability (Table AW – 5). However, since these creeks exhibit characteristics of Rosgen F channel types, they may not be as stable as the fish habitat surveys indicate. The Middle Fork has areas of low bank stability, primarily on the National Forest (not private) portion of Phipps Meadow and on private land downstream of Highway 7. Bank stability can be directly affected by mechanical damage to banks or indirectly through changes in bank vegetation.

Bank Stability – Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of bank stability. Bank stability is generally high in the analysis area. Range allotment monitoring in the Blue Mountain allotment indicates that bank stability is on an upward trend. This trend is expected to continue under current grazing levels.

Alternative 2 – Proposed Action

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 2. Restricting these activities to areas outside of RHCAs would prevent adverse impacts to bank stability. Therefore, direct and indirect impacts to banks and bank stability from logging activities would not occur. In addition, harvest would not increase peak flows, as described in the Cumulative Effects, ERA section.

Existing bank vegetation would be protected during road maintenance/reconstruction activities in RHCAs. Road reconstruction activities would not extend outside of existing road prisms in RHCAs. Therefore, road maintenance/reconstruction activities would not result in a decrease in current bank stability levels.

Prescribed Fire Activities

Prescribed fire activities would occur in RHCAs to a limited degree. Burning activities would mimic low-intensity fires that are characteristic of natural burning patterns in riparian areas. This would be accomplished by not actively lighting fires in RHCAs while allowing fires to back into RHCAs from adjacent upslope areas. This technique would result in a patchy distribution of burned and unburned areas in RHCAs. Using these techniques, some stream bank vegetation would burn; however, herbaceous plants should recover in the second year following the burning activities. Shrubs in burned areas would likely be top killed but fire intensities would be low enough not to result in complete mortality of shrubs. Stream bank stability would be decreased in burned areas until vegetation recovers. However, it is unlikely that burned patches along stream banks would be in sufficient sizes or quantity to result in an overall decrease in bank stability.

Road Closure/Decommissioning Activities

Existing bank vegetation would be protected during road closure/decommissioning activities in RHCAs. Road closure/decommissioning activities would not extend outside of existing road prisms in RHCAs. Therefore, road closure/decommissioning activities would not result in a decrease in current bank stability levels. Where decommissioned road segments are directly adjacent to stream channels, bank would be strengthened after about 10 years as planted conifers grow.

Alternative 3

Timber Harvest Activities

Timber harvest activities and effects would be the same as Alternative 2.

Existing bank vegetation would be protected during road maintenance/reconstruction activities in RHCAs. Road reconstruction activities would not extend outside of existing road prisms in RHCAs. Therefore, road maintenance/reconstruction activities would not result in a decrease in current bank stability levels.

Prescribed Fire Activities

Prescribed fire activities and effects would be the same as Alternative 2.
Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2, therefore impacts to bank stability would not occur.

Alternative 4

Timber Harvest Activities

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities. Impacts to bank stability would not occur.

Prescribed Fire Activities

Prescribed fire activities and effects would be the same as Alternative 2.

The hazard from severe wildfire would be lower under this alternative than Alternative 1, and higher than Alternatives 2 and 3, as shown in the Fire and Fuels section of Chapter 3. Effects of a severe wildfire would be the same as described for Alternative 1.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 4 would be the same as Alternative 2. See effects discussion for Alternative 2.

Embeddedness/Fine Sediment – Affected Environment

Composition of the stream substrate is an important feature of aquatic habitat. Cobble and gravel substrates provide habitat for a diverse assemblage of benthic macro invertebrates as well as eggs and early life stages of numerous fish species. Macro invertebrates represent a substantial portion of the diet available to various fish species.

Filling of interstitial spaces (i.e. gaps between rocks on the stream bottom) with fine sediment (particles less than 2 mm in size) reduces habitat for many macro invertebrates. Fish eggs and early life stages can also be buried and smothered when interstitial spaces are embedded with fine sediment. Winter habitat for juvenile salmonids is also lost as interstitial spaces are filled.

Embeddedness data is no longer collected during Region 6 stream surveys. Instead, stream substrate data is collected using pebble count procedures. Either methodology can be used to estimate the amount of fine sediment in streams. Adverse impacts to macro invertebrates and fish can occur where fine sediment exceeds 20% of the surface area of the streambed or embeddedness exceeds 20%. However, newer science indicates cobble embeddedness estimations may not be repeatable, and so embeddedness data may be in error.

Fine sediment in streams is a normal component of salmonid habitat; however, major disruption of the system occurs when sediment levels substantially exceed natural levels. Deposition of fine sediment can eliminate habitat for aquatic insects; reduce density, biomass, and diversity of aquatic insects; reduce permeability of spawning gravels; and reduce emergence of fry from redds (Nelson et al. 1991). Studies have shown that an increase in 1 – 3 mm size sand from 20 to 30% can decrease emergent survival of salmonid species from 65% down to 40% (Phillips et al. 1975). Fine sediments are known to impact fry emergence and survival, and fine sediment (less than 6.5 mm in size) levels above 40% can effectively eliminate salmonid populations and many macro invertebrate species (Everest and Harr 1982).

Increases in fine sediment can occur due to increased transport of fine sediment from upland areas, riparian areas, and destabilized stream channels. Increases can result from both episodic sources such as wildfires or from chronic sources such as roads. Episodic sources normally result in increases that return to pre-disturbance levels after about 10 years through recovery processes. Chronic sources can result in lasting changes of stream channels and aquatic habitat.

Both Mill and Crawford Creeks were embedded 100% and did not meet the Forest Plan DFC (<= 20%) in 1992 (Table AW – 5). The conditions persist. The likely sources for fine sediment in Mill and Crawford Creeks are activities in riparian areas, including channel modifications from railroad logging, channel erosion, livestock grazing (especially past grazing), and roads. Several roads in the project area have been identified as potential sources of fine sediment.

FSR 2620 is the most problematic road in the project area for effects to aquatic resources. FSR 2620 is currently a Level 3 road, but due to budget restraints, has received very little maintenance in recent years. Some aggregate is eroding into Crawford Creek, leaving exposed cobbles in the subgrade. Erosion of the road surface is contributing a small amount of sediment into Crawford Creek during periods of intensive run-off. The lack of dust control measures also increase sediment during periods of high use during dry periods, such as during bow season; this also shortens the life of the road surface (leading to rutting during wet periods, which also contributes to sediment run-off).

The Middle Fork also has high fine sediment levels. Overall, fine sediment (less than 2 mm) made up 28% of the streambed (Table A – 5). Highest levels of fine sediment were in Reach 15 (59%) and Reach 16 (76%). These two reaches are directly below Phipps Meadow where a series of beaver dams failed and a subsequent downcutting event occurred in the mid-1990s.

Recent culvert replacements on Bridge Creek, Lunch Creek and South Fork Bridge Creek may temporarily increase (about two years) fine sediment levels for about 1/2 to one mile downstream from each culvert location (see Appendix D).

Embeddedness/Fine Sediment – Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of fine sediment/embeddedness over much of the analysis area. Existing fine sediment levels are likely having adverse impacts to aquatic habitat. These adverse effects include reduced spawning success for salmonids and reduced quality of winter habitat for juvenile salmonids. Fine sediment levels in Mill and Crawford Creeks would slowly decrease as channels stabilize from past grazing and road building. However, native surface roads that are contributing fine sediment would stay in their current condition. The extremely high fine sediment levels in the upper reaches of the Middle Fork in the analysis area would decline through time as the channel adjusts and recovers from the downcutting event that occurred in the mid- 1990s.

The hazard from severe wildfire would be higher under this alternative than the action alternatives, as shown in the Fire and Fuels section of Chapter 3, Tables F – 5 through F – 12. If a severe wildfire does occur, a pulse of sediment would probably enter the streams due to soil erosion and due to channel erosion from increased peak flows and decreased root structure on intermittent and ephemeral channels. This describes the effect of severe wildfire under all alternatives.

As noted by Dunham et al. (2003), the effects of wildfires depend on a variety of factors including their timing, location, area, extent, and intensity. Other factors include the characteristics of the ecosystems and the species affected along with other indirect physical and ecological linkages. While such events can cause short term negative effects, such as those listed below, over long time periods the resulting habitat conditions may be more productive then in areas where natural disturbance has been suppressed (Dunham et al. 2003). Wildfires can have a number of detrimental effects to stream channels such as decreasing stream channel stability, increasing discharge and affecting discharge variability, altering coarse woody debris delivery and storage, increasing nutrient availability, increasing sediment delivery and transport, increasing solar radiation and altering water temperature regimes (Dunham et al. 2003). In cases where natural stream processes are already impaired such as Crawford Creek, the recovery of the stream ecosystem from the effects of severe wildfire is likely to be slower, more sporadic, and potentially incomplete (Minshall 2003).

Alternative 2

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 2. Restricting these ground disturbing activities to areas outside of RHCAs, along with erosion control BMPs for skidding, roads, and temporary roads, would prevent additional increases in existing levels of fine sediment from these activities. PACFISH RHCA buffer widths were designed to provide an area to trap fine sediment generated from upslope activities such as timber harvest. BMPs limiting draw bottom skidding and the location of landings (Chapter 2) make sediment production from units negligible.

Only 2.3 miles of temporary road would be within 500 feet of streams (all outside of RHCAs). Of the 8.6 miles of temporary road, approximately 3.7 miles would be constructed on slopes

<10%, 3.9 miles on slopes between 10-20% and 1.0 mile on slopes >20%. All temporary roads would be decommissioned after use. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. This will include subsoiling and seeding as necessary.

Log and rock haul on authorized roads would occur in RHCAs. There would be about 5.6 miles of haul route along RHCA roads (Table AW – 8). The estimated number of log truck loads would be 1,789 under Alternative 2. Road maintenance/reconstruction activities would occur on all 5.6 miles of road in RHCAs (Table AW – 8). Road maintenance/reconstruction would occur in existing roads prisms, not in streams. Road maintenance activities would consist of:

- blading and shaping road surfaces,
- repairing a damaged ditch-relief culvert,
- rocking existing drain dips and grade sags where needed,
- rocking wet areas of road,
- brushing,
- removal of danger trees, and
- dust abatement.

Road reconstruction activities would consist of:

- Constructing new drainage dips and waterbars,
- Constructing new outlet ditches,
- Placing geotextile material on existing road surfaces,
- Repair or replacement of existing cattle guards, and
- Tree and stump removal.

Use of log and rock haul routes in RHCAs probably would result in creation and transport of a negligible amount of fine sediment to stream channels, due to loosening of sediment particles and destruction of ground cover by maintenance/reconstruction and by traffic. However, BMPs (Chapter 2, Appendix F) implemented during forest management activities, including log and rock haul, would control fine sediment, keeping amounts reaching stream channels to negligible levels for other than rare precipitation events. Blading and reshaping road surfaces, replacing a damaged ditch-relief culvert, applying rock, constructing new drain dips and waterbars, constructing new outlet ditches, and placing geotextiles would all reduce erosion. Machinery would be kept on the road prism. In addition, haul activities would only occur on dry or frozen roads to prevent damage to roads and drainage structures.

Dust abatement is the application of a product, which either bonds dust particles and fines to larger matter or makes them heavier, so they tend not to rise with the passage of vehicles. The purpose of dust abatement is to prevent loss of surface fines, enhance vehicle safety, and in some cases, prevent pollution and provide vehicle occupant comfort. Water is the only agent that would be used for dust abatement for proposed haul activities.

Water would be drafted from designated water sources. Water drafting could potentially decrease stream flow and thus, the amount of water available for fish. Water drafting could also remove fish from the stream or injure them, if they are held against screens. Designated water sources for the Crawford Project are the developed water drafting sites on Clear Creek (located near the Blue Mountain Work Center) and the rock pit at Taylor Flat. Water drafting can occur only as long as supply is adequate to provide for both fish and withdrawal. Approved screens would be attached to intake hoses to prevent adverse impacts to fish. NMFS developed criteria for pump intake screens would be used on all water pump intakes. Screen mesh openings shall not exceed 3/32 inch for woven wire or perforated plate screens, or 0.0689 inch for profile wire screens, with a minimum 27% open area. Trucks would be maintained to prevent oil leaks. Loading is done in a manner to minimize overflowing and discharge of wash into stream. The maximum withdrawal from one site in an 8 – hour period would be 18,000 gallons of water. Water drafting guidelines from the 2005 Forest Road Maintenance BA would be followed during drafting activities. These guidelines would prevent the potential harm to fish.

Prescribed Fire Activities

Prescribed fire activities would occur in RHCAs to a limited degree (see Anadromous Riparian Areas discussion in Chapter 1,) in addition to upland areas. Burning activities would mimic low intensity fires that are characteristic of natural burning patterns in riparian areas. This would be accomplished by not actively lighting fires in RHCAs but, allowing them to back into RHCAs from adjacent upslope areas. This technique would result in a patchy distribution of burned and unburned areas in RHCAs. Using these techniques, fire intensities would not be high enough to consume downed wood that plays a role in trapping fine sediment. Some ground cover would be consumed but would be quickly replaced as litter fall occurs in the first year following burning and herbaceous plants recover in the second year following burning. Prescribed fire would be excluded from approximately 265 acres of Category 1 and 4 RHCA where riparian hardwoods are exhibiting improvement. Mill Creek Subwatershed was rated as at low risk for erosion potential during the Forest Roads Analysis due to the geology, soils, and topography of the subwatershed. A measurable increase in fine sediment in stream channels as a result of burning activities is unlikely due to the combination of a patchy, low intensity burn in RHCAs, typical recovery of ground cover within 2 years of burning, and the low erosion potential for the subwatershed. Beche et al. (2005) conducted intense post-prescribed fire monitoring (e.g. pebble counts, longitudinal profiles, cross-sections) and observed little to no change in stream sediment composition 1 year post-fire. Similarly, they observed little to no change in stream channel morphology and no substantial change in erosion or deposition in the surveyed reaches (Beche et al. 2005).

Road Closure/Decommissioning Activities

Closed roads are those roads on which motorized traffic has been excluded by regulation, barricade blockage, or by obscuring the entrance. A closed road is still an operating facility on which motorized traffic has been removed (year-long or seasonal) and remains on the Forest Road Transportation System. Closed roads would be left in a stable condition and maintained. About 0.7 miles of currently open road would be closed within the Mill Creek Subwatershed. Drainage structures would be self-maintaining after closure. Closure of these roads poses a negligible risk of sedimentation to fish bearing streams since dry land "filtration" lies between the closure sites and any streams, and since the amount of land disturbed during gate construction is too small and too flat to produce significant sediment. However, since these roads are being kept as part of the forest road system, the benefits of the closures would likely not be “permanent.”

Reopening non-riparian segments of the 2600235 and 2600237 Roads in order to allow decommissioning of a riparian segment of the 2600237 Road, would eliminate sediment concerns from the 237 Road.

The effects of road decommissioning are beneficial for water quality and fish habitat, starting about 2 years after the decommissioning. The improved infiltration and ground cover condition of the decommissioned roads would help restore natural watershed function, including reduced sediment yield from the road prism.

The procedure for decommissioning a road would include removing all culverts and reshaping the immediate area. In addition, cross ditches would be constructed to maintain drainage and reduce the potential for surface erosion. These measures would be implemented during decommissioning to “hydrologically disconnect” road from streams, to reduce sediment entering streams and affecting fish habitat.

Additional soil stabilization measures that may be used include:

- Scarification or sub-soiling to increase infiltration and facilitate vegetative recovery,
- Seeding with native grass to stabilize soils, and
- Planting conifers on decommissioned road segments located in RHCAs where conditions would support establishment and growth.

Road decommissioning activities may result in increases in fine sediment, especially where RHCA road segments are decommissioned. About 5.8 miles of road would be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek (Table AW – 9).

Decommissioning of FSR 2620156 would involve the removal of one culvert on Crawford Creek and may result in a short-term (about 2 years) increase in fine sediment while the culvert is being removed. Removal of the culvert would follow procedures approved by NMFS and USFWS that minimize downstream sediment flows.

There is a short-term risk of generating sediment during and shortly after decommissioning activities which could reach streams, and could affect fish and fish habitat in those streams. This risk is primarily associated with removing the culvert, and with the scarification, or subsoiling which may be needed on some road segments to discourage vehicle use and improve infiltration. Design criteria include culvert removal guidelines, as well as standard contract clauses, which incorporate BMPs. The proposed design criteria and application of BMPs would reduce the probability and magnitude of this short-term risk.

Due to the proximity of the work to stream channels, there is still a low level of risk of affecting rearing juvenile steelhead, or steelhead habitat. The potential to transfer this effect downstream to Chinook salmon or bull trout migratory habitat is negligible.

After about 2 years, effects of road decommissioning are beneficial for water quality and fish habitat. The improved infiltration and ground cover condition of the decommissioned roads would help restore natural watershed function, including reduced sediment yield from the road prism.

Alternative 3

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 3. Restricting these ground disturbing activities to areas outside of RHCAs would prevent additional increases in existing levels of fine sediment from these activities.

Haul routes and haul frequency would be reduced compared to Alternative 2. Under Alternative 3, there would be 5.5 miles of haul route located in RHCAs (Table AW – 10). The estimated number of log truck loads is 1,219 under Alternative 3, a reduction of 570 loads from Alternative 2. The miles of maintenance/reconstruction activities in RHCAs, 5.5 miles under Alternative 3 (Table AW – 10), would be essentially the same as under Alternative 2. Use of haul routes in RHCAs would result in creation and transport of fine sediment to stream channels. Design measures, along with fairly level, well vegetated ground between the roads and the streams, would keep sediment increases due to haul negligible, compared to sediment from channel erosion. Effects under this alternative would be less than under Alternative 2.

Table AW – 10. Miles of Haul Routes and Maintenance/Reconstruction Activities in RHCAs Proposed Under Alternative 3.

Activity	Miles in Cat 1 RHCAs	Miles in Cat 2 RHCAs	Miles in Cat 3 RHCAs	Miles in Cat 4 RHCAs
Haul	2.4	0.0	0.0	3.1
Maintenance	2.4	0.0	0.0	2.4
Reconstruction	0.0	0.0	0.0	0.7

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2

Road Closure/Decommissioning Activities

Road closure/decommissioning activities in Alternative 3 would be the same as Alternative 2.

Alternative 4

Timber Harvest Activities

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

The hazard from severe wildfire would be lower under this alternative than Alternative 1, and higher than Alternatives 2 and 3, as shown in the Fire and Fuels section of Chapter 3. Effects of a severe wildfire would be the same as described for Alternative 1.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities in Alternative 4 would be the same as Alternative 2.

Width-to-Depth Ratio – Affected Environment

The Forest Plan Desired Future Condition/Riparian Management Objective (DFC/RMO) for width-to-depth ratio is based on wetted width and depth. A large wetted width-to-depth ratio indicates wide shallow stream channel morphology. Wide shallow streams are prone to increases in stream temperatures due to their high surface area to volume ratio. Shallow streams also provide little habitat for fish, especially adult redband trout, due to the lack of water depth.

Wetted width-to-depth ratios can be increased by increases in peak flows, decreases in low flows, direct bank alteration, or increases in sediment or a combination of these factors. Conversely, reductions in these factors can lead to reductions in width-to-depth ratios. Increases in peak flows in Mill Creek Subwatershed are negligible to small. The intermittent to very low perennial flows in Crawford and Mill Creeks mean that less bank-stabilizing wetland vegetation occurs on these creeks than typical fish-bearing streams; this situation probably contributes to the high width/ depth ratio. Water withdrawals from the Middle Fork John Day River for irrigation (see Appendix D) probably decrease summer low flow a small amount. The irrigation with-drawals may be increasing the wetted width-to-depth ratio in the Middle Fork

The Middle Fork John Day River is exceeding the Forest Plan DFC/RMO for width-to-depth ratio (Table AW – 5). Mill and Crawford Creeks were meeting the width-to-depth ratio RMO/ DFC in 1993.

Width-to-Depth Ratio – Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 likely would maintain the current width-to-depth ratios in Mill and Crawford Creeks since adjacent roads are influencing the channel morphology of these streams. The intermittent flow of Crawford Creek and very low flows in Mill Creek make establishment and growth of riparian vegetation even more difficult. Width-to-depth ratios for the Middle Fork on the forest would likely decrease as bank stability increases.

Alternative 2

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 2. Proposed timber harvest activities would not result in increases in width to depth ratios since heavy equipment associated with felling and yarding activities would not be operated in RHCAs and therefore would not result in alteration of banks or bank vegetation. Increases in fine sediment of a magnitude that would result in destabilization of stream channels from ground disturbing activities associated with timber harvest activities are unlikely to occur because RHCA buffers are sufficient to trap the majority of fine sediment produced by these activities.

Prescribed Fire Activities

Minor impacts to stream bank stability would occur as a result of prescribed burning activities in RHCAs (see Bank Stability discussion). However, these impacts would not be of a scale that would result in destabilization of stream channels or result in increased width-to-depth ratios.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities would not result in reductions in bank stability (see Bank Stability discussion). Fine sediment from decommissioning activities is unlikely to result in destabilization of stream channels (see Fine Sediment/Embeddedness discussion). Therefore, proposed road closure/decommissioning actives would not result in increases in current width-to-depth ratios.

Alternative 3

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 3. Timber harvest activities would be reduced under Alternative 3 compared to Alternative 2.

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2

Alternative 4

T*imber Harvest Activities*

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities. There would be no effects from timber harvest activities on width-to-depth ratios.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

The hazard from severe wildfire would be lower under this alternative than Alternative 1, and higher than Alternatives 2 and 3, as shown in the Fire and Fuels section of Chapter 3. Effects of a severe wildfire would be the same as described for Alternative 1.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities in Alternative 4 would be the same as Alternative 2.

Water Temperature/Stream Shading – Affected Environment

Water temperature influences the metabolism, behavior, and health of fish and other aquatic organisms. Fish can survive at temperatures near extremes of suitable temperature ranges. However, growth is reduced at low temperatures due to all metabolic processes being slowed. At the opposite extreme, growth is reduced at high temperatures since most or all energy from food must be used for maintenance needs. Fish are also more susceptible to diseases near the extremes of a species suitable temperature ranges.

The Forest Plan water temperature standard is for no measurable increase in maximum water temperature, and maximum water temperatures below 64°F within migration and rearing habitat and below 60°F within spawning habitats (PACFISH RMO). In general, juvenile and Chinook salmon and redband trout, and juvenile steelhead will occupy water that is from 55 to 64 °F. Upper lethal temperatures range from about 75°F for steelhead to about 80°F for Chinook salmon. Mean maximum water temperatures are above the suitable range for salmonid species present during summer months in the Crawford Analysis Area (Table AW – 11).

In addition to meeting the Forest Plan Standard, the Forest must meet Oregon water quality standards under the Clean Water Act. EPA approved new water quality standards for Oregon in March 2004. All fish bearing streams in the analysis area are considered spawning and rearing habitat for bull trout for Designated Beneficial Use purposes. The following water temperature standards apply:

> (f) The seven-day-average maximum temperature of a stream identified as having bull trout spawning and juvenile rearing use on subbasin maps set out at OAR 340–041– 0101 to 340– 041– 0340: Figures 130B, 151B, 160B, 170B (John Day Basin), 180A, 201A, 260A, 310B, and 340B, may not exceed 12.0 degrees Celsius (53.6 degrees Fahrenheit).

Table AW – 11. Average Maximum Stream Temperatures in the Crawford Analysis Area.

Stream	Location	Years Analyzed	7 Day Mean Max Temp (°F)
Crawford Creek	Upper	1995–2000	66.5
	Middle	1995–2001	74.6
	Lower	1995–2001, 2005	76.3
Mill Creek	Highway 7	1995–2001	67.4
Middle Fork	Below Phipps Meadow	1995–2005	71.7
	Near Austin	1995–2005	75.2

The Middle Fork John Day River, Crawford Creek, and Mill Creek are on the Oregon 303(d) list for water quality-limited water bodies for high temperatures. In the project area, the Middle Fork is listed for standards associated with the Designated Beneficial Uses of bull trout spawning and rearing. Lower down the river, it is listed for standards associated with the salmon and trout rearing and for salmon and steelhead spawning. Crawford and Mill Creeks are listed for standards associated with the Designated Beneficial Uses of summer salmonid rearing. A factor that contributes to the high temperatures in Crawford and Mill Creeks is their very low perennial flow. Much of the vegetation on Crawford Creek and the Middle Fork is stringer meadow instead of forest, and this is another factor which increases solar exposure and contributes to increases in stream temperature. (“Stringer meadows” are small meadows found along streams, often narrow but elongated up and down the stream.) Past human activities including riparian roading and logging may contribute to the high temperatures. A road has existed in the approximate location of road 2620 for decades and has likely resulted in various impacts to Crawford Creek such as raising the temperature of Crawford Creek by decreasing shade, decreasing potential for cold water storage, and disconnecting the creek from its floodplain. Water withdrawals from the Middle Fork for irrigation may increase summer temperatures by a small amount, by decreasing flow and increasing wetted width-to-depth ratios.

Water Temperature/Stream Shading – Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of stream shading. Current water temperatures exceed the riparian management objective (RMO) for water temperature in the analysis area. Mean maximum water temperatures are above the suitable range for Chinook salmon, redband trout, and juvenile steelhead which are present in the Crawford Analysis Area during the summer months.

Water temperatures in Crawford Creek would likely not change over time due to the influence of FSR 2620 on streamside vegetation. About 1.5 miles of FSR 2620 are located within 50 feet of Crawford Creek. Water temperatures are also unlikely to change in Mill Creek since most of the perennial portion is present on private land where water withdrawals for irrigation occur. Water temperatures in the Middle Fork may improve within 10 years as streamside vegetation responds to improvements in range management activities. Recent range monitoring indicates that there is an upward trend in channel and stream bank vegetation in the Upper Middle Fork John Day Watershed.

The hazard from severe wildfire would be higher under this alternative than the action alternatives, as shown in the Fire and Fuels section of Chapter 3. If a severe wildfire does occur, stream temperatures probably would increase, due to decreased shading. This describes the effect of severe wildfire under all alternatives.

Alternative 2

Conclusion: None of the activities, singly or cumulatively, would cause measurable increases in stream temperature.

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 2. The BMP restricting these activities to areas outside of RHCAs would prevent adverse impacts to existing stream shading. RHCA widths are sufficient for Category 1 and 2 streams to prevent removal of trees that provide stream shading. Felling of danger trees may occur along 5 miles of haul routes in RHCAs and field observations indicate one to two trees per mile may be felled for a total of 5 to 10 trees over 5 miles. Danger trees are usually dead and provide little shade especially when surrounded by live trees. Therefore, measurable increases in stream temperatures would not result from proposed harvest activities.

Water withdrawals for dust abatement during haul activities would occur. Water withdrawals would be in accordance with the BMPs described in the 2005 Malheur N.F. Road Maintenance BA and NMFS guidance. Use of these BMPs would insure that water withdrawals do not result in a measurable increase in water temperatures.

Water drafting can occur only as long as supply is adequate to provide for both fish and with-drawal. Approved screens would be attached to intake hoses to prevent adverse impacts to fish. NMFS developed criteria for pump intake screens would be used on all water pump intakes. Screen mesh openings shall not exceed 3/32 inch for woven wire or perforated plate screens, or 0.0689 inch for profile wire screens, with a minimum 27% open area. Trucks would be maintained to prevent oil leaks. Loading is done in a manner to minimize overflowing and discharge of wash into stream. The maximum withdrawal from one site in an 8 – hour period would be 18,000 gallons of water. Water drafting guidelines from the 2005 Forest Road Maintenance BA would be followed during drafting activities. These guidelines would prevent the potential harm to fish in Clear Creek.

Prescribed Fire Activities

Ignition is not planned within RHCAs. Fire from upslope burning units, which is within prescription, would be allowed to back into RHCAs. BMPs include retention of at least 95% of stream shade (Table 2.7). The prescribed burning would occur when moisture and climate conditions would minimize the potential for a high intensity burn. With a low intensity burn, very little stream vegetation providing shade is expected to be consumed under the more moist conditions encountered in riparian areas associated with perennial streams. There is not expected to be any loss of shade, but if there is, it will be less than 5%, which is not enough to affect stream temperature. In a recent study, Beche et al. (2005) found that a fall prescribed fire within the riparian zone of a mixed-conifer forest in El Dorado County, California was patchy in terms of intensity, consumption, and severity. Additionally they found that although 49.4% of all tagged trees (>11.5 cm/4.5 in.) and snags were scorched by the prescribed fire, only 4.4% of all tagged trees were dead one year after the prescribed fire. In general, the trees killed by the prescribed fire were small and located near areas of high litter accumulation (Beche et al. 2005).

Road Closure/Decommissioning Activities

Road decommissioning and closure actions would not have any immediate effect on shade. Removal of danger trees in RHCAs for closure/decommissioning activities is not anticipated. About 5.8 miles of road would be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek. Conifers would be planted in decommissioned road segments as part of the decommissioning process. Over the long-term (50 to 70 years) shading would increase as planted conifers become established and grow to a size that provides shading.

Alternative 3

Conclusion: None of the activities, singly or cumulatively, would cause measurable increases in stream temperature.

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads would not be located in RHCAs under Alternative 3. Timber harvest activities would be reduced under Alternative 3 compared to Alternative 2. This would result in a reduction of haul activities including a reduced need for water withdrawals for dust abatement and felling of danger trees. There is not expected to be any loss of shade, which could affect stream temperature.

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities in Alternative 3 would be the same as Alternative 2.

Alternative 4

Conclusion: None of the activities, singly or cumulatively, would cause measurable increases in stream temperature.

Timber Harvest Activities

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings, temporary roads and felling of danger trees. It would also eliminate the need for haul activities including water withdrawals for dust abatement. There would be no effects from timber harvest activities on water temperature and stream shade.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

The hazard from severe wildfire would be lower under this alternative than Alternative 1, and higher than Alternatives 2 and 3, as shown in the Fire and Fuels section of Chapter 3. Effects of a severe wildfire would be the same as described for Alternative 1.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities in Alternative 4 would be the same as Alternative 2.

Aquatic Habitat – Summary of Affected Environment and Direct and Indirect Environmental Consequences

Fish habitat in the analysis area generally does not meet Forest Plan Desired Future Conditions/ Riparian Management Objectives (DFCs/RMOs) for pool frequency, Large Woody Debris (LWD), sediment, temperature, width-to-depth ratio (Table AW – 5). In part this is due to naturally low flows and to stringer meadow vegetation along Crawford and Mill Creeks. Although bank stability does meet the Riparian Management Objectives, Crawford and Mill Creeks exhibit characteristics of Rosgen F channels, so channel erosion may be the most significant factor in sediment budgets in these creeks. However, effects of channel type are difficult to disentangle from other sediment sources, such as roads, erosion from “scabs” (shallow soil areas where ground cover standards are not met), and past livestock grazing. Crawford and Mill Creeks are highly altered streams with poor habitat conditions for salmonids. Intermittent flow in Crawford Creek and very low flow in the perennial reach of Mill Creek are also strongly limiting factors for fish habitat. The Middle Fork, on the forest, is also in a highly altered state but appears to be on an upward trend.

Under Alternatives 2 and 3, use of riparian roads for haul would result in increases in fine sediment during use. Short-term increases in fine sediment from haul and all activities, other than road decommissioning, are unlikely to result in measurable increases in fine sediment to stream channels. The BMPs (described in Chapter 2, Activity Descriptions, Road Use During Harvest and Management Requirements, Constraints, and Design Measures and Appendix F), along with fairly level, well vegetated ground between the roads and the streams, would keep sediment increases due to haul negligible. Since all commercial thinning units are outside RHCAs, there would be no effects to fish habitat from activities inside the harvest units.

Under Alternatives 2, 3, and 4 there is a short-term risk of generating sediment during and shortly after road decommissioning which could reach streams, and could affect fish and fish habitat in those streams. This risk is primarily associated with removing the FSR 2620156 road culvert on Crawford Creek. The proposed design criteria and application of BMPs would reduce the probability and magnitude of this short-term risk. The proposed road decommissioning activities would result in a lasting decrease in fine sediment levels in the analysis area, starting about 2 years after decommissioning. Since road decommissioning activities are the same for all action alternatives it is unlikely that there would be measurable differences among action alternatives.

Two road segments (7000255, 2600237/2600235) consisting of 1.7 miles, located outside the RHCAs would be reopened in order to reduce impacts to RHCAs. These roads were originally closed under previous projects. For the 255 Road, an unauthorized road (used by the public because the 255 road is effectively closed) serves as a detour through a RHCA around the closed segment. For the 237/235 segment, use of a riparian segment of the 237 Road is creating sediment concerns. Reopening segments of the closed roads and decommissioning of the riparian segments would eliminate negative impacts to the RHCA and aquatic habitat.

Proposed activities (logging, road use, road maintenance, road reconstruction, road watering, road decommissioning, road re-opening, prescribed fire, precommercial thinning, and activity fuels treatment) are unlikely to result in changes in water temperatures, pool frequencies, width-to-depth ratios, LWD, or bank stability. Grooming of the alternate snowmobile trails (if logging occurs in the winter) is unlikely to affect aquatic habitat, because impacts of trail grooming and snowmobile use are so light.

Alternative 1 proposes no new activities, resulting in no activity-related benefits or impacts to aquatic species and their habitat. However, the lack of road treatments and culvert removal would allow sediment to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base.

Aquatic Habitat & Water Quality – Cumulative Effects

Cumulative Effects Common to All Alternatives

The cumulative effects boundary is the same as the Aquatic Analysis Area (Figure AW – 1). Past and ongoing actions are described in Appendix D. Effects of the past and ongoing actions are described in the Affected Environment sections above:

- Effects of Past and Ongoing Actions
- General Existing Stream Conditions
- The Affected Environment sub-sections for Pool Frequency, Large Woody Debris, Bank Stability, Embeddedness/Fine Sediment, Width-to-Depth Ratio, and Water Temperature/Stream Shading.

Effects are mostly due to roads (including former logging railroads), past grazing, and past riparian harvest (see the Aquatic Habitat – Summary of Affected Environment and Direct and Indirect Environmental Consequences section immediately above). Lesser effects may be due to irrigation withdrawals (temperature), riparian firewood cutting (LWD), US 26 – Bridge Creek culvert replacements, and other recent and planned culvert replacements within the Bridge Creek Subwatershed (sediment).

The aquatic habitat and water quality effects of future activities described in Appendix D are negligible, except for the ongoing actions mentioned in the preceding sentence. The effects of use and maintenance of roads which are not decommissioned would remain about the same as at present. The effects of US 26 culvert replacements will start to decrease in 2009 when instream work is finished on the four remaining culvert replacements, and would be negligible by 2011 (Appendix D).

All alternatives would permit natural slow, partial recovery from effects of past grazing, past riparian road construction, and past riparian harvest. This recovery would occur as riparian trees grow larger, as large wood falls into the streams, as channel types change to more stable, narrow configurations, as sediment from past actions is washed out, and as riparian shrubs and sedges recover and contribute to more stable stream banks. Recovery would be only partial because ongoing impacts from some existing roads would not permit full recovery. Intermittent flow in Crawford Creek and very low flow in the perennial reach of Mill Creek are strongly limiting factors for fish habitat.

With full implementation of grazing standards there is little likelihood of effects to aquatic habitat and hence cumulative effects since these standards are designed to allow a near natural rate of recovery of aquatic habitat and riparian vegetation. The current grazing standards are designed to eliminate any effects on aquatic habitats that could carry over to the following year. All alternatives in the Middle Fork John Day Range EIS (Appendix D) are designed to continue to meet current grazing standards.

If a severe crown fire occurs, shade would be reduced, and water temperatures would increase. Sediment would increase from channel and upland sources, and a pulse of woody debris would fall into the streams. Both low flows and peak flows would increase for perhaps 10 years, until evapotranspiration recovers.

Alternative 1 – No Action

Under Alternative 1, recovery of sediment would be slightly slower, and not progress quite as far as under Alternatives 2, 3, and 4, because of the effects of the roads which would not be decommissioned.

Under Alternative 1 the hazard of a severe crown fire is higher, as described in the Fire and Fuels section of Chapter 3.

Alternatives 2, 3, and 4

Alternatives 2, 3, and 4 would reduce and eliminate some of the road sediment related impacts to aquatic habitat. About 5.8 miles of native surface roads would be decommissioned in RHCAs. This would leave about 11 miles of native surface roads in RHCAs in the analysis area; a reduction of 34%. Of the 16 roads identified in the Crawford Roads Analysis (2001) as impacting aquatic habitat, eight would be decommissioned under Alternatives 2, 3, and 4.

Two road segments (7000255, 2600237 / 2600235) consisting of 2.1 miles, located outside the RHCAs would be reopened in order to reduce impacts to RHCAs. These roads were originally closed under previous projects. For the 255 Road, an unauthorized road (used by the public because the 255 Road is effectively closed) serves as a detour through a RHCA around the closed segment. For the 237 / 235 segment, use of a riparian segment of the 237 Road is creating sediment concerns. Reopening segments of the closed roads and decom-missioning the riparian roads would eliminate negative impacts to the RHCA and aquatic habitat.

Road decommissioning activities proposed under Alternatives 2, 3, and 4 may result in short-term (about 2 years after activities cease) cumulative effects because the proposed activities will likely result in short-term increases in fine sediment. The short-term increases may add to adverse effects because streams in the analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids. However, the proposed road decommissioning activities would lead to a lasting reduction in fine sediment levels after about 2 years and therefore will have beneficial impacts to aquatic habitat and fish. Removal of a culvert on Crawford Creek when FSR 2620156 is decommissioned would reduce the number of culverts that are fish passage barriers from four to three.

Timber harvest, log haul, prescribed burning, road maintenance, and road reconstruction proposed under Alternatives 2 and 3, and prescribed burning proposed under Alternative 4 may result in negligible short-term increases in fine sediment. However, since impacts to aquatic habitat from these activities would be negligible increases in fine sediment, it is unlikely that these increases would result in cumulative adverse effects when combined with other past, ongoing, or future actions.

Under Alternatives 2 and 3 the hazard of a severe crown fire is lower than under Alternatives 1 and 4, as described in the Fire and Fuels section of Chapter 3.

Cumulative Effects – Equivalent Roaded Area

The USDA Forest Service (1990) anticipated that "A harvest effects model will be applied which converts a range of harvest activities to a common factor and applies a recovery rate to simulate hydrologic or watershed recovery over time." (p. IV – 48) For the Crawford Project, an Equivalent Roaded Area (ERA) model was used. The analysis area is the Mill Creek Subwatershed. Activities on private land and the Wrac Lodgepole Project were included in the calculations. This model is explained in the soils report of the project record. The Threshold of Concern (TOC) was calculated as the average of the three old subwatersheds, weighted by their area. The TOC is 14.5%.

Table AW – 12. Equivalent Roaded Area (% of Mill Creek Subwatershed).

Year	Alt. 1 and 4	Alt. 2	Alt. 3
2007	7.3	9.0	8.6
2012	6.4	7.9	7.5

Under all alternatives, the ERA is well below the TOC. This indicates that the addition of the Crawford Project to past, ongoing, and future activities (described in Appendix D) would not be expected to produce significant effects on peak flow, channel erosion, or water yield. This result is to be expected because shelterwood harvest is planned for only 193 acres in Alternative 2, and none in other alternatives. Thinning and prescribed burning leave enough trees so that evaporation and transpiration are not reduced enough to increase water yield or peak flow.

Affected Environment and Environmental Effects – Aquatic Species

The analysis area for aquatic species and the cumulative effects boundary are the same as used for aquatic habitat (Figure AW – 1). There will be no activities or associated direct and indirect effects in the upper part of the Mill Creek Subwatershed that lies south of the Highway 26 and drains into the project area.

Aquatic Species with Special Management Status Present in Analysis Area

Management Indicator Species

Management Indicator Species (MIS) are species of vertebrates and invertebrates whose population changes are believed to best indicate effects of land management activities. Through the MIS concept, the total number of species found within a project area is reduced to a subset of species that collectively represent habitats, species and associated management concerns. MIS are used to assess the maintenance of populations (the ability of a population to sustain itself naturally) and biological diversity (which includes genetic diversity, species diversity, and habitat diversity), and to assess effects on species in public demand. The Malheur Forest Plan directs analyses to focus on MIS. Aquatic MIS in the analysis area for the Crawford Project are:

steelhead (*Oncorhynchus mykiss*), redband trout (*Oncorhynchus mykiss gairdneri*), and bull trout (*Salvelinus confluentus*) (Table AW – 13).

Table AW – 13. Fish Species with Special Management Status Present or Suspected to be in the Project Area.

Fish Species (Status[1])	Stream	Migration Habitat	Spawning Habitat	Summer Rearing Habitat
Bull trout (ESA –T, MIS)	Middle Fork John Day River	Present	Not Present	Not Present
	Mill Creek	Not Present	Not Present	Not Present
	Crawford Creek	Not Present	Not Present	Not Present
Steelhead (ESA –T, MIS)	Middle Fork John Day River	Present	Present	Present
	Mill Creek	Present	Not Present	Present
	Crawford Creek	Present	Present	Present
Redband trout (R6S, MIS)	Middle Fork John Day River	Present	Present	Present
	Mill Creek	Present	Present	Present
	Crawford Creek	Present	Present	Present
Spring Chinook salmon (R6S)	Middle Fork John Day River	Present	Present	Present
	Mill Creek	Not Present	Not Present	Not Present[2]
	Crawford Creek	Not Present	Not Present	Not Present[2]

1) ESA–T = Listed as Threatened under the Endangered Species Act, MIS = Malheur National Forest management indicator species, R6S = Region 6 sensitive species 2) Winter rearing habitat for juvenile spring Chinook salmon may be present.

Threatened, Endangered, and Sensitive Species

An endangered species is an animal or plant species listed under the ESA that is in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant species listed under the ESA likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

A sensitive species is an animal or plant species identified by the Regional Forester for which species viability is a concern either a) because of current or predicted downward trend in population numbers or density, or b) because of current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Threatened, endangered, and sensitive (TES) aquatic species in the analysis area for the Crawford Project are: threatened – bull trout (*Salvelinus confluentus*), steelhead (*Oncorhynchus mykiss*); sensitive – redband trout (*Oncorhynchus mykiss gairdneri*), spring Chinook salmon (*Oncorhynchus tshawytscha*) (Table AW – 13). The Columbia spotted frog (*Rana luteiventris*), a Region 6 sensitive species, is also present in the analysis area**.** A summary of determinations is found in Table AW – 14**.**

Westslope cutthroat trout (*Oncorhynchus clarki lewis*) and Malheur mottled sculpin (*Cottus bendirei ssp.)*, both Region 6 sensitive species, are not present in the Middle Fork subbasin. Therefore, the Crawford Project will have no impact on either species and will not be considered further in the Aquatics analysis, except in Table AW – 14.

There are no aquatic species in the project area that are listed by the state of Oregon as threatened or endangered.

Table AW – 14. Summary of Determinations.
(Rationale for conclusion of determinations is contained in this section of the document)

Species	No Action Alternative 1	Proposed Action Alternative 2	Alternative 3	Alternatives 4
Redband trout (S)	MIIH	MIIH (BI)	MIIH (BI)	MIIH (BI)
Malheur mottled sculpin (S)*	NI	NI	NI	NI
Columbia spotted frog (S)	NI	MIIH (BI)	MIIH (BI)	MIIH (BI)
Westslope cutthroat trout (S)*	NI	NI	NI	NI
Columbia River Basin Bull Trout(T)	NLAA	NLAA	NLAA	NLAA
Mid Columbia River Steelhead (T)	LAA	LAA (BE)	LAA (BE)	LAA (BE)
Steelhead Designated Critical Habitat (T)	LAA	LAA(BE)	LAA(BE)	LAA(BE)
Spring Chinook Salmon (S)	MIIH	MIIH (BI)	MIIH (BI)	MIIH (BI)
Spring Chinook Salmon EFH	NAE	NAE	NAE	NAE

P = Proposed, E = Endangered, T = Threatened, S = Sensitive. NE = No Effect, NAE = No Adverse Effect, NLAA = May Effect, Not Likely to Adversely Affect, LAA = May Effect, Likely to Adversely Affect, BE = Beneficial Effect, BI= Beneficial Impact, NI = No Impact, MIIH = May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (Effects in parentheses are long-term effects) *not present in the Middle Fork Subbasin.

Environmental Consequences, Rationale and Determination by Species Based on Direct, Indirect and Cumulative Effects of Alternatives Bull Trout – Affected Environment

Bull trout were listed by the U.S. Fish and Wildlife Service (USFWS) as threatened under the federal ESA on June 10, 1998 (63 FR 31647). Critical habitat for bull trout was not designated in the analysis area by USFWS (70 FR 56212). Bull trout are also a Malheur National Forest management indicator species. The Crawford Project Area is located in the John Day bull trout subpopulation area.

Population Status

Middle Fork John Day Subbasin:

Bull trout in the Middle Fork John Day River Subbasin persist at low abundance levels. In 1999, population surveys were conducted by ODFW, the Malheur National Forest and others in Clear Creek, Big Creek, Deadwood Creek, and Granite Boulder Creek to estimate abundance. Total numbers of bull trout consisting of primarily juvenile and subadult fish, were estimated to be 1,950 individuals in Big Creek, 640 individuals in Clear Creek, and 368 individuals in Granite Boulder Creek (Hemmingsen 1999).

Crawford Fisheries Analysis Area:

Bull trout are only seasonally present in the fisheries analysis area when utilizing the Middle Fork as a migration corridor.

Distribution and Habitat

Middle Fork John Day Subbasin:

Four local populations currently exist within the Middle Fork John Day River Subbasin. Local populations include Clear Creek, Granite Boulder Creek, Deadwood and Big Creek (Buchanan et al. 1997). The Malheur National Forest identifies upper Big Boulder Creek, Badger Creek, Indian Creek, and Vinegar Creek as potential habitat for bull trout local populations (potential local populations).

Current distribution in the Middle Fork John Day River Subbasin is based on isolated sightings with the primary distribution restricted to tributaries and limited to 22% of stream miles previously known to support bull trout (Claire and Gray 1993, Buchanan et al. 1997). Summer distribution of bull trout, based on the 1990 and 1992 ODFW Aquatic Inventory Project, indicated bull trout occupy approximately 16 miles of stream in the Middle Fork John Day River Subbasin, including: 5.5 miles in Big Creek, 2.5 miles in Deadwood Creek (a tributary to Big Creek), 4 miles in Granite Boulder Creek; and 4 miles in Clear Creek. Bull trout migration from these tributary streams during the summer is highly unlikely due to high water temperatures and habitat modifications in the Middle Fork. Aquatic inventory surveys conducted by the ODFW in 1990 and 1991 detected 60 bull trout in the Middle Fork John Day River Subbasin; two fish were measured at 260 millimeters (10 inches) and 360 millimeters (14 inches), all others were less than 210 millimeters (8 inches) in length (Buchanan et al. 1997). In the 1999 and 2000 surveys of Clear Creek, eight redds were observed each year (Prairie City Ranger District redd survey data).

Crawford Fisheries Analysis Area:

Bull trout are seasonally present in the Middle Fork. Bull trout use the river as a migration corridor and for winter rearing habitat (Figure AW – 2, on the following page). Bull trout are not present in Mill Creek or Crawford Creek where habitat is unsuitable. Spawning and rearing habitat for bull trout is not present in the Crawford Fisheries Analysis Area.

Bull Trout – Environmental Consequences

Alternative 1 – No Action

Determination

Columbia River Basin Bull Trout (T): May Affect, Not Likely to Adversely Affect (NLAA)

Rationale

Current migration habitat for bull trout in the fisheries analysis area is in a degraded state. The reduced number of large deep pools in the Middle Fork limits the number of resting pools available for migrating fluvial bull trout. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base.

Alternative 2

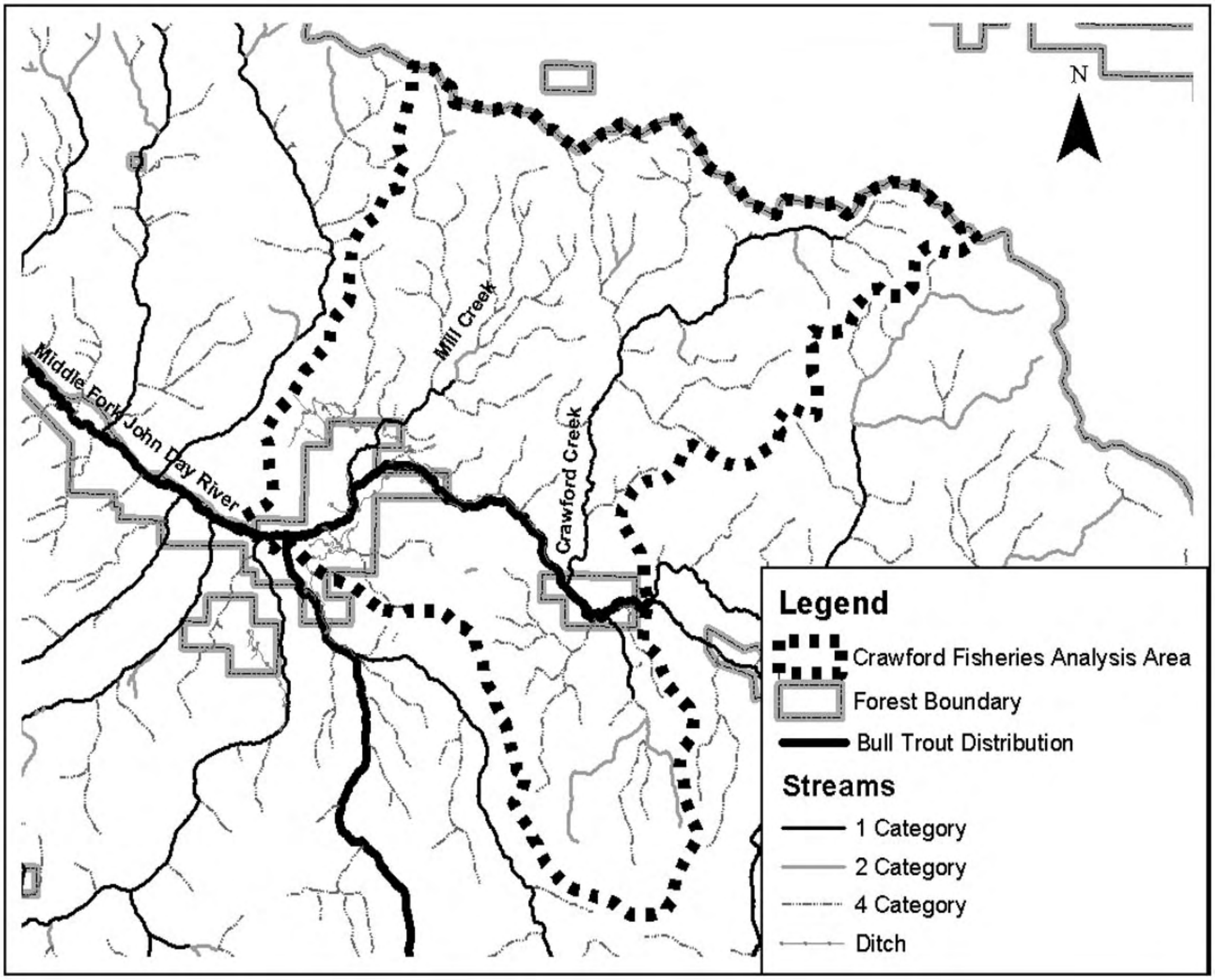
Determination

Columbia River Basin Bull Trout (T): May Affect, Not Likely to Adversely Affect (NLAA).

Rationale

Proposed activities would not result in impacts to habitat for migrating bull trout. Expected short-term increase in fine sediment from tributaries will not be of a magnitude to result in a loss of deep pool habitat in the Middle Fork. The water drafting site on Clear Creek for dust abatement is below summer rearing habitat for bull trout and would have no affect.

Figure AW – 2. Distribution of Bull Trout in the Crawford Fisheries Analysis Area.



Alternative 3

Determination

Columbia River Basin Bull Trout (T): May Affect, Not Likely to Adversely Affect (NLAA).

Rationale

Same as Alternative 2

Alternative 4

Determination

Columbia River Basin Bull Trout (T): May Affect, Not Likely to Adversely Affect (NLAA).

Rationale

Same as Alternative 2.

Steelhead – Affected Environment

Steelhead (Mid-Columbia Distinct Population Segment (DPS), MCR steelhead) was listed by the National Marine Fisheries Service (NMFS) as threatened under the federal ESA on March 25, 1999 (64 FR 15417). MCR steelhead is also a Malheur National Forest management indicator species. Critical habitat for MCR steelhead was designated on September 2, 2005 (70 FR 52630). Critical habitat is present in the fisheries analysis area.

Steelhead trout are the anadromous form of *O. mykiss*. Adult summer steelhead return to freshwater from June through September. Adults overwinter in large rivers while sexually maturing. Adults resume migration to spawning streams in early spring. Spawning takes place from March through May. Eggs incubate during the spring and emergence occurs from April through July depending on water temperatures. Juveniles typically spend 2 to 3 years in freshwater. Juvenile steelhead generally utilize habitats with higher water velocities than juvenile Chinook salmon. In winter, juveniles utilize deep pools with abundant cover. Juveniles may reside in their natal stream for their entire freshwater rearing phase or may migrate to other streams within a watershed. Smoltification occurs during late winter and emigration to the ocean occurs during spring. Summer steelhead adults normally rear for 1 to 2 years in the ocean.

Population Status

Middle Fork John Day Subbasin:

MCR steelhead runs in the John Day River Basin are composed entirely of native stocks. However, hatchery fish do stray into the John Day Basin from the Columbia River (John Day Subbasin Plan). MCR steelhead is present in eight streams in the Upper Middle Fork Watershed. The Middle Fork John Day River Subbasin contributes approximately 22% of the total run for the basin (John Day Subbasin Plan). Redds counts have displayed wide variability since 1964. Redds per mile have been below ODFW management objectives (5.8 redds per mile) since 2003 (Figure AW – 3).

Crawford Fisheries Analysis Area:

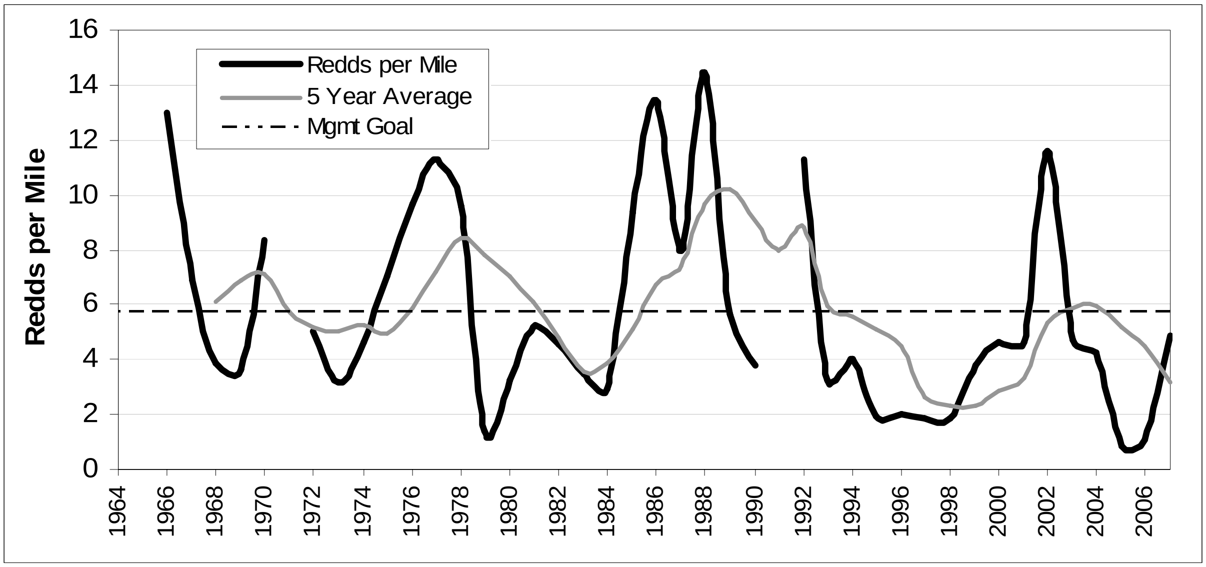
ODFW does not conduct redd counts for MCR steelhead in the fisheries analysis area. Due to the limited flow in Crawford Creek, the potential for steelhead spawning and rearing is limited in this stream. Some spawning does occur during years when water conditions are favorable. There is no known steelhead spawning in Mill Creek.

Distribution and Habitat

Middle Fork John Day Subbasin:

MCR steelhead is widely distributed in the Middle Fork Subbasin. Spawning and rearing takes place in all major tributaries of the Middle Fork.

Figure AW – 3. Number of Redds per Mile for MCR Steelhead in the Middle Fork John Day River Subbasin, 1964 to 2007.



Crawford Fisheries Analysis Area:

There are about 12.3 miles of steelhead habitat in the fisheries analysis area (Figure AW – 4). MCR steelhead utilize the Middle Fork for migration, (during years when water conditions are favorable), spawning and juvenile rearing habitat (4.7 mi). Spawning and juvenile rearing habitat are present in Crawford Creek (6.3 mi). Rearing habitat is present in Mill Creek (1.3 mi).

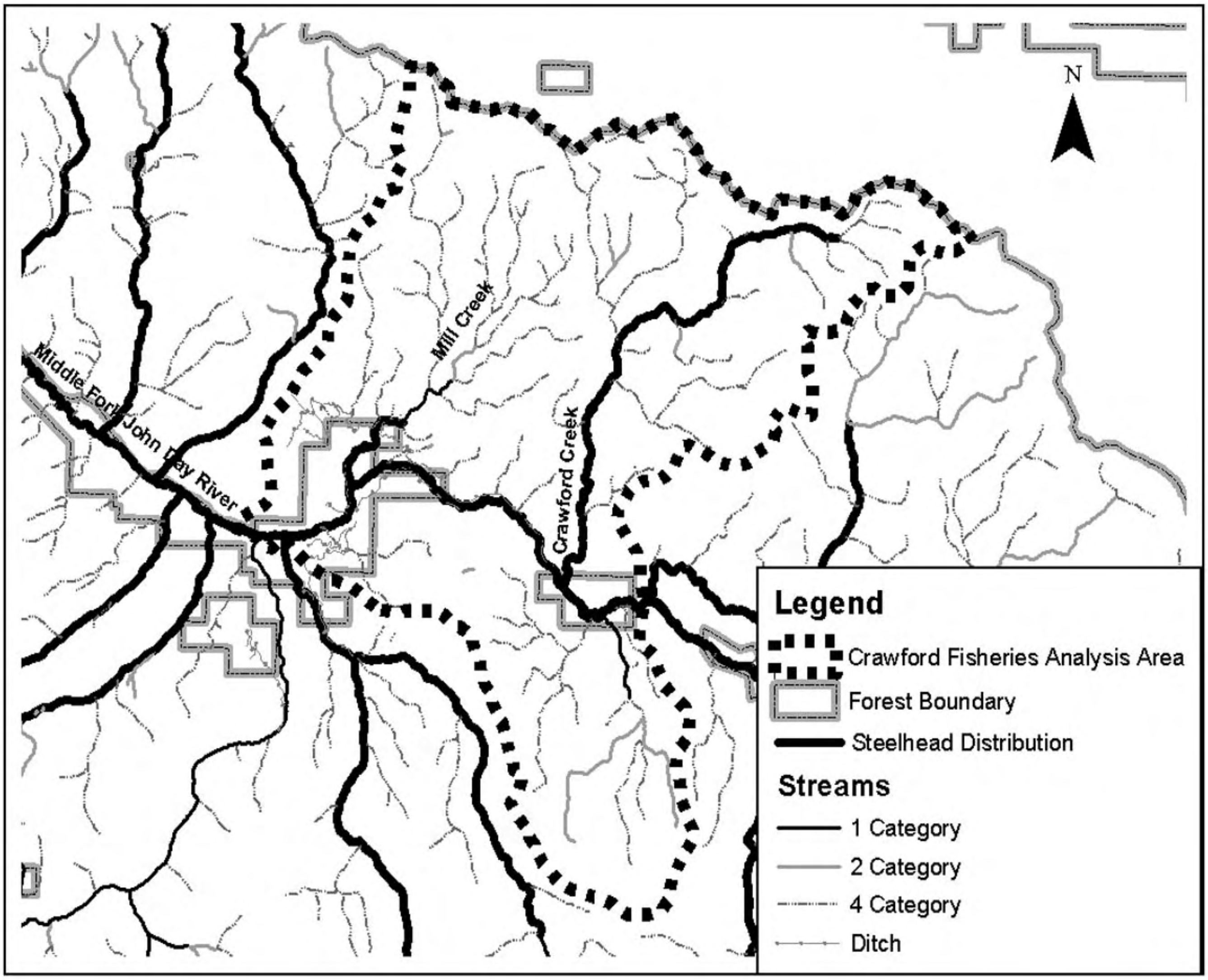
Critical Habitat

Critical habitat was designated for the MCR steelhead on February 16, 2000 (65 FR 7764). Critical habitat for MCR steelhead under the 2000 rule encompassed the major Columbia River tributaries known to support the DPS, including the Deschutes, John Day, Klickitat, Umatilla, Walla Walla, and Yakima Rivers, as well as the Columbia River and estuary. Critical habitat consisted of all waterways below long-standing (100 years or more), naturally impassable barriers, including the Middle Fork. The adjacent riparian zone was also considered critical habitat. This zone was defined as the area that provides the following functions: Shade, sediment, nutrient/chemical regulation, stream bank stability, and input of LWD/organic matter. Protective regulations for MCR steelhead were issued under section 4(d) of the ESA on July 10, 2000 (65 FR 42423).

In late 2000, a lawsuit was filed challenging the NOAA Fisheries Service's February 2000 final designation of critical habitat for DPSs of Pacific salmon and steelhead listed under the ESA. A federal court ruled that the agency did not adequately consider the economic impacts of the critical habitat designations. In April 2002, NOAA Fisheries Service withdrew its 2000 critical habitat designations.

Critical habitat for MCR steelhead was redesignated on September 2, 2005 (70 FR 52630). Under the 2005 rule, Mill Creek, Crawford Creek, and the Middle Fork have been designated as critical habitat for MCR steelhead. Designated critical habitat includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line (33 CFR 319.11). In areas where ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series.

Figure AW – 4. Distribution of MCR Steelhead in the Crawford Fisheries Analysis Area.



The primary constituent elements (PCEs) that are essential for the conservation of listed DPSs on the Malheur Forest are those sites and habitat components that support one or more life stages, including:

(1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;

(2) Freshwater rearing sites with:

(i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;

(ii) Water quality and forage supporting juvenile development; and

(iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

(3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Steelhead – Environmental Consequences

Alternative 1

Determination

Mid-Columbia Summer Steelhead (T): May Affect, Likely to Adversely Affect (LAA).

Steelhead Designated Critical Habitat: May Affect, Likely to Adversely Affect (LAA).

Rationale

Habitat for MCR steelhead in the fisheries analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the fisheries analysis area to support MCR steelhead. Based on fine sediment levels the likelihood of successful spawning in Crawford Creek is low even during favorable water conditions. Roads cross Crawford Creek nine times in the lower 2.7 miles. Of the nine crossings, seven are culverts located along FSR 2620. Four of the culverts are rated as impassable to all life stages of salmonids. These culverts impede the movement of adult steelhead and redband trout attempting to spawn in Crawford Creek and prevent the movement of juvenile steelhead and redband trout. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base. These conditions would persist under Alternative 1.

Alternative 2

Determination

Mid-Columbia Summer Steelhead (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Steelhead Designated Critical Habitat: May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Rationale

Habitat for MCR steelhead in the fisheries analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the fisheries analysis area to support MCR steelhead. Based on fine sediment levels the likelihood of successful spawning in Crawford Creek is low even during favorable water conditions. These conditions currently persist.

Short-term increases in fine sediment from timber harvest, log and rock haul, prescribed burning, road maintenance and road reconstruction are unlikely to result in measurable increases in fine sediment in stream channels. Decommissioning activities however, may result in a short-term increase in fine sediment due to removal of the FSR 2620156 road culvert and disturbance of some road surfaces to discourage vehicle use and improve infiltration. The increases may add to adverse effects because streams in the fisheries analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids.

In the long-term, Alternative 2 would reduce fine sediment levels in the fisheries analysis area as a result of the proposed road decommissioning activities. About 18.0 miles of native surface roads would be decommissioned including about 5.8 miles located in RHCAs. One culvert that is a fish barrier on Crawford Creek would be removed when FSR 2620156 is decommissioned. These actions would result in an incremental improvement in habitat conditions for MCR steelhead in the fisheries analysis area. However, high water temperatures and altered stream channel conditions will likely persist.

Alternative 3

Determination

Mid-Columbia Summer Steelhead (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Steelhead Designated Critical Habitat: May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Rationale

Same as Alternative 2.

Alternative 4

Determination

Mid-Columbia Summer Steelhead (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Steelhead Designated Critical Habitat: May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term

Rationale

Same as Alternative 2.

Redband Trout – Affected Environment

Redband trout are a Region 6 sensitive species and a Malheur National Forest management indicator species. Redband trout are the resident form of *O. mykiss*. Redband trout may or may not be reproductively isolated from steelhead. Redband and steelhead trout from the same geographic area may share a common gene pool.

Redband trout are sensitive to changes in water quality and habitat. Adult redband trout are generally associated with pool habitats, although various life stages require a wide array of habitats for rearing, hiding, feeding, and resting. Pool habitat functions as important refugia during low water periods. An increase in sediment lowers spawning success and reduces the quantity and quality of pool and interstitial habitat. Other important habitat features include healthy riparian vegetation, undercut banks and LWD.

Redband trout may reside in their natal stream or may migrate to other streams within a watershed to rear. Habitat requirements are similar for redband trout and juvenile steelhead.

Spawning occurs during the spring, generally from March to June. Redds tend to be located where velocity, depth and bottom configuration induce water flow through the stream substrate, generally in gravels at the tailout area of pools. Water temperatures influence emergence of fry, which is typically from June through July.

Population Status

Middle Fork John Day Subbasin:

Neither ODFW nor the Forest Service routinely monitors abundance and distribution of redband trout in the John Day Basin. Juvenile *O. mykiss* with resident (redband trout) and anadromous (steelhead) life history types are difficult to differentiate where the two populations coexist, making independent monitoring difficult. At this time, abundance of John Day trout redband populations is unknown.

Redband trout are present in all fish bearing streams in the analysis area. Relative abundance surveys were completed during the 1993 stream surveys on Mill and Crawford Creeks. Few adult redband (greater than or equal to 5 inches in length) were found in either Mill or Crawford Creeks (Table AW – 15). No juvenile redband trout (less than or equal to 5 inches in length) were found in Mill Creek and only two were found in Crawford Creek during the relative abundance surveys. The normal pattern for age class distribution in salmonid populations is for a decreasing abundance in ages classes. However, this was not the case for Crawford and Mill Creeks, which would indicate that little if any reproduction was occurring in these streams. No fish sampling, either population of relative abundance surveys, for redband trout have occurred on the Middle Fork.

Table AW – 15. Relative Abundance Estimates of Redband Trout for Streams in the Crawford Fisheries Analysis Area.

Stream	Number of Adults Observed	Number of Juveniles Observed	Density (#/m^2) (All age classes)	Source/Year
Middle Fork John Day River	—–	—–	—–	—–
Mill Creek	10	0	0.034	USFS, 1993
Crawford Creek	6	2	0.008	USFS, 1993

1) No population estimate

In contrast to the relative abundance estimates for Mill and Crawford Creeks, ODFW estimated the mean relative abundance for redband trout in the Middle Fork Subbasin on streams with better habitat was 0.184 fish per square meter (Figure AW – 5, on the following page).

Distribution and Habitat

Middle Fork John Day Subbasin:

Currently in the John Day Basin, redband trout are present in the North Fork, Middle Fork, Main stem, and South Fork John Day Rivers and their tributaries. Redband trout are present in all fish-bearing streams in the Middle Fork John Day Subbasin. Summer distribution of redband trout is generally limited to headwater areas.

Crawford Fisheries Analysis Area:

There are about 13.1 miles of redband trout habitat in the fisheries analysis area (Figure AW – 6, following page). Spawning and rearing habitat is present in Mill Creek (2.1 mi) and Crawford Creek (6.3 mi). Spawning, rearing and migration habitat is present in the Middle Fork (4.7 mi).

Figure AW – 5. Comparison of Relative Abundance (#/M2) Of Redband Trout (Redband and Juvenile Steelhead) In Mill Creek and Crawford Creek to Other Streams in the Middle Fork John Day Subbasin.

Mean density for redband trout in comparison streams is 0.184 fish per m^2. Streams were sampled from 1990 to 1993. Data for Mill Creek and Crawford Creek from USFS surveys. Data for other streams from ODFW surveys.

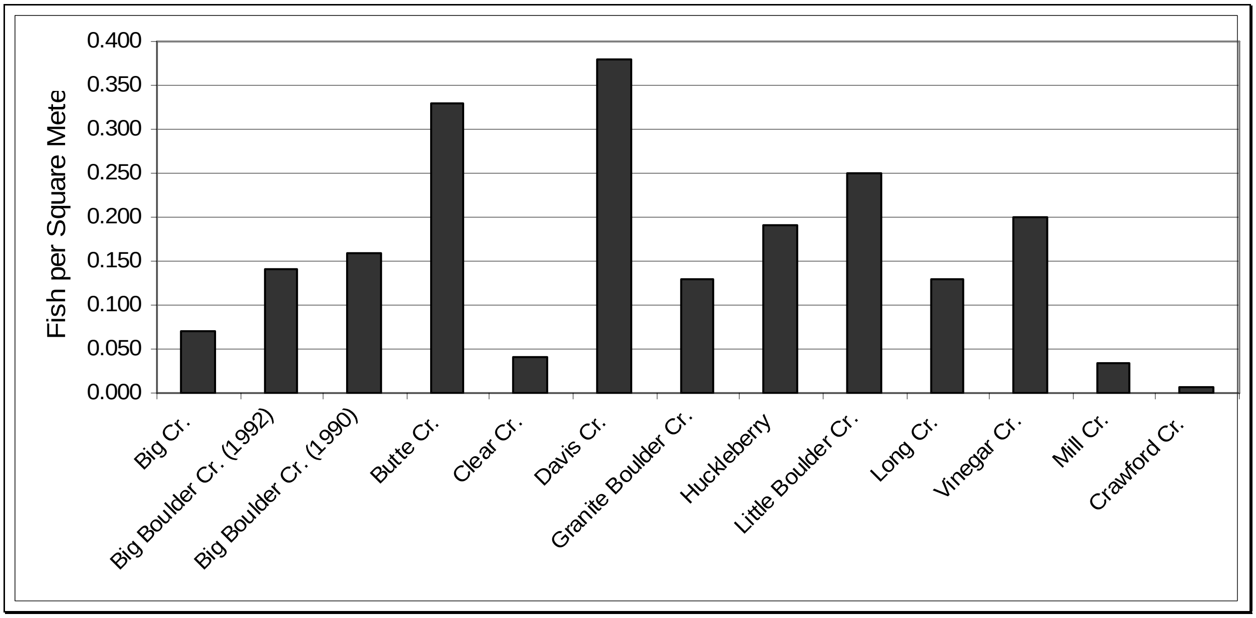
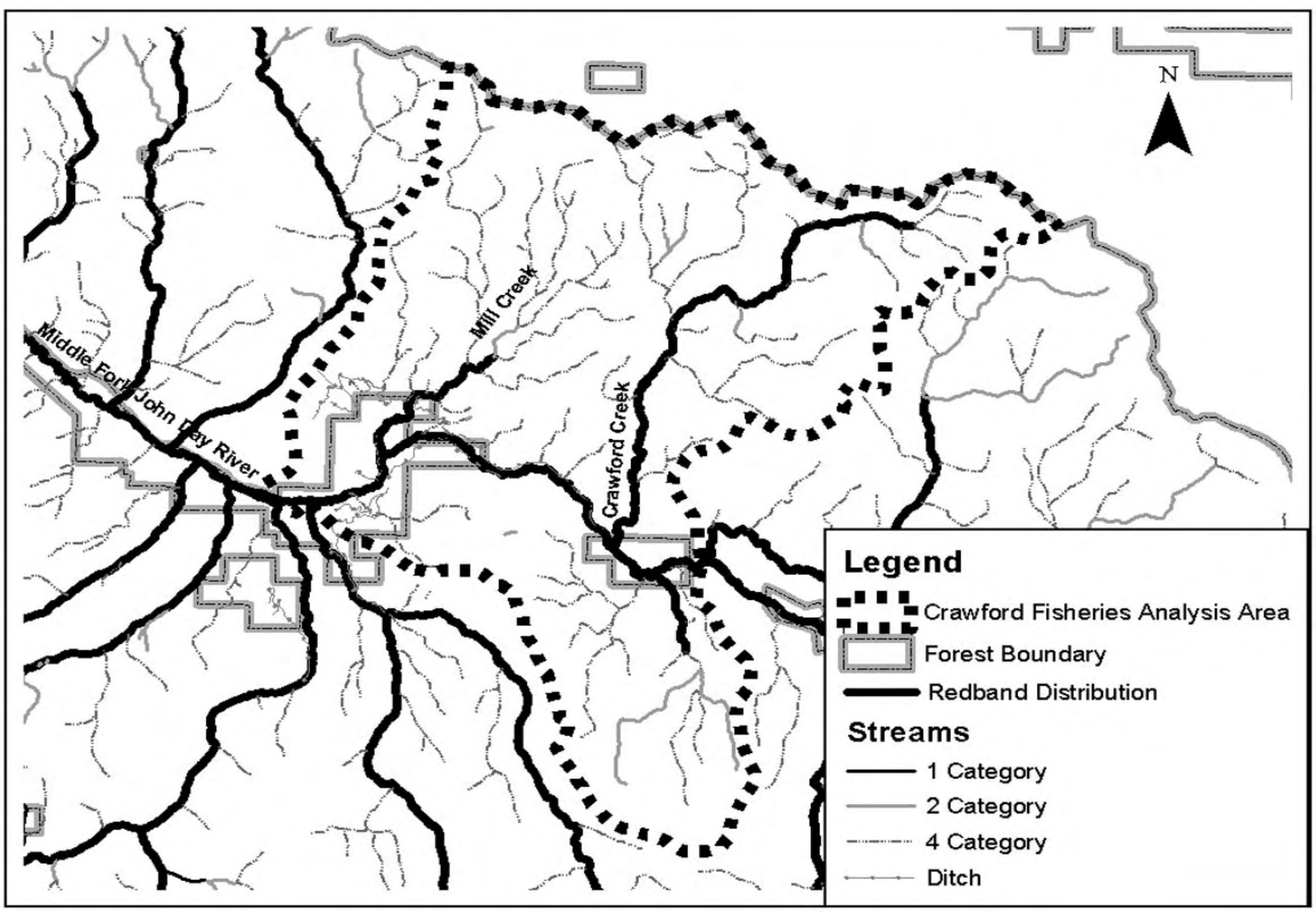


Figure AW – 6. Distribution of Redband Trout in the Crawford Fisheries Analysis Area.



Red Band Trout – Environmental Consequences

Alternative 1 – No Action

Determination

Interior Redband Trout (S): Risk of May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH).

Rationale

Habitat for redband trout in the fisheries analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the fisheries analysis area to support redband trout. Based on fine sediment levels the likelihood of successful spawning in Mill and Crawford Creeks is low. This is born out by the low numbers of redband trout present in these streams in 1993. These conditions persist. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base. Alternative 1 would maintain the current degraded habitat conditions for redband trout.

Alternative 2

Determination

Interior Redband Trout (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

Rationale

Habitat for redband trout in the fisheries analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the fisheries analysis area to support redband trout. Based on fine sediment levels the likelihood of successful spawning in Mill and Crawford Creeks is low. This is born out by the low number of redband present in these streams in 1993. These conditions persist.

Short-term increases in fine sediment from timber harvest, log and rock haul, prescribed burning, road maintenance and road reconstruction are unlikely to result in measurable increases in fine sediment in stream channels. Decommissioning activities however, may result in a short-term increase in fine sediment due to removal of the FSR 2620156 road culvert and disturbance of some road surfaces to discourage vehicle use and improve infiltration. The increases may add to adverse effects since streams in the fisheries analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids.

In the long-term, Alternative 2 would reduce fine sediment levels in the fisheries analysis area as a result of the proposed road decommissioning activities. About 18.0 miles of native surface roads would be decommissioned including about 5.8 miles located in RHCAs. One culvert that is a fish barrier on Crawford Creek would be removed when FSR 2620156 is decommissioned. These actions would result in an incremental improvement in habitat conditions for redband trout in the fisheries analysis area. However, high water temperatures and altered stream channel conditions would likely persist.

Alternative 3

Determination

Interior Redband Trout (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.
Rationale

Same as Alternative 2

Alternative 4

Determination

Interior Redband Trout (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

Rationale

Same as Alternative 2

Spring Chinook Salmon – Affected Environment

Spring Chinook salmon are a Region 6 sensitive species. Essential Fish Habitat (EFH) for spring Chinook salmon has been designated by NMFS in the fisheries analysis area. Salmon are sensitive to changes in water quality and habitat. Juvenile Chinook salmon are generally associated with pool habitats. An increase in sediment lowers spawning success and reduces the quantity and quality of pool and interstitial habitat. Other important habitat features include healthy riparian vegetation, undercut banks and LWD.

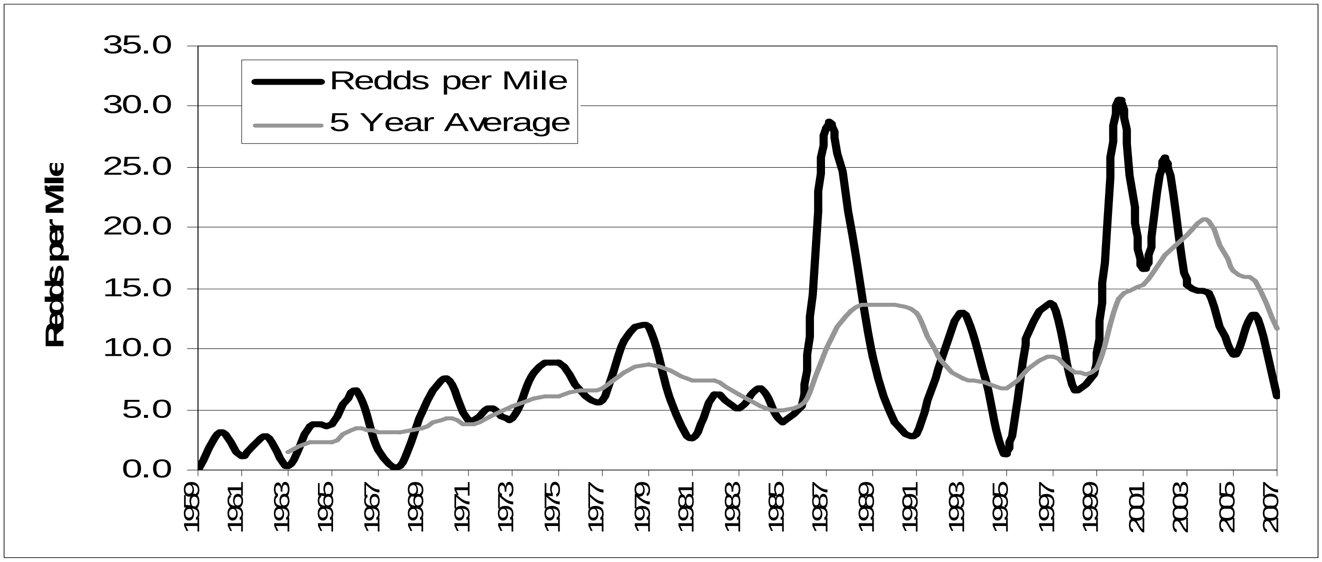
Adult spring Chinook salmon return to the Middle Fork during the spring. Adults hold in deep pools during the summer while sexually maturing. Spawning occurs during fall, generally from August through September. Embryos incubate over the winter and emergence occurs the following spring. Juveniles generally rear for one year in freshwater. Juveniles use habitats with slower water velocities (pools, glides, and side channels). Juveniles overwinter in deep pools with abundant cover. Smoltification and emigration to the ocean occurs in the spring of their second year. The ocean rearing phase lasts from 1 to 3 years.

Population Status

Middle Fork John Day Subbasin:

Spring Chinook salmon runs in the John Day River Basin are composed entirely of native stocks. Spring Chinook salmon are present in three streams in the Upper Middle Fork Watershed. The Middle Fork Subbasin has historically contributed approximately 12% of the total run for the basin (USFWS and NMFS 1981). The population has been generally increasing since 1959 but has been declining since 2002 (Figure AW – 7). However, due to the low population size (<500) and current habitat conditions, the Middle Fork population would be at risk during any future periods of adverse environmental conditions (JDSRDP 2005).

Figure AW – 7. Number of Spring Chinook Salmon Redds per mile in the Middle Fork John Day Subbasin, 1959 to 2007.



Crawford Fisheries Analysis Area:

Separate estimates of abundance of Chinook salmon are not available for the fisheries analysis area.

Distribution and Habitat

Middle Fork John Day Subbasin:

Spawning habitat for the Middle Fork spring Chinook is present in the Big Creek, Camp Creek, and Upper Middle Fork John Day River Watersheds. Main spawning areas are located along the Middle Fork with minor amounts of spawning occurring in Clear Creek. Juvenile rearing primarily occurs in Squaw Creek, Clear Creek, Granite Boulder Creek, Camp Creek, and the Middle Fork downstream to the confluence with the North Fork John Day River.

Crawford Fisheries Analysis Area:

There are about 4.7 miles of spring Chinook spawning and rearing habitat within the Middle Fork (4.7 mi) fisheries analysis area (Figure AW – 8, on the following page). Juveniles may also utilize the lower portions of Mill Creek and Crawford Creek for winter rearing habitat.

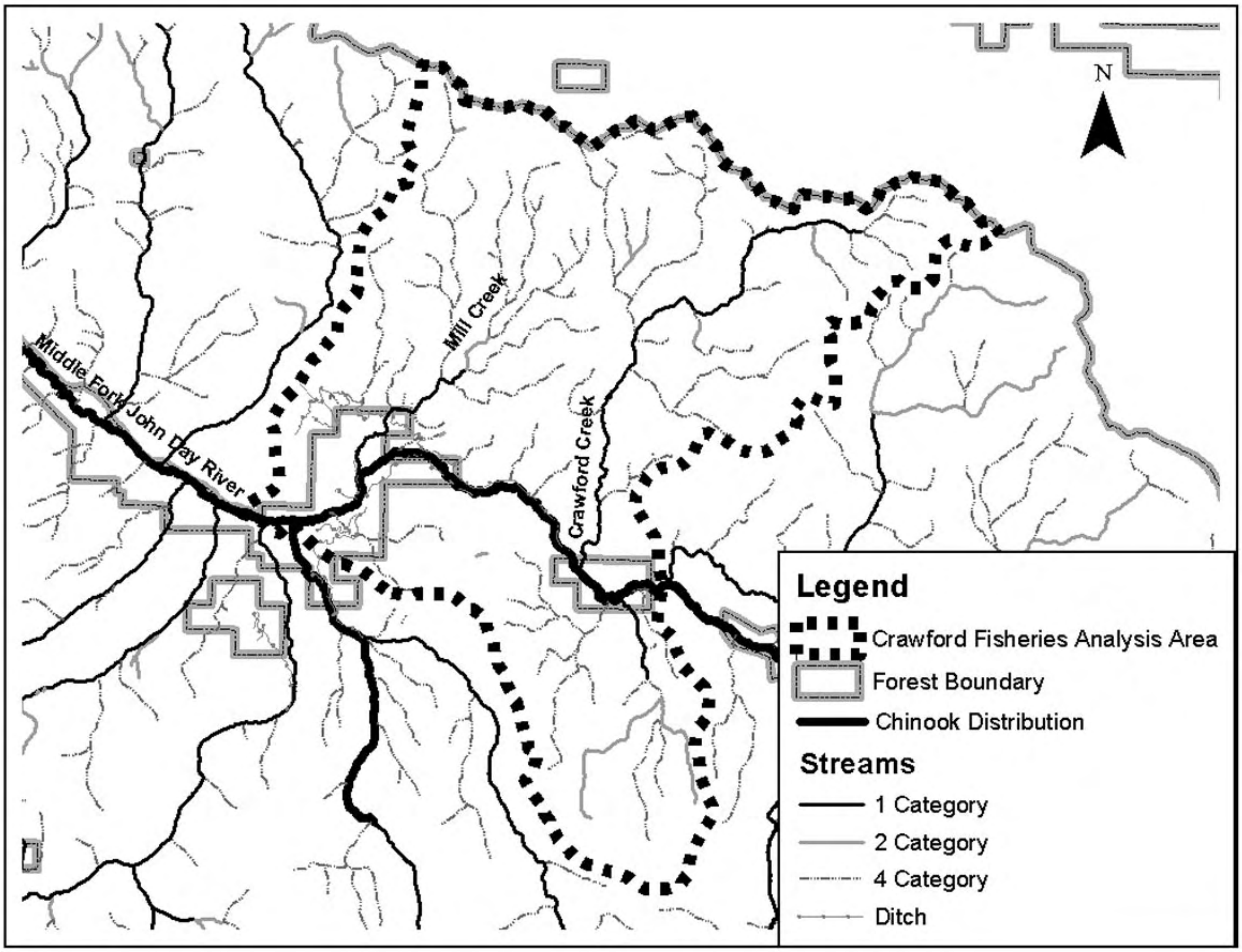
Essential Fish Habitat (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104 – 267), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NMFS on activities that may adversely affect EFH. EFH determinations and rationale are included in this section by alternative.

Congress defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The EFH guidelines further interpret the EFH definition as:

1. Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate,
2. substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities,
3. necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem, and
4. "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

Figure AW – 8. Distribution of Spring Chinook Salmon in the Crawford Fisheries Analysis Area.



Spring Chinook Salmon – Environmental Effects

Alternative 1

Determination

Chinook Salmon (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH).

Rationale

Habitat for Chinook salmon in the fisheries analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of the Middle Fork in the fisheries analysis area to support Chinook salmon. Fine sediment levels in the upper reaches of the Middle Fork below Phipps Meadow (Reaches 15 and 16) are reducing the likelihood of successful spawning of Chinook salmon. Reductions in pool habitat in the Middle Fork has reduced migration and holding habitat for adult Chinook salmon. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base. Alternative 1 would maintain the current degraded habitat conditions for Chinook salmon.

Despite the degraded habitat conditions in the Crawford Fisheries Analysis Area, Chinook population levels in the Middle Fork Subbasin appear to be stable though high variability makes it difficult to determine the long-term viability of the population. This uncertainty is evident in the fact that NMFS chose not to list the population as threatened as part of the Mid-Columbia ESU in 1998 (63 FR 11482) while ODFW is concerned that the population would at risk during future periods of adverse environmental conditions (JDSRDP 2005).

EFH Determination

Chinook Salmon Essential Fish Habitat: No Adverse Effect (NAE).

Rationale

EFH for Chinook salmon in the fisheries analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of the Middle Fork in the fisheries analysis area to support Chinook salmon. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base. These conditions would persist under Alternative 1.

Alternative 2

Determination

Chinook Salmon (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

Rationale

Habitat for Chinook salmon in the fisheries analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of the Middle Fork in the fisheries analysis area to support Chinook salmon. Fine sediment levels in the upper reaches of the Middle Fork below Phipps Meadow (Reaches 15 and 16) are reducing the likelihood of successful spawning of Chinook salmon. Reductions in pool habitat in the Middle Fork has reduced migration and holding habitat for adult Chinook salmon.

Timber harvest and prescribed burning activities proposed under Alternative 2 would result in short-term increases in fine sediment. These increases will likely not be measurable but may add to adverse impacts already occurring due to current levels of fine sediment in the fisheries analysis area.

Proposed road decommissioning activities will also result in short-term increases in fine sediment. However, fine sediment levels in the Analysis area will decline in the long-term due to the reduction in native surface roads located in RHCAs; about 34%. This will likely result in a both a measurable and meaningful reduction in fine sediment in the future thus improving rearing and spawning habitat for Chinook salmon.

EFH Determination

Chinook Salmon Essential Fish Habitat: No Adverse Effect (NAE).

Rationale

Timber harvest and prescribed burning activities proposed under Alternative 2 would result in short-term increases in fine sediment. These increases are unlikely to be measurable but would add to already high levels of fine sediment in EFH for Chinook salmon in the fisheries analysis area.

Proposed road decommissioning activities would also result in short-term increases in fine sediment. However, fine sediment levels in the Analysis area will decline in the long-term due to the reduction in native surface roads located in RHCAs; about 34%. This would likely result in a both a measurable and meaningful reduction in fine sediment in the future thus improving rearing and spawning EFH for Chinook salmon.

Alternative 3

Determination

Chinook Salmon (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

Rationale

Same as Alternative 2.

EFH Determination

Chinook Salmon Essential Fish Habitat: No Adverse Effect (NAE).

Rationale

Same as Alternative 2.

Alternative 4

Determination

Chinook Salmon (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

Rationale

Habitat for Chinook salmon in the fisheries analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of the Middle Fork in the fisheries analysis area to support Chinook salmon. Fine sediment levels in the upper reaches of the Middle Fork below Phipps Meadow (Reaches 15 and 16) are reducing the likelihood of successful spawning of Chinook salmon. Reductions in pool habitat in the Middle Fork has reduced migration and holding habitat for adult Chinook salmon.

Prescribed burning activities proposed under Alternative 4 would result in short-term increases in fine sediment. These increases would likely not be measurable but would be less compared to Alternative 2 because of the elimination of timber harvest and related activities. Increase would likely add to adverse impacts already occurring due to current levels of fine sediment in the fisheries analysis area.

Proposed road decommissioning activities would also result in short-term increases in fine sediment. However, fine sediment levels in the fisheries analysis area would decline in the long-term due to the reduction in native surface roads located in RHCAs; about 34%. This would likely result in a both a measurable and meaningful reduction in fine sediment in the future thus improving rearing and spawning habitat for Chinook salmon.

EFH Determination

Chinook Salmon Essential Fish Habitat: No Adverse Effect (NAE).

Rationale

Prescribed burning activities proposed under Alternative 4 would result in short-term increases in fine sediment. These increases are unlikely to be measurable but would add to already high levels of fine sediment in EFH for Chinook salmon in the fisheries analysis area.

Proposed road decommissioning activities would also result in short-term increases in fine sediment. However, fine sediment levels in the fisheries analysis area would decline in the long-term due to the reduction in native surface roads located in RHCAs; about 34%. This would likely result in a both a measurable and meaningful reduction in fine sediment in the future thus improving rearing and spawning EFH for Chinook salmon.

Columbia Spotted Frog – Affected Environment

Spotted frogs are highly aquatic and are rarely found far from permanent water. They are usually found along the grassy margins of low gradient streams, lakes, ponds, springs, and marshes. Spotted frogs are normally found along low gradient reaches of streams.

During winter, spotted frogs burrow into banks adjacent to streams, ponds, and springs. Breeding occurs in the spring varying with elevation. In the Columbia basin of Washington, breeding occurs from March to April in lower elevations, and from May to June in the higher elevations. Breeding habitat is usually found in shallow water in ponds or other quiet waters along streams. Breeding may also occur in flooded areas adjacent to streams and ponds. Adults may disperse overland in the spring and summer after breeding.

Population Status

Condition and Trend of Population:

This species occurs in extreme southeastern Alaska, southwestern Yukon, northern British Columbia, and western Alberta south through Washington east of the Cascades, eastern Oregon, Idaho, and western Montana to Nevada (disjunct, Mary's, Reese, and Owyhee river systems), southwestern Idaho (disjunct), Utah (disjunct, Wasatch Mountains and west desert), and western and north-central (disjunct) Wyoming. Disjunct populations occur on isolated mountains and in arid-land springs. In Oregon, Columbia spotted frogs appear to be widely distributed east of the Cascade Mountains.

USFWS lists livestock grazing and introduction of nonnative fish (salmonids and bass) as threats to the Great Basin population of Columbia spotted frogs (66 FR 1295).

The spotted frog is considered present in all subbasins on the Malheur National Forest. It is assumed this species is widely distributed in the Middle Fork Subbasin. Limited habitat surveys have been conducted specifically for spotted frogs; however, habitat probably exists along low gradient perennial streams. Fish surveys record incidental sightings of frogs but most do not differentiate species. During 1996 fish surveys, spotted frogs were reported in the Davis/Placer Subwatershed; along Davis and Placer Creeks.

Spotted frogs have also been documented in the Middle Fork, Crawford Creek, and Squaw Creek. In 2003 and 2004, Forest Service personnel conducted spotted frog surveys and spotted frogs were found near the mouth of Camp Creek, in the Middle Fork near Camp Creek, and Crawford Creek. Egg masses of spotted frogs were also found in a pond adjacent to Bridge Creek and Highway 26 near Austin Junction.

Habitat in the Analysis Area:

Spotted frogs have been documented in the Middle Fork and Crawford Creek in the fisheries analysis area.

Columbia Spotted Frog – Environmental Consequences

Alternative 1 – No Action

Determination

Columbia Spotted Frog (S): No Impact (NI).

Rationale

Alternative would maintain current habitat conditions for spotted frogs. Riparian habitat appears to be improving for spotted frogs based on the upward trend of riparian areas documented during range allotment monitoring in 2004.

Alternatives 2, 3, and 4

Determination

Columbia Spotted Frog (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

Rationale

Spotted frog habitat in riparian areas would be protected by limiting proposed timber harvest activities to areas outside of RHCAs (Alternatives 2 and 3). The Malheur National Forest requires a 100 foot buffer around springs (Forest Plan Standard 56). Spotted frogs utilize springs for winter habitat. Forest Plan Standard 56 protects springs from disturbance from logging activities in upland areas.

Proposed burning activities may result in impacts to adult frogs that are dispersed through the project area and frog habitat in riparian areas. Vegetative cover in riparian areas would be decreased in the short-term where shrubs and tall herbaceous vegetation is consumed during burning activities in RHCAs.

Decommissioning road segments in RHCAs would pose short-term risks to adult frogs yet would result in improved riparian areas in the long-term and should result in improvement of habitat for spotted frogs.

Cumulative Effects Common to all Aquatic Species by Alternative

All of the activities in Appendix D, Cumulative Effects (past activities, past wildfires, present activities, and foreseeable activities) and the current project proposal have been considered for their cumulative effects on aquatic habitat and associated aquatic species. The following discussion focuses on the past, ongoing and foreseeable future activities that may contribute positive or negative effects. The effects determination and rationale by species and alternative are discussed in the previous section and summarized in Table AW – 14. The analysis area for aquatic species and the cumulative effects boundary are the same as used for aquatic habitat (Figure AW – 1).

Effects Common to all Alternatives

During the past 100 years livestock grazing, weed infestations, timber harvesting activities, stream dewatering, firewood cutting, fire suppression, road construction, road density, lack of road maintenance, and general road use on public and private lands have contributed to landscape changes that may have affected processes such as overland flows, channel development and riparian and fish habitat within the drainage associated with this project. Legacy effects from past management activities may continue to impact water quality and aquatic habitat in the project area and downstream of the project area.

Stream reaches on the Middle Fork John Day River, downstream of the project area have improved dramatically due to riparian fencing on Nature Conservancy, Confederated Tribes of Warm Springs and private lands that have restricted riparian livestock use. Additionally, current grazing management practices, within the project area, have allowed stream reaches to improve and develop an upward trend. In 2005 the Blue Mountain allotment was grazed after July15th, to obtain a NLAA call for steelhead with 163 cow/calf pairs or 466 head months but was rested in 2006 and 2007 for resource protection.

Potential effects from the alternatives would be cumulative with effects from non-federal activities within the project area and activities within the aquatic analysis area on federal, state and private lands. Aside from this project, other non restoration activities that may contribute to cumulative effects include; timber harvest activities, wildfires, livestock grazing, road use, flood irrigation/water diversion, and vegetation alteration.

The combined negative effects from past roading and certain recreational use could result in shade reductions and increased sediment that could temporarily alter fisheries habitat. The magnitude and timing of these potential impacts are unpredictable, but they would have short-term (1 to 3 years) to long term (50+ years) negative effects on fisheries habitat in this watershed.

If a severe crown fire occurs (See Fire and Fuels section of Chapter 3) shade would be reduced, and water temperatures would increase, for perhaps one to a few decades, depending on riparian shrub and tree recovery. Both base flows and peak flows may increase for perhaps 10 years, until evapotranspiration recovers and depending on altered snow accumulation and snowmelt regimes (elevation and aspect substantially regulate peak flow processes within the project area). Increases in base flows would provide more summer habitat for aquatic species, and may reduce the temperature increases. Sediment from upland sources could increase for 1 to 3 years following a fire. Sediment from channel sources could increase due to increased peak flows and due, to a lesser extent, to the fire killing bank stabilizing trees and shrubs. However, recovery of bank stabilizing herbaceous and shrubby vegetation would probably limit increased sediment from channel sources to less than 5 years. Severe fire would also supply an extended pulse of woody debris to streams, which would gradually decay over decades.

The Malheur National Forest Invasive Plants Treatment Project proposes to control invasive plants by a combination of hand tools, ground based herbicides, and biological control methods. These methods would not produce any water temperature increases and there is only a slight chance they would produce negligible sediment increases. Thus, no cumulative effects are expected in the way of sediment or temperature increase from the addition of the Invasive Plants Treatment Project to the Crawford Project. It is likely that invasive plant treatments would occur within the Crawford fisheries analysis area; however the locations and quantities of sites to be treated with the Invasive Plants Treatment Project (as proposed with Project Design Features) are unknown at this time. Given this uncertainty the possibility exists that short-term adverse effects to listed aquatic species may occur. The Crawford Project is designed so that invasive plants would not be spread by project activities, so no additional invasive plant control would result from project activities.

The effects of other foreseeable activities, described in Appendix D, on aquatic species are negligible with the exception of the four remaining culvert replacements along Highway 26, irrigation withdrawals, and which are potential sediment, temperature concerns, respectively. Under all alternatives, the long term effects of the Highway 26 culvert replacements are beneficial although short term adverse affects to aquatic TES species may result. The effects of use and maintenance of roads which are not decommissioned would remain the same as at present. The effects of culvert replacements would start to decrease when work finishes in 2009, and would be negligible by 2011.

All alternatives would permit a natural slow, partial recovery from effects of past grazing, past riparian road construction, and past riparian harvest. This recovery would occur as riparian trees grow larger, as large wood falls into the streams, as channel types change to more stable, narrow configurations, as sediment from past actions is washed out, and as riparian shrubs and herbs recover and contribute to more stable stream banks. Recovery would be only partial because some ongoing impacts from some existing roads would not permit full recovery.

Alternative 1 – No Action

Under the No Action Alternative, there would be no management activities associated with the timber harvest in the project area; therefore, there would be no direct effects to aquatic species. However there would be cumulative effects as described below. Roads would not be treated in this alternative, which would allow about 18 miles of roads to continue acting as potential sediment sources, affecting aquatic species habitat within the project area and downstream reaches. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base.

The hazard of a severe crown fire is higher, as described in the Fire and Fuels section of Chapter 3. Most of the forested stands in the project area are identified as moderate to high risk for stocking induced mortality and related infestation of pests or disease. Without silvicultural treatment and/or the controlled re-introduction of fire into the project area, current stand conditions would worsen and increase the chance of a stand replacement fire. A stand replacement wildfire would result in the loss of shading along stream channels, loss of instream wood structures, and short-term (3 to 5 years) loss of streamside vegetation. This could adversely affect fish habitat. In addition, localized extirpation of these fish could occur as the result of severe wildfires (Rinne 1996).

The recovery of aquatic habitat and water quality would be slightly slower, and not progress quite as far as under Alternatives 2, 3, and 4, because of the effects of the roads which would not be decommissioned in RHCAs.

Alternatives 2, 3, and 4

Road decommissioning activities and removal of FSR 2620156 culvert, proposed under Alternatives 2, 3, and 4 may result in short-term cumulative effects because the proposed activities would likely result in short-term increases in fine sediment. The short-term increases may add to adverse effects because streams in the analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids. However, the proposed road decommissioning activities would lead to a long-term reduction in fine sediment levels and therefore would have beneficial impacts to aquatic habitat and fish. Removal of a culvert on Crawford Creek when FSR 2620156 is decommissioned would reduce the number of culverts that are fish passage barriers from four to three.

Likely sources of sediment are channel modification from railroad logging, channel erosion, erosion from “scabs” (shallow soil areas where ground cover standards are not met), livestock grazing (especially past grazing), the gullying in Phipps Meadow in the mid-1990s, and roads. These sources include both natural processes and past and ongoing actions on both National Forest and private lands. Under Alternative 2 and 3 timber harvest, log and rock haul, prescribed burning, road maintenance and road reconstruction may result in negligible increases in fine sediment, however it is unlikely that these increases would result in cumulative adverse effects when combined with other past, ongoing, or future actions. Sediment production by road decommissioning would be a small proportion of the sediment from natural processes and from past and ongoing actions, and would last only about two years. Thus the cumulative effect of the proposed action would be a relatively small increase in total sediment production. After two years sediment would decrease due to road decommissioning.

Under Alternatives 2, 3, and 4 the hazard of a severe crown fire is lower than under Alternative 1, as described in the Fire and Fuels section of Chapter 3.

Since impacts to aquatic habitat from the proposed vegetation, log and rock haul, road maintenance, road reconstruction and prescribed burning activities are limited to negligible increases in fine sediment it is unlikely that these increase would result in cumulative effects from range management activities. Road decommissioning activities proposed under Alternatives 2, 3, and 4 may result in short-term increases in fine sediment. However, the level of these cumulative effects with grazing management activities is not likely to reach a point where measurable adverse affects would occur where grazing standards are met.

Alternative 4

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings, temporary roads and felling of danger trees. It would also eliminate the need for haul activities including water withdrawals for dust abatement. About 807 acres would be precommercially thinned resulting in grapple piles on 655 acres and hand piles on 146 acres.

Alternative 4 would still result in short-term ground disturbing negative effects but at a smaller scale and magnitude compared to Alternatives 2 and 3. The hazard of a severe crown fire is lower than under Alternative 1, but higher then Alternatives 2 and 3 where different amounts and types of vegetation treatment would occur, as described in the Fire and Fuels section - Chapter 3.

Short-term increases in fine sediment from prescribed burning are unlikely to result in measurable increases in fine sediment in stream channels. Decommissioning activities however may result in a short-term increase in fine sediment due to due to removal of the FSR 2620156 road culvert and disturbance of some road surfaces to discourage vehicle use and improve infiltration. The increases may add to adverse effects because streams in the fisheries analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids. No temporary roads, reconstructed or road maintenance activities would occur in Alternative 4, reducing the chance of sediment input to streams.

In the long-term, Alternative 4 would reduce fine sediment levels in the fisheries analysis area as a result of the proposed road decommissioning activities. About 18.0 miles of native surface roads would be decommissioned including about 5.8 miles located in RHCAs. One culvert that is a fish barrier on Crawford Creek would be removed when FSR 2620156 is decommissioned. These actions would result in an incremental improvement in habitat conditions for MCR steelhead in the fisheries analysis area. However, high water temperatures and altered stream channel conditions would likely persist until riparian shade producing vegetation recovers.

Consistency with Direction and Regulations

Malheur Forest Plan

Alternative 1 – No Action

Alternative 1 does not fully meet the MA–3B standards, and PACFISH standards and guidelines. Alternative 1 is not consistent with the following Forest Plan Standards:

- MA–3B Standard 41: "…Minimize the density of opens roads in this management area by obliterating, revegetating, or closing unnecessary roads or any roads causing significant resource damage."

- PACFISH Standard RF – 3c: Determine the influence of each road on RMOs. Meet RMOs and avoid adverse effects on inland native fish by:
    - Closing and stabilizing or obliterating, and stabilizing roads not needed for future management activities. Prioritize these actions based on the current and potential damage to anadromous native fish in priority watersheds, and the ecological value of the riparian resources affected.

Roads that have known adverse impacts to aquatic resources would remain in their current condition under Alternative 1 (see Crawford Roads Analysis).

Alternatives 2 and 3

Alternatives 2 and 3 are consistent with MA–3B standards, Amendment 29, and the PACFISH amendment.

- MA–3B Standard 41: Roads that are causing resource damage to aquatic habitats are proposed for closing or decommissioning. However, FSR 2620, which has had an adverse impact to Crawford Creek, would be left open.
- PACFISH RF – 2b: Proposed temporary roads and landings are located outside of RHCAs.
- PACFISH RF – 3a and b: Roads that would be used for proposed vegetation management activities would have drainage problems repaired and would be brought up to standards prior to haul.
- PACFISH RF – 3c: Roads not need for future management activities and old skid trails that have been identified as sources of fine sediment would be closed, decommissioned, or obliterated.
- PACFISH RA – 2: Danger trees felled in RHCAs will be left on site where woody debris objectives are not being met.
- Forest Plan DFCs/RMOs: Activities proposed under Alternatives 2 and 3 would not retard the attainment of Forest Plan RMOs for aquatic habitat (LWD, replacement LWD, pool frequency, bank stability, width-to-depth ratio, sediment/substrate, shading, and water temperature). Alternatives 2 and 3 may result in short-term increases in fine sediment in Crawford and Mill Creeks due to road decommissioning activities. However, design measures would be used to minimize the amount of fine sediment resulting from these activities. These activities would result in long-term decreases in fine sediment in these streams, which should result in the attainment of the DFC/RMO for fine sediment.

Alternative 4

Alternative 4 is consistent with MA–3B standards, Amendment 29, and the PACFISH amendment.

- MA–3B Standard 41: Roads that are causing resource damage to aquatic habitats are proposed for closing or decommissioning. However, FSR 2620, which has had an adverse impact to Crawford Creek, would be left open.
- PACFISH RF – 3c: Roads not need for future management activities and old skid trails that have been identified as sources of fine sediment would be closed, decommissioned, or obliterated.

- Forest Plan DFCs/RMOs: Activities proposed under Alternative 4 would not retard the attainment of Forest Plan RMOs for aquatic habitat (LWD, replacement LWD, pool frequency, bank stability, width-to-depth ratio, sediment/substrate, shading, and water temperature). Alternative 4 may result in short-term increases in fine sediment in Crawford Creek and Mill Creek due to road decommissioning activities. However, design measures would be used to minimize the amount of fine sediment resulting from these activities. These activities would result in long-term decreases in fine sediment in these streams, which should result in the attainment of the DFC/RMO for fine sediment.

Clean Water Act

The Middle Fork John Day River, Crawford Creek, and Mill Creek are on the Oregon 303(d) list for water quality-limited water bodies for high temperatures. In the project area, the Middle Fork is listed for standards associated with the Designated Beneficial Uses of bull trout spawning and rearing. All Alternatives comply with the Clean Water Act and the Forest Plan, since none raise water temperatures, and since all follow Best Management Practices (BMPs) as specified in "Forest Service R6 General Water Quality Best Management Practices" (1988), and in standards and guidelines in the Forest Plan. The site specific BMPs are listed in Chapter 2 (in the description of the alternatives and in the Management Requirements, Constraints, and Design Measures Tables 2 – 6 and 2 – 7), in PACFISH Standards and Guidelines (as described in Chapter 3, Aquatics & Water Quality, Regulatory Framework section), in Appendix F, and in standard timber sale contracts.

Endangered Species Act

All alternatives are consistent with the Endangered Species Act.

Consultation with U.S. Department of the Interior (USDI), Fish and Wildlife Service (USFWS), has been completed (Biological Assessment and letter of concurrences are located in the project file). Informal consultation with the USFWS was completed on April 17, 2002 with the receipt of the Letter of Concurrence (LOC) for the Crawford Vegetation Management Project. When the 2002 LOC was issued, bull trout critical habitat designation was being proposed for the John Day Basin. Since then, a final critical habitat designation for bull trout, published on September 26, 2005, excluded the John Day River System. Thus, analysis of effects to bull trout critical habitat is not necessary. The effects determination for the Crawford Timber Sale EA (Alternative 2) was a ***may effect, not likely to adversely affect bull trout***. On March 27, 2008 the Forest Service received a letter from USFWS stating that the "Service concurs that the project, as modified, is not likely to result in additional effects to bull trout, beyond what were addressed previously in the 2002 LOC. Effects due to the project modifications are no greater than those analyzed in the original consultation so the April 17, 2002 LOC is still valid."

Formal consultation with the National Marine Fisheries Service (NMFS) was completed on April 16, 2002 with the receipt of the Biological Opinion (BO) for the Crawford Timber Sale EA. The effects determination for the Crawford Timber Sale EA (Alternative 2) was a may effect, likely to adversely affect MCR steelhead. Reinitiation of consultation with NMFS began May 21, 2007 because critical habitat for Mid Columbia River Steelhead was designated that may be affected by the action and the proposed action changed. A final biological assessment has been submitted to NMFS with a may affect, likely to adversely affect (beneficial effect) for threatened Mid Columbia River Steelhead and designated critical habitat. The Forest Service has received notification from NFMS that the information that was provided is sufficient and that the BA is being submitted for review. A Biological Opinion has not yet been received.

Magnuson-Stevens Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104 – 267), requires the inclusion of Essential Fish Habitat (EFH) descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NMFS on activities that may adversely affect EFH.

NMFS concluded that the proposed action for the 2002 Crawford Timber Sale EA may adversely affect the EFH for Chinook salmon. Pursuant to Section 305(b)(4)(A) of the Magnuson-Stevens Act, NMFS was required to provide EFH conservation recommendations to the Malheur National Forest. In addition to conservation measures proposed for the project by the Malheur National Forest, all of the Reasonable and Prudent Measures and the Terms and Conditions contained in Section 2.4 of the ESA portion of the 2002 Opinion were applicable to salmon EFH. Therefore, NMFS incorporated each of those measures as EFH conservation recommendations. Note: NMFS had no additional conservation recommendations regarding the action addressed in 2002 Biological Opinion.

Reinitiation of EFH consultation with NMFS began May 21, 2007 (see ESA above for details of this consultation). The proposed actions in the biological assessment submitted to NMFS are ***no adverse effect*** on Chinook salmon EFH.

Floodplains (Executive Order 11988)

Executive Order 11988 says that Federal agencies shall avoid adverse effects to floodplains or minimize potential harm. Floodplains several feet wide occur along much of the Middle Fork, Crawford Creek, and Mill Creek. The floodplains are well within RHCAs, and so all alternatives avoid adverse effects to the floodplains, and thus are consistent with Executive Order 11988.

Recreational Fisheries

Alternative 1 – No Action

Alternative 1 would maintain the current degraded aquatic habitat conditions. The current aquatic habitat conditions are resulting in reduced recreational fishing opportunities.

Alternatives 2, 3, and 4

Alternatives 2, 3, and 4 include decommissioning and reopening roads. About 34% of native surface roads in RHCAs would be decommissioned. This aquatic conservation and restoration action would improve quantity, function, sustainable productivity, and distribution of recreational fisheries by reducing impacts from elevated levels of fine sediment as directed under Executive Order 12962, Recreational Fisheries.

Irreversible and Irretrievable Commitments of Resources

Irreversible effects are not expected. Reduced population viability for MCR steelhead, bull trout, redband trout, spring Chinook salmon, and Columbia spotted frog is not expected. PACFISH established explicit goals and objectives for anadromous fish habitat condition and function. By following PACFISH standards and guidelines as well as design criteria specific to this project, it is believed that irretrievable commitment of this resource can be avoided. The goal is to achieve a high level of habitat diversity and complexity through a combination of habitat features.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on aquatics and hydrology can be found in the Aquatics and Hydrology Specialist Report located in the project record.

Terrestrial Wildlife

Introduction

This section describes the terrestrial wildlife species found in the project area and the effects of the alternatives on these species. Rather than addressing all wildlife species, discussions focus on Forest Plan management indicator species (MIS), threatened, endangered and sensitive (TES) species, Forest Plan featured species, and landbirds (see individual species lists below). TES species effects are analyzed in more detail in the Crawford Biological Evaluation located in the project record.

The existing condition is described for each species, group of species, or habitat. Direct, indirect, and cumulative effects of alternatives are identified and discussed.

Regulatory Framework

The three principle laws relevant to wildlife management are the National Forest Management Act of 1976 (NFMA), the Endangered Species Act of 1973 (ESA), and the Migratory Bird Treaty Act (MBTA) of 1918. The direction relative to wildlife is as follows:

- NFMA requires the Forest Service to manage fish and wildlife habitat to maintain viable populations of all native and desirable non-native wildlife species and conserve all listed threatened or endangered species populations (36CFR219.19).
- ESA requires the Forest Service to manage for the recovery of threatened and endangered species and the ecosystems upon which they depend. Forests are required to consult with the U.S. Fish and Wildlife Service if a proposed activity may affect the population or habitat of a listed species.
- MBTA established an international framework for the protection and conservation of migratory birds. This Act makes it illegal, unless permitted by regulations, to "pursue, hunt, take, capture, purchase, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird …"

Forest Service Manual Direction provides additional guidance: identify and prescribe measures to prevent adverse modifications or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species (FSM2670.31 (6)). The Forest Service Manual directs the Regional Forester to identify sensitive species for each National Forest where species viability may be a concern.

Species presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, observations made during fire reconnaissance, non-Forest Service databases, and status/trend and source habitat trend documented for the Interior Columbia Basin. Effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. This strategy is based upon science that demonstrates connections between species populations and viability and the quantity and condition of habitat at appropriate scales of analysis (Baydack et al 1999). There is a high confidence level that species discussed in this document are either currently present in the area or were prior to the fire.

The principle policy document relevant to wildlife management on the Malheur National Forest is the 1990 Malheur National Forest Land and Resource Management Plan, referred to as the

Forest Plan for the remainder of this section. The Forest Plan provides standards and guidelines for management of wildlife species and habitats. Standards and guidelines are presented at the Forest level (LRMP, pg IV – 27 to IV – 33) or Management Area level (LRMP pg IV – 50, IV – 53, IV – 56 to IV – 57, IV – 105 to IV – 107, and IV – 108). Management Areas include General Forest (MA–1), Rangeland (MA–2), Anadromous Riparian Area (MA–3B), Old-Growth (MA–13) and Visual Corridors (MA–14).

The 1995 Regional Forester's Eastside Forest Plan Amendment 2 amended Forest Plans for the National Forests in Eastern Oregon and Eastern Washington, including the Malheur National Forest. Amendment 2 established interim wildlife standards for old-growth, old-growth connectivity, snags, large down logs, and northern goshawks. The Regional Forester has periodically distributed letters clarifying direction in Amendment 2 (Regional Forester, October 2, 1997; October 23, 1997; June 11, 2003).

Additional management direction is provided for migratory landbirds. Concern for declines in population trends has led to the creation of an International Partners in Flight (PIF) network and program. In 1992, an Oregon-Washington Chapter of PIF formed, with a separate Oregon subcommittee for assessing conservation needs at the state level. In 1994, the Forest Service, Region 6, signed a Memorandum of Agreement with 14 other agencies and non-agency entities to develop a program for the conservation, management, inventory, and monitoring of neo-tropical migratory birds. Executive Order 13186 (66 FR 3853, January 17, 2001) directs the Forest Service to consider the conservation of land bird species in the design, analysis and implementation of activities on federal lands administered by the US Forest Service.

Analysis Methods

Effects on wildlife will be assessed for National Forest land in Mill Creek Subwatershed, focusing on effects of activities within proposed treatment units for the following periods of time: Short-term 0-5 years, mid-term 5-25 years, and long-term 25+ years. Direct, indirect, and cumulative effects of alternatives are identified and discussed.

Rather than addressing all wildlife species, the Forest Plan focuses on three categories of wildlife: management indicator species (MIS); threatened, endangered and sensitive (TES) species; and featured species. In addition, interest has been raised for neotropical migratory birds. Categories and wildlife species are summarized below:

- **Management Indicator Species (MIS)**

  The Forest Plan identifies 15 MIS and their associated habitat requirements. MIS habitat requirements are presumed to represent those of a larger group of wildlife species, and act as a barometer for the health of their various habitats. American marten, pileated woodpecker, and northern three-toed woodpecker represent old-growth habitats, Rocky Mountain elk represent big game species, and primary cavity excavators (most woodpeckers) represent dead wood habitats. Effects to MIS species will be discussed in the Old-Growth Forest, Big Game Habitat, and Primary Cavity Excavator sections respectively.

- **Threatened, Endangered and Sensitive (TES) Species**

  An endangered species is an animal or plant species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. A sensitive species is an animal or plant species identified by the Forest Service Regional Forester for which species viability is a concern either a) because of significant current or predicted downward trend in population numbers or density, or b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Threatened, endangered, and sensitive species effects are summarized in this section by TES status and species. The Crawford Biological Evaluation in the project record provides more detailed information.

- **Featured Species**

The Malheur Forest Plan defines a featured species as a wildlife species of high public interest or demand. The featured species associated with the project area are northern goshawk and blue grouse. Effects to northern goshawk and blue grouse will be discussed in the Featured Species – Northern Goshawk and the Featured Species – Blue Grouse sections, respectively.

- **Landbirds including Neotropical Migratory Birds (NTMB)**

Landbirds, including neotropical migratory birds, are discussed because many species are experiencing downward population trends. Discussion can be found in the section Species of Concern – Landbirds including Neotropical Migratory Birds (NTMB). Landbirds, including neo-tropical migratory birds (NTMB), were analyzed based on high priority habitats identified in the Oregon-Washington Chapter of Partners in Flight, Northern Rocky Mountains Bird Conservation Plan (Altman 2000). While the Malheur Forest has not conducted official NTMB surveys in the project area, the Oregon Breeding Bird Atlas (Adamus et al. 2001) includes observational data for this area. Much of the data for the Malheur Forest was obtained from local biologists and ornithologists. Most NTMB species that are expected in the project area were recorded within the atlas' hexagons for the area. Based on a review of the District's wildlife database and observations made during reconnaissance of the fire area, there is a high confidence level that species discussed in this report are currently present in the area.

Species presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, and status/trend and source habitat trend documented for the Interior Columbia Basin. Formal wildlife surveys were not conducted for most species. Effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. This strategy is based upon science that demonstrates connections between species populations and viability and the quantity and condition of habitat at appropriate scales of analysis (USDA Forest Service 2001). There is a high confidence level that species discussed in this document are currently present in the area.

Effects on species will be determined by assessing how alternatives affect the structure and function of vegetation relative to current and historical distributions. The Forest Vegetation section of this document defines the historical vegetation patterns and structure within the Upper Middle Fork John Day River Watershed. Field reconnaissance information, aerial photos, and Geographic Information System (GIS) databases provided additional information.

Some wildlife habitats require a detailed analysis and discussion to determine potential effects on a particular species. Other habitats may either not be impacted or are impacted at a level which does not influence the species or their occurrence. The level of analysis depends on the existing habitat conditions, the magnitude and intensity of the proposed actions, and the risk to the resources.

The following definitions for short-term, mid-term, and long-term are used to facilitate discussion of effects.

- Short-term 0 – 5 years
- Mid-term 5 – 25 years
- Long-term 25 + years

The wildlife section is subdivided into sub-sections: Old-Growth Management Indicator Species, Big Game Habitat, Primary Cavity Excavator Species, Northern Goshawk, Blue Grouse, Threatened, Endangered and Sensitive Species, and Landbirds including Neotropical Migratory Birds. Sub-sections will summarize specific analysis methods

Old-growth habitat was analyzed using the District's GIS old-growth map layer, vegetation and management activity layers, stand exams extrapolated using most similar neighbor analysis, Dedicated and Replacement Old-Growth surveys, and field reconnaissance.

Elk habitat was evaluated using the Habitat Effectiveness Index (HEI) (Thomas et al. 1988), marginal and satisfactory cover percentages, and open road densities. Big game cover was designated using stand exams, most similar neighbor analysis, aerial photographs and ground reconnaissance. Open road densities were calculated using the District access travel management database. Values were estimated for National Forest lands at the subwatershed level.

Snag densities and sizes were estimated using data obtained through stand exams, most similar neighbor analysis and field reconnaissance. This EIS uses the DecAID 2.0 analysis tool (Mellen et al. 2006) to evaluate alternative effects on dead wood habitats. DecAID is an internet-based computer program developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use snags and large, down logs. The tool synthesizes published literature, research data, wildlife databases, and expert judgment and experience. Woodpecker use data was utilized in this analysis.

Effects to threatened, endangered and sensitive (TES) species are summarized in this chapter and then described in more detail in the Wildlife Biological Evaluation located in the project record.

Landbirds, including neotropical migratory birds (NTMB), were analyzed based on high priority habitats identified in the Oregon-Washington Chapter of Partners in Flight, Northern Rocky Mountains Bird Conservation Plan (Altman 2000). While the Malheur Forest has not conducted official NTMB surveys in the project area, the Oregon Breeding Bird Atlas (Adamus et al. 2001) includes observational data for this area. Much of the data for the Malheur Forest was obtained from local biologists and ornithologists. Most NTMB species that are expected in the project area were recorded within the atlas' hexagons for the area. Based on a review of the District's wildlife database and observations made during reconnaissance of the fire area, there is a high confidence level that species discussed in this report are currently present in the area.

Cumulative effects analyzed in respect to past, ongoing and foreseeable future activities are listed in Appendix D. These effects were first analyzed within the context of the Mill Creek Subwatershed. If there were no contributions to negative or positive cumulative effects at that scale, then no further analysis was conducted. If there were contributions to effects at that scale, then the analysis scale was broadened to a larger land base scale, usually adjacent subwatersheds.

Alternative 1, the No Action Alternative, is required by NEPA. It is used as a benchmark to compare and describe the differences and effects between taking no action and implementing action alternatives. The No Action Alternative is designed to represent the existing condition; resource conditions are then projected forward in time to estimate resource changes expected in the absence of the proposed management activities.

Affected Environment – Old-Growth

Dedicated Old-Growth habitat and LOS stands are distributed throughout the analysis area. The Regional Forester's Eastside Forest Plan Amendment 2 (USDA 1995) gives direction for maintaining connectivity between LOS habitats to allow the free movement of old-growth wildlife species. Connectivity is to be maintained in at least two directions from existing LOS and Dedicated Old-Growth habitats. Connectivity corridors should commonly have medium diameter or larger trees (≥9 inches dbh) and canopy closure within the upper third of site potential. Corridors should be at least 400 feet wide. If stands with these conditions are not available, then the next best stands will be selected and should be managed to improve connectivity. Harvesting in connectivity corridors is permitted if all the criteria described above can be met, and if some amount of understory (if it occurs) is left in patches or scattered to assist in supporting stand density and cover. Those stands with a high degree of ground level vegetation provide additional screening and security cover for old-growth associated species as well as for wide ranging carnivores. Generally, connectivity corridors are maintained or managed at higher tree densities and canopy cover than adjacent areas to provide more security for dispersal or movement.

Old-growth habitat was analyzed using the District's GIS old-growth map layer, vegetation and management activity layers, stand exams extrapolated using most nearest neighbor analysis, Dedicated and Replacement Old-Growth surveys, and field reconnaissance.

Modeling is used to project stand development for future structural stages. The INFORMS program was used to run the Forest Vegetation Simulation (FVS) growth simulator on all of the forested stands within the project area. The FVS model, with the Blue Mountain variant, is being used to compare structures between alternative treatments. Long-term projections become estimates at best; however, results do show trends and are useful for comparing different alternatives.

The following terms for old-growth are used interchangeably throughout this section. Nuances in the vocabulary are defined throughout the section.

- Old-Growth
- Late and Old Structure (LOS)
- Dedicated Old-Growth (DOG)
- Replacement Old-Growth (ROG)
- Old Forest Multi-Strata (OFMS)
- Old Forest Single-Stratum (OFSS)

Old-Growth Management Direction

The Forest Plan establishes management direction for old-growth MIS via Forest-wide standards (pg IV – 32) and Management Area direction (pgs IV – 105 to IV – 107). The Forest Plan identifies three MIS for old-growth habitat: pileated woodpecker, American marten, and three-toed woodpecker. By providing old-growth habitat for these species, it is assumed that habitat for old-growth obligate species will be provided as well.

Forest Plan, Management Area 13 (MA–13) provides for the management of old-growth through a network of DOG and ROGs. Each DOG/ROG is specifically managed for one of two Management Indicator Species (MIS) for OFMS: pileated woodpecker or American marten. ROGs are established to counter possible catastrophic damage or deterioration of the DOGs. Replacement areas may not have all the characteristics of old-growth, but are managed to achieve those characteristics so that when a DOG area no longer meets the needed habitat requirements, the ROG can take its place.

The Forest Plan directs continued review of DOG/ROG areas, with adjustments to boundaries as appropriate, to ensure suitable levels of old-growth habitat are provided for species dependent upon them and to ensure those areas meet Forest Plan Standards and Guidelines. The Forest Plan and its corresponding Final Environmental Impact Statement identifies the process and direction to identify ROG and Pileated Woodpecker Feeding Areas (PWFA) for each DOG area.

In addition to the DOG/ROG network, Forest-wide Standard 59 (Forest Plan, pg IV – 31) directs Forest managers to delineate areas of old-growth lodgepole pine. These old-growth areas are specifically managed for three-toed woodpeckers, a MIS for old-growth lodgepole pine. These areas are not considered part of the MA−13 network.

Regional Forester’s Eastside Forest Plan Amendment 2 (USDA 1995) amended the Forest Plan to manage LOS stands within the Historic Range of Variability (HRV). See Forest Vegetation section for details of the HRV analysis. HRV is a landscape level assessment of structural stage; Amendment 2 direction applies to LOS stands both inside and outside of the DOG/ROG network. In addition, Amendment 2 directs land managers to maintain connectivity between LOS habitats to allow the free movement of old-growth wildlife species.

Old-Growth Management Indicator Species (MIS)

Pileated Woodpecker (*Dryocopus pileatus*)

Pileated woodpeckers prefer mature and old-growth forests with at least 60% canopy cover (Bull and Holthausen 1993). This species relies heavily on snags and downed wood material for foraging. Nests are built in cavities excavated in large (greater than 21 inches dbh) dead or decadent ponderosa pine, western larch or grand fir trees. Pileated woodpeckers forage mainly by excavating insects (most notably carpenter ants) from snags and down logs in the summer and scaling bark for insects in the winter.

Forage habitat is most commonly found in grand fir forest types and consists of snags, usually greater than 20 inches dbh, logs larger than 25 inches in diameter, and live trees greater than 21 inches dbh used mostly for scaling. Home range for a breeding pair has been identified by different sources as ranging from 300 acres (Thomas 1979) to 550 acres (Bull 1987) to 900 acres (Bull and Holthausen 1992). Current literature (Bull and Holthausen 1992) recommends that pileated woodpeckers may require at least four large snags per acre rather than the 2.4 snags per acre recommended in the Forest Plan.

Habitat trend information derived from Interior Columbia Basin studies indicated that about 60% of the watersheds in the Blue Mountains showed a decreasing trend in pileated woodpecker habitat and 30% showed an increasing trend. Declines in source habitat are primarily attributed to a reduction in late seral forest. Breeding Bird Survey (BBS) data indicated a 7.8% annual decline in populations in Oregon and Washington from 1966 through 1994 (Wisdom et al. 2000).

The Forest Plan directs that pileated woodpecker DOGs are to be at least 300 acres of mature and old-growth habitat; ROGs are intended to be half the size of the DOG, i.e., about 150 acres. In addition, 300 acres are managed as a PWFA; the ROG and PWFA are permitted to overlap. Pileated woodpecker DOGs were delineated Forest-wide to provide an even distribution of habitat areas, one DOG every 12,000 acres, or approximately 5 miles apart. Management requirements were derived from the US Forest Service 1986 Minimum Management Requirements.

American Marten (*Martes americana)*

Martens prefer mature old-growth forest with a well-developed multi-storied canopy. Cover and prey species largely determine their distribution and abundance. Snags and downed woody material are important for winter and summer dens, resting sites, and cover for prey species. Martens show a strong avoidance of open areas, possibly for predator avoidance (Hawley and Newbry 1957). Dry forest types and those that lack structure near the ground are used very little (Buskirk and Powell 1994). Movement and dispersal over the landscape is maintained by providing corridors with consistent overhead cover (Ruggerio et al. 1994). Home range for a breeding pair has been identified by different sources as ranging from 160 acres (Campbell 1979) to 1,400 acres (Freel 1991).

Habitat trend information derived from Interior Columbia Basin studies indicated that about 50% of the watersheds in the Blue Mountains showed a decreasing trend in marten habitat and 35% showed an increasing trend. The distribution of marten within the Interior Columbia Basin has been fairly stable, but population changes are not known (Wisdom et al. 2000).

The Forest Plan directs that American marten DOGs are to be 160 acres and ROGs are to be 80 acres. American marten DOGs were delineated every 4,000 to 5,000 acres, or approximately 3 miles apart. Management requirements were derived from the US Forest Service 1986 Minimum Management Requirements.

American Three-Toed Woodpecker (*Picoides dorsalis*)

Source habitats for three-toed woodpeckers are old forests of lodgepole pine, grand-fir, white-fir, Engelmann spruce, and sub-alpine fir. The three-toed woodpecker prefers stands where lodgepole pine is either dominant or co-dominant, and uses mostly trees 9 inch dbh and greater for both nesting and foraging (Bull 1980, Goggins 1986). Suitable habitat is tied to existing levels of diseased and decaying trees with heart rot for nesting and roosting, as well as decaying substrate to provide a prey base for wood-boring insects (Goggins et al. 1987). In particular, three-toed woodpeckers are attracted to areas with high concentrations of beetles, such as habitats created by stand replacing burns or blowdown.

Habitat trend information derived from Interior Columbia Basin studies indicated that about 70% of the watersheds in the Blue Mountains showed an increasing trend in three-toed woodpecker habitat and 30% showed a decreasing trend. Breeding Bird Survey (BBS) data is insufficient to determine population trends in the Interior Columbia Basin, but data summarized across the West indicates a 0.7% annual decline in populations from 1966 through 1994 (Wisdom et al. 2000). North American Breeding Bird Survey (BBS) data for 1980 – 1998 indicate a significant annual decrease in three-toed woodpecker populations of 15.0% (n = 12 survey routes) and

13.4% (n = 18) in the U.S. and across the species' range in North America, respectively (Sauer et al. 1997). These data, however, should be viewed with caution given the low number of routes and low abundance of three-toed woodpeckers/route (Leonard, 2001).

The Forest Plan Standards require identification of potential or existing old-growth, lodgepole, pine habitat for three toed woodpeckers. In the Minimum Management Requirement analysis, the assumption was that a breeding female can be supported on 75 acres of quality habitat and that one home range approximately every 2,000 – 2,500 acres was a suitable maximum dispersal distance to assure population viability. The stands in the cold-dry biophysical environment in the silviculture section indicate that there is 47% -3700 acres of OFMS but field verification confirmed these stands are mixed conifer stands and not pure lodgepole pine. There are no designated habitat areas for northern three-toed woodpecker in the project area and there is insufficient old-growth lodgepole pine habitat to designate any areas. Effects to three-toed woodpeckers will be discussed in the Snags and Down Wood Section of this document.

Dedicated and Replacement Old-Growth

Three DOGs are located within the project area. Table WL – 1 below lists each DOG, its associated MIS, total acres, and structural stage percentage. See the map in Appendix B. Existing DOGs do not always meet minimum size requirements, and they are not always tied to logical stand or topographical boundaries. ROGs have not been established for the three DOGS in the project area. PWFAs have not been established for the two DOGs designated for pileated woodpecker management.

Table WL – 1. Dedicated Old-Growth Area Existing Condition.

DOG Area	MIS Species	Total Acres	Structural Stages
DOG 134	Pileated Woodpecker	382	61% – YFMS 27% – UR 7% – SEOC 4% – SECC 1% – OFMS
DOG 241	American Marten	169	90% – UR 6% – OFMS 4% – SECC
DOG 335	Pileated Woodpecker American Marten	273	95% – UR 5% – YFMS

MIS = Management Indicator Species. OFMS = Old Forest Multi-Strata, YFMS = Young Forest Multi–Strata, UR = Understory Reinitiation, SECC = Stem Exclusion Closed Canopy, SEOC = Stem Exclusion Open Canopy.

To maintain an even distribution of old-growth areas across the Forest, the Forest Plan originally designated DOGs across all biophysical environments or forest types. Attempts were made to identify some of the best habitat available, while maintaining the old-growth grid system. Generally, dry forest types provide lower quality habitat for pileated woodpeckers and American marten than moist forest types. Historically, dry forest types were maintained under a low intensity, frequent fire regime; historic stand structure was likely old forest single-stratum (OFSS). Due to fire suppression, tree stocking and canopy closure are greater than they were under historic conditions. Although many of the stands in the DOGs currently do not meet old-growth definitions, they do contain habitat components that can support pileated woodpeckers and martens in the short- to mid-term.

In the early to mid-1990s, informal old-growth surveys were conducted. In 2005, taped pileated woodpecker calls were broadcasted. The DOGs have periodically been visited to record presence of pileated woodpeckers, marten and other wildlife species.

DOG 134 – Pileated Woodpecker

DOG 134 is primarily within the warm-dry biophysical environment, and varies in tree composition from mixed conifers stands of grand fir, ponderosa pine, Douglas-fir and western larch to pure ponderosa pine stands. Stands are in a mid-seral condition, primarily young forest multi-strata (YFMS) and understory reinitiation (UR). The YFMS stands often provide adequate canopy complexity and canopy closure, but the number of large diameter trees fall short of quantities required for OFMS classification. Stands are deficient in large diameter trees and snags. Past timber harvest is evident. Generally, stands on warm-dry sites are considered marginal habitat for pileated woodpeckers. In this DOG, however, overstocked stand conditions support a higher canopy cover, and therefore, provides woodpeckers with greater security from predation and increased insect prey activity for foraging. Therefore, this DOG does provide woodpecker habitat in the short- to mid-term. Habitat quality is better in the north in stands above the Middle Fork John Day River and less so in pure ponderosa pine stands on the southern bench. Snags are below Forest Plan Standards, estimated at about 2.7 snags per acre 10 inches dbh and greater with very few over 21inch dbh. In 2005, taped calls did not solicit responses from pileated woodpeckers but foraging signs were evident.

DOG 241 – American Marten

DOG 241 is 169 acres in size. About 50% of DOG 241 is within the cool-dry and cold-dry biophysical environments, which are capable of providing good marten habitat. The remaining 50% of the DOG is in the warm-dry biophysical environment which is considered a marginal forest type for supporting marten. The DOG is comprised of mixed conifer stands of grand fir, Douglas-fir, and ponderosa pine, with western larch and lodgepole pine in the draws. As with DOG 134, overstocked stand conditions currently provide the higher canopy covers that marten select. Stands are considered mature, but the number of large diameter trees fall short of quantities required for OFMS classification. Snags are below Forest Plan Standards, estimated at six snags per acre, 10 inches dbh and greater with very few over 21 inches dbh. Past harvest has occurred. There have been sightings of marten reported near DOG 241. In 2005, taped calls solicited responses from pileated woodpeckers. Signs of past woodpecker foraging is evident.

DOG 335 – Pileated Woodpecker and American Marten

DOG 335 is 273 acres in size; it does not meet the minimum Forest Plan Standard for territory size (300 acres). The DOG is within the cold-dry and warm-dry biophysical environments and is primarily in the UR structural stage. Although this area does not classify as OFMS, there are areas with large diameter grand fir and sufficient canopy closure to provide habitat for pileated woodpeckers and American martens. The DOG is comprised of mixed conifer stands of grand fir, Douglas-fir, ponderosa pine, western larch, and lodgepole pine. The grand fir are providing roost and foraging strata that is not available in most of the project area due to past management or site capability. Snags are below Forest Plan Standards, estimated at about 3.8 snags per acre 10 inches dbh and greater with very few over 21inch dbh. There were no pileated woodpecker sightings in the 2005 survey, but pileated woodpeckers have nested in the DOG in past years and foraging sign is abundant in the more mesic portions of the DOG.

Old-Growth within the Project Area

Regional Forester's Eastside Forest Plan Amendment 2 (USDA 1995) amended the Forest Plan to manage LOS stands within the Historic Range of Variability (HRV). Stand classified as OFMS and OFSS would be considered LOS habitat. Refer to the Vegetation Section of this FEIS for the HRV Analysis.

The following sections describe the existing condition of OFMS and OFSS in the Mill Creek Subwatershed. Amendment 2 direction applies to OFMS/OFSS stands both inside and outside of the DOG/ROG network. Discussions will also address Management Indicator Species for OFMS (pileated woodpecker and American marten) and OFSS (white-headed woodpecker).

Old Forest Single-Stratum (OFSS) Habitat

The Upper Middle Fork John Day Watershed Analysis (WA) identifies the need for the development of OFSS structure ponderosa pine-dominated stands (USFS 1998). Historic accounts show a strong presence of this habitat condition, structure, and tree composition across much of the project area and the watershed as a whole. The majority of the warm-dry and hot-dry biophysical environments occur in this or similar conditions. Chapter 1 identified a need to develop historic levels of OFSS structure habitat in the project area.

White-headed Woodpecker (*Picoides albolarvatus*)

The white-headed woodpecker differs from many of the other primary cavity excavators identified as MIS in the Forest Plan in its near exclusive selection of mature, single-stratum ponderosa pine dominated habitats. This species relies almost exclusively upon the seeds from large ponderosa pine cones for its foraging needs as well as utilizing insects gleaned off ponderosa pine trees. Large ponderosa pine snags are utilized for nesting purposes. Because of its more limited need and use of snags as foraging sites, the species snag requirements are less than those required by other primary cavity excavators such as the pileated, downy, and hairy woodpeckers.

The Regional Forester's Eastside Forest Plan Amendment 2 states that since 1993, the Forest Plan as amended has directed the Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS.

Habitat trend information derived from Interior Columbia Basin studies indicated that about 70% of the watersheds in the Blue Mountains showed a decreasing trend in white-woodpecker habitat and 30% showed a static or increasing trend. Basin-wide, greater than 50% of watersheds had strong negative declines in the availability of source habitats (old-growth ponderosa pine, aspen/ cottonwood/willow, large diameter ponderosa pine snags). Breeding Bird Survey (BBS) data indicated a 3.0% annual increase in populations in Oregon and Washington from 1966 through 1994 (Wisdom et al. 2000).

The current condition and availability of habitat for this species across the project area and watershed is extremely limited. Past harvest focused on the removal of mature ponderosa pine. Fire suppression allowed stocking of smaller trees to increase dramatically, shifting structural stage to SECC, UR, YFMS, or OFMS. In the analysis area, OFSS occurs on 3% (289 acres) and 0% (0 acres) of the warm-dry and hot-dry biophysical environments, respectively. Historically, this habitat type occurred on 5 to 55% and 20 to 70% of the warm-dry and hot-dry biophysical environments, respectively.

The lack of OFSS habitats does not meet the needs of the white-headed woodpecker, flammulated owl, or other species that depend upon open, mature ponderosa pine stands for foraging, nesting, and roosting. Species dependent upon these habitats would likely remain at low densities, with populations poorly distributed in isolated marginal habitats.

It is assumed that with a greater availability of OFSS habitat, white-headed woodpecker population densities would be higher. Several observations of the white-headed woodpecker have been reported in the project area during field surveys and reconnaissance in recent years.

Multi-Strata Habitat

Multi-strata forest habitats are more common in the project area. Multi-strata habitats include OFMS and Young Forest Multi-strata (YFMS) stand structures. Currently, OFMS (2,320 acres) and YFMS (2,308 acres) comprise 29% of the Mill Creek subwatershed. YFMS habitats are evenly distributed throughout the subwatershed. OFMS habitats are unevenly distributed, with a fairly large, contiguous block of habitat in the northeast portion of the subwatershed.

Multi-strata habitat is generally within or above HRV for all biophysical environments, although the landscape is skewed towards OFMS versus YFMS. Only the warm-dry biophysical environment is below HRV for OFMS; historically, this habitat type occurred on 5 to 20% of this biophysical environment and currently comprises about 4%. Past forest management, primarily timber harvest and fire suppression has altered the conditions in many of these stands. Fire suppression has changed the species composition and structure from ponderosa pine-dominated stands to mixed conifer stands dominated by lodgepole pine, grand fir, and Douglas-fir. This management activity created multi-strata stand structures where they were historically not present, providing more potential habitat for species requiring multi-strata habitat. Timber harvest reduced the number of large diameter live trees, snags and large down wood, important habitat components for multi-strata dependent species.

Habitats in the warm-dry, cold-dry and cool-moist biophysical environments, with OFMS and YFMS structures, provide the bulk of the habitat for the pileated woodpecker and American marten. Table WL – 2 identifies the acres of potential habitat for these species that exists in the analysis area. Primary habitat was defined as OFMS structure with greater than 60% canopy closure. Secondary habitat was defined as OFMS and YFMS structure with 40 to 59% canopy closure. There are approximately 2,020 acres of suitable habitat for the pileated woodpecker and American marten within the analysis area.

Table WL – 2. Potential Pileated Woodpecker and American Marten Habitat (acres).

Habitat Type	Acres
Primary Habitat	261
Secondary Habitat	1,759
Total	2,020

Primary Habitat = Warm-dry, cold-dry, and cool-moist forest types, OFMS, canopy cover = greater than 60%.
Secondary Habitat = Warm-dry, cold-dry, and cool-moist forest types, OFMS and YFMS, canopy cover 40-60%.

Primary habitat stands have high canopy closures and extensive middle and understory vegetation development producing the highest quality habitat for multi-strata LOS dependent species. Primary habitat acres are very low due to the lack of canopies greater than 60% canopy closure, likely due to the lower site potential of warm and dry biophysical environments. Secondary habitat is comprised of stands with lower canopy closures and/or lower stand densities. Middle and understory canopies are likely less developed, due to past timber harvest and/or site potential. In OFMS and YFMS habitats, snags are relatively abundant, although in smaller size classes, and therefore, provide more limited nesting/denning/roosting habitat.

The majority of multi-strata mixed conifer habitat is smaller isolated/fragmented blocks with similar habitat characteristics. Sizes of these individual blocks vary, ranging from 3 acres to over 290 acres with an average size of about 50 acres. Past timber harvest activities and differences in vegetation type/site potential are the primary forces that have isolated these patches of habitat. Some smaller blocks are located relatively close to the larger blocks and may contribute to the overall habitat use of those areas by pileated woodpecker and American marten, while other blocks are isolated by substantial amounts of unsuitable habitat and may receive little use by these species. Based on the analysis of stand exams in the forest GIS database, many of the multi-strata stands are deficient in large diameter snags and downed wood. Smaller snags, 10 to 20 inches, are plentiful in many multi-strata stands and help mitigate deficiencies of the larger snags. (Refer to the Snag and Downed Wood Section and the DecAID analysis.) Overall habitat condition and function in the multi-strata habitats for the pileated woodpecker and American marten is generally low. Core habitat in DOGs appears to be adequate but capable of supporting only one breeding pair of pileated woodpeckers per DOG. Habitat features, such as higher canopy closures, complex canopy structures, near ground level vegetative cover, and higher deadwood habitat densities are uncommon. This is expected due to the prevalent biophysical environment and past management practices.

Connectivity

DOG habitat and LOS stands are distributed throughout the analysis area. The Regional Forester's Eastside Forest Plan Amendment 2 (USDA 1995) gives direction for maintaining connectivity between LOS habitats to allow the free movement of old-growth wildlife species. Connectivity corridors should commonly have medium diameter or larger trees (greater than or equal to 9 inches dbh) and canopy closure within the upper third of site potential. Corridors should be at least 400 feet wide. If stands with these conditions are not available, then the next best stands will be selected and should be managed to improve connectivity. Those stands with a high degree of ground level vegetation provide additional screening and security cover for old-growth associated species as well as for wide ranging carnivores. Generally, connectivity corridors are maintained or managed at higher tree densities and canopy cover than adjacent areas to provide more security for dispersal or movement. (See Appendix B for a map of connectivity corridors.)

Table WL – 3 identifies connectivity habitat within the analysis area. There are approximately 3,476 acres of habitat within the connectivity network. Unharvested stands or stands with an abundance of small diameter trees are currently providing the best connectivity in the area.

Corridors generally meet or exceed the minimum requirements as described in the Regional Forester's Eastside Forest Plan Amendment 2. In some cases, stands have been identified as connectivity habitat even though minimum canopy closure requirements were not met, in order to provide some level of connection between LOS habitats that did not have two or more connections. In the short-term, connectivity corridors provide for the free movement of old-growth associated terrestrial wildlife.

Table WL – 3. Connectivity Habitat: Total Habitat, High Quality Habitat, Habitat by Stand Structure and Biophysical Environment.

Habitat Characteristic	Acres	Percentage *
Total Connectivity Habitats (does not include LOS habitats)	3,476	100
High Quality Connectivity Habitat**	592	20
Stand Structure		
Young Forest Multi-Strata (YFMS)	528	15
Stem Exclusion Open Canopy (SEOC)	737	21
Stem Exclusion Closed Canopy (SECC)	1,805	52
Understory Reinitiation (UR)	406	12
Biophysical Environment		
Hot-Dry Forest Type	149	4
Warm-Dry Forest Type	2,245	65
Cool-Dry Forest Type	6	<1
Cold-Dry Forest Type	1,076	31

* Percent of total connectivity habitat within project area. ** High quality connectivity habitat is defined as those stands with multi-strata structure (YFMS or UR) and 40% canopy closure or greater.

Environmental Consequences – Old-Growth

Alternative 1– No Action

Dedicated and Replacement Old-Growth

Direct and Indirect Effects

Existing DOGs would remain the same. Boundaries would not be adjusted to reflect logical stand or topographical boundaries. No new ROG areas or Pileated Woodpecker Feeding Areas (PWFAs) would be designated to meet Forest Plan Standards. Alternative 1 would not meet Forest Plan Management Area direction for old-growth. Although no new management activities would occur under this project, areas adjacent to existing DOGs could be managed under other management area (MA) standards and guidelines. The ability to manage for an adequate system of DOGs/ROGs/PWFAs could be reduced.

In the short-term, there would be no direct effects to DOGs within the project area. Habitat effectiveness for old-growth species would remain as described in the existing condition. The No Action Alternative would have no immediate effects on marten, pileated woodpeckers, or their habitats. All existing snags and down logs would continue to provide forage and potential nest cavities.

In the mid- to long-term, the lack of thinning or burning in this alternative would allow stands in the ROGs to develop denser canopy closure that would provide additional habitat for pileated woodpeckers and American marten. Green replacement trees and snags would continue to develop as stands move toward late and old structure and are affected by insects and disease.

There would be an increasing risk of large-scale, stand-replacing fires that would set back structural stage development, resulting in large areas of young trees and longer time spans to develop old forest structures. In the warm-dry and hot-dry biophysical environments, disturbances would continue to be at a larger scale than historically occurred, with “out of scale” adverse effects to many wildlife species. All three DOGs include stands in the warm-dry biophysical environment.

Old Forest Single-Stratum

Direct and Indirect Effects

There is currently a lack of old forest stand structures due to past timber harvest, fire suppression and other disturbances. In the short-term, implementation of Alternative 1, the No Action Alternative, would result in no additional acres of OFSS habitat being restored or created. Due to the slow growth rates of the overstocked stands, development of old forest stand structures would develop slowly with OFSS increasing from 3 to 15% over the next 50 years (combination of all biophysical environments) over the next 50 years. This includes increases in the OFSS structure in the hot-dry and warm-dry biophysical environments from 0 to 8% and 3 to 10%, respectively.

This OFSS habitat type would continue to be below the Historic Range of Variability (HRV) within the subwatershed under this alternative, even at 50 years. As mentioned in the existing condition section, the lack of OFSS habitats does not meet the needs of species such as the white-headed woodpecker, flammulated owl, and other neotropical land bird species that depend upon open, mature ponderosa pine stands for foraging, nesting, and roosting.

This alternative would not meet the purpose and need to develop OFSS habitats as identified for this project in Chapter 1. Selection of this alternative would forgo options and management opportunities to restore habitat for these species. In the mid- to long-term, this alternative would adversely impact these species by neglecting their habitat needs and continuing existing management activities that contribute to the loss and/or conversion of limited marginal habitats that are currently providing habitat for these species. Species dependent upon these habitats would likely remain at low densities, with populations poorly distributed in isolated marginal habitats.

There is an increasing risk of large-scale, stand-replacing fires that would set back structural stage development, resulting in large areas of young trees and longer time spans to develop old forest structures. In the warm-dry and hot-dry biophysical environments, disturbances would continue to be at a larger scale than historically occurred, with “out of scale” adverse effects to many wildlife species. Stand replacement fires could further reduce OFSS habitats, and the species that rely on them.

Old Forest Multi-Strata

Direct and Indirect Effects

Alternative 1 would maintain the existing condition of habitat for OFMS dependent species, such as pileated woodpecker and American marten. In the short-term, existing canopy closure, stand structure, and dead wood habitats would be maintained across the analysis area as described in the existing condition section. Multi-strata stands would become denser in the mid- to long-term due to continued fire exclusion. Standing and downed wood densities would increase in the mid- and long-term as stand densities increase, and projected insect and disease infestations occur. OFMS would continue to develop, increasing from 3 to 29% over the next 50 years.

There would be an increasing risk of large-scale, stand-replacing fires that would set back structural stage development, resulting in large areas of young trees and longer time spans to develop old forest structures. In the warm-dry and hot-dry biophysical environments, disturbances would continue to be at a larger scale than historically occurred, with “out of scale” adverse effects to many wildlife species. A fire of this magnitude and severity would convert suitable pileated woodpecker and American marten habitat to an unsuitable condition.

Connectivity

Direct and Indirect Effects

In the connectivity corridors, no timber harvest or prescribed burning activities would occur; existing conditions would remain the same in the short-term. Map W – 2 identifies existing connectivity habitat within the Mill Creek Subwatershed. These corridors generally meet or exceed the minimum requirements as described in the Regional Forester’s Eastside Forest Plan Amendment 2. In some cases, stands have been identified as connectivity habitat even though minimum canopy closure requirements were not met, in order to provide some level of connection between late and old structure (LOS) habitat that did not have two or more connections. Under this alternative, connectivity corridors would continue to provide for the free movement of old-growth associated terrestrial wildlife species in the short-term. In the mid- to long-term, multi-strata stands would continue to develop dense habitat structure, increase snags and downed wood, and provide high quality hiding and screening cover in these time frames.

Many of the connectivity corridors are in warm-dry and hot-dry biophysical environments. Where tree stocking is high, stands would remain at high risk to stand-replacing fires that could eliminate cover and fragment connective habitats. A stand-replacing fire could make some stands unsuitable for travel.

Alternatives 2, 3, and 4

Dedicated and Replacement Old-Growth

Direct and Indirect Effects

All action alternatives would adjust the DOG boundaries to incorporate suitable late and old structure habitat and to reflect logical vegetation or topographical boundaries in the Forest Geographic Information System (GIS) database. All action alternatives would designate new ROGs and Pileated Woodpecker Feeding Areas. Changes would make the DOG habitats in the project area consistent with the standards for MA–13 Old-Growth habitats as identified in the Forest Plan, as well as recommendations and direction provided in the FEIS for the Forest Plan. Changes are summarized in Table WL – 4. See Appendix B (maps) for DOG and ROG changes.

The Forest Plan would be nonsignificantly amended to make changes to the DOGs and to add ROG acres, converting acres from Management Areas 1 (General Forest), MA–14 (Visual Corridors) and MA–3 (Riparian) to MA–13 (Old-Growth). Standards and guidelines in MA–14 and MA–3 would still apply. PWFA acres would retain their original MA classification, except where they overlap with the ROGs.

Under all action alternatives, there would be a net increase of 57 acres of DOG habitat. The adjustments of boundaries and acreage for these DOGs would meet or exceed Forest Plan Standards for MA–13. The acres moved into MA–13 would be protected and maintained as suitable habitat for American marten or pileated woodpecker (or both). Not all the acres added as DOG are currently providing old forest structure. The acres added were the best adjacent habitat available.

Table WL – 4. DOG, ROG, and PWFAs. Changes in the Old-Growth Network for Alternatives 2, 3, and 4.

DOG #	Management Requirements Species	Minimum Forest Plan Acre Requirements[1]	Existing DOG Acres	Proposed DOG Acres	Proposed ROG Acres[2]	Proposed Additional Pileated Feeding Acres[2]	Total Proposed Acres
DOG 134	Pileated Woodpecker	600	382	395	256	83	734
DOG 241	American Marten	240	169	169	85	—	254
DOG 335	Pileated Woodpecker, American Marten	600	273	317	179	154	650
TOTALS		1,080	824	881	520	237	1,638

[1] Old–growth Management Area (MA–13) Minimum Management Requirements:
- Pileated Woodpecker Areas = 300–acre DOG + 300–acre feeding area = *600 acres*. ROGs = 150–acres and overlap with feeding areas.
- American Marten = 160–acre DOG + 80–acre ROG = *240 acres*

[2] ROG acres also contribute towards pileated woodpecker feeding acres. "Proposed ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

There would also be a net increase of 520 acres of ROG habitats due to the delineation of three new ROGs. These ROGs would meet Forest Plan Standards for size and proximity to their associated DOG units. ROGs and PWFAs areas were located in the best habitat available within ¼ mile of existing DOGs. Generally ROGs are half the size of DOGs however the ROG 134 was delineated over a larger area since the only available adjacent habitat is within the hot-dry biophysical environment. This biophysical environment is not the most suitable to sustain pileated woodpeckers and martens. Less than optimal habitat requires a larger home range for this species; therefore, 339 acres of ROG and PWFA were added to the expanded DOG 134 for a total of 734 acres.

Table WL – 5 displays the ROG/PWFA additions and summarizes structural stages. The majority of acres are in the OFMS and YFMS habitats, providing some of the best habitat in the area for pileated woodpecker and American marten.

Table WL – 5. Designation of Replacement Old-Growth and Pileated Woodpecker Feeding Areas.

DOG Area	MIS Species	Total Acres	Structural Stages
ROG/PWFA 134	Pileated Woodpecker	339	84% – YFMS 16% – OFMS
ROG 241	American Marten	85	100% – SECC
ROG/PWFA 335	Pileated Woodpecker American Marten	333	52% – OFMS 25% – SECC 21% – OFSS 2% – UR

PWFA – Pileated Woodpecker Feeding Area. MIS = Management Indicator Species. OFMS = Old Forest Multi-Strata, OFSS – Old Forest Single-Stratum, YFMS = Young Forest Multi-Strata, UR = Understory Reinitiation, SECC = Stem Exclusion Closed Canopy

As discussed previously, ROG/PWFA 134 would be designated in the hot-dry biophysical environment. ROGs/PWFAs for DOG 335 would be located in a combination of cold-dry, cool-dry and warm-dry biophysical environments. ROG 241 would be located in the cold-dry biophysical environment.

Snags in the ROGs/PWFAs were estimated from stand exams. Snags 20 inches dbh and greater range from 1.1 to 1.4 per acre; this level is below the Forest Plan Standard of 2.39 snags per acre for large diameter snags. Snags 10 to 20 inches dbh range from 7 to 10 per acre, and although this size class is not the optimal size for pileated woodpeckers and martens, it does help supplement deadwood habitats. Once snags fall, they will contribute to large down log habitat used by both species (see Primary Cavity Excavator Species Section). Stands generally meet or exceed Forest Plan Standards for down logs. Snag densities and sizes were estimated using data obtained through stand exams, most similar neighbor analysis and field reconnaissance. This EIS uses the DecAID 2.0 analysis tool (Mellen et al. 2006) to evaluate alternative effects on dead wood habitats. DecAID is an internet-based computer program developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use snags and large, down logs. The tool synthesizes published literature, research data, wildlife databases, and expert judgment and experience. Woodpecker use data was utilized in this analysis.

Additional DOG and ROG acres should better maintain the integrity of the Forest's old-growth network in the short- to mid-term. Long-term sustainability may be limited due to the over-stocked stand conditions and the higher parentage of late seral species. There is a greater chance, particularly in the warm-dry and hot-dry biophysical environments, that fire or insects and disease will reduce the carrying capacity of DOGs/ROGs/PWFAs.

Timber harvest and prescribed fire can be used to help address long-term sustainability concerns by restoring historic stand structure and fire regimes. Regional Forester's Eastside Forest Plan Amendment 2 (USFS 1995) and the Upper Middle Fork John Day Watershed Analysis (USFS 1998) recommended shifting OFMS stands back towards OFSS, where appropriate. This strategy is most appropriate in the hot-dry and warm-dry biophysical environments. Amendment 2 also directs that younger stands should be managed towards OFMS and OFSS. Action alternatives incorporate these strategies at varying levels (See Table WL – 6).

Table WL – 6. Commercial Treatment within Old-Growth Habitat by Alternative.

Alternative	Harvest Acres in DOGs	Harvest Acres in ROGs	Harvest Acres in PWFAs	Harvest Acres in OFMS and OFSS	Prescribed Burning in ROGS
Alternative 1	0	0	0	0	0
Alternative 2	0	88 (18%)	50 (7%)[1]	61 (2%)	340
Alternative 3	0	50 (10%)	50 (7%)[1]	54 (2%)	340
Alternative 4	0	0 (0%)*	0 (0%)[1]	0 (0%)	340

[1]Pileated Woodpecker Feeding Areas overlap Replacement Old-Growth.
* Alternative 4 includes precommercial thinning in ROG without commercial harvest. These acres are not shown in the table.

The Forest Plan (pgs IV – 106) permits management of the ROGs to maintain or enhance the capability of a site to provide old-growth habitat in the future. In ROG 335, all action alternatives would thin 50 acres (Unit 32). In ROG 241, Alternatives 2 and 4 would thin 38 acres (Units 38 and 39). Alternative 3 would not thin Units 38 and 39. Alternatives 2 and 3 would use a combination of commercial and precommercial thinning. Alternative 4 would strictly use precommercial thinning.

Thinning prescriptions within ROGs 335 and 241 would be modified to induce uneven-aged management, to reduce fire risk, and to increase growth rates on the residual trees. All trees 21 inches and larger in diameter would be retained, except where they present a safety hazard or operational constraints such as in the construction of temporary roads for logging. Existing snags 12 inches dbh and greater would be retained except where they present a safety hazard. Stands are in the cold-dry and warm-dry biophysical environments. They classify as SECC or SEOC, mid-successional stands which currently provide little to no nesting habitat for pileated woodpeckers or denning habitat for marten due to lower canopy cover and a deficiency in large diameter trees, snags and down logs. Stands may be used for foraging, more likely for pileated woodpeckers and less likely for marten.

Approximately 8.6 miles of temporary road would be constructed with Alternative 2, and 1.5 miles with Alternative 3 to facilitate harvest activities, they would be decommissioned after activities are completed. No temporary roads will affect DOGs however two short segments of temporary road would be constructed in Alternatives 2 and 3 to provide access for commercial thinning of ROG 335 (Unit 32). A longer segment of temporary road would be constructed to provide access for commercial thinning of ROG 241 (Units 38 and 39) in Alternative 2. No temporary roads would be constructed in Alternative 4.

In the short- to mid-term, commercial thinning and temporary road construction in ROGs in Alternatives 2 and 3 would further reduce the suitability of these stands for pileated woodpeckers and American martens. Thinning would, however, accelerate growth of residual trees and development of old-growth habitat; stands could provide source habitat for pileated woodpeckers and martens more quickly than under the No Action Alternative. All snags and down logs would continue to provide potential nest cavities and foraging habitat. The number of snags felled for safety reasons during logging would be considered incidental; felled snags would be retained on site as downed logs. Alternative 3 does not treat Units 38 and 39 (ROG 241); in the short- to long-term, conditions would provide better foraging habitat for pileated woodpeckers and possibly American marten, but would take longer to develop old-growth conditions suitable for nesting or denning.

Alternative 4 would be strictly precommercial thinning of smaller diameter trees in ROGs 335 and 241. This treatment is not as intensive as the commercial/precommercial thinning proposed in Alternatives 2 and 3; post-treatment canopy cover would be greater, but the stands would likely take longer to develop into old-growth.

Although habitat for pileated woodpecker and American martens would be reduced in the short- to mid-term, core areas in the DOGs and the remainder of the ROGs/PWFAs would be maintained to provide habitat. Implementation of any of the action alternatives would meet the direction in the Forest Plan, which should provide for the viability needs of the pileated woodpecker, American marten, and other OFMS associated wildlife species. DOG and ROG boundaries would be consistent with forest vegetation stand boundaries in the Forest GIS database after implementation. DOGs will not be treated. Changes would improve the effectiveness of administering these habitats and ensure their continued function on the landscape.

The effects of treatments in old-growth outside the DOGs/ROGs and in connectivity corridors will be discussed in the old forest single-stratum, old forest multi-strata, and Connectivity sections below. All alternatives thin an additional 39 acres of OFMS (portion of Unit 78- outside ROGS). Treatment acres are in the cool dry, biophysical environment. OFMS likely provides nesting/ denning habitat as well as foraging habitat for pileated woodpeckers and marten. Alternatives 2 and 3 would thin trees to about 65 square feet of basal area retaining the larger diameter trees in the unit and multiple canopy structures. The stand would still classify as OFMS following treatment, although tree stocking and canopy cover would be reduced. In the short- to mid-term, thinning would reduce the suitability of these stands for pileated woodpeckers and American martens. Thinning would, however, reduce fire risk and increase growth rates on residual trees. Alternative 4 would be strictly precommercial thinning of smaller diameter trees. This treatment is not as intensive as thinning proposed in Alternatives 2 and 3; post-treatment canopy cover would be greater, but growth rates on residual trees would be lower. Habitat for pileated woodpeckers and American martens would be reduced.

Old Forest Single-Stratum

Direct and Indirect Effects

Chapter 1 identified a need to develop historic levels of OFSS structure habitat in the project area. In the Mill Creek Subwatershed, OFSS occurs on 3% and 0% of the warm-dry and hot-dry biophysical environments, respectively. Historically, this habitat type occurred on 5 to 55% and 20 to 70% of the warm-dry and hot-dry biophysical environments, respectively. In addition, some cold-dry biophysical environments, particularly those in grand fir/grouse huckleberry plant associations, are currently overstocked, multi-strata stands; historically many of these sites were also dominated by OFSS stands.

Table WL – 7 displays acres of OFMS conversion, OFSS maintenance and OFSS development. Descriptions are described in the table below. OFSS treatments would benefit species that utilize these habitats including the white-headed woodpecker and flammulated owl. Table WL – 7 also displays the percentage of the Mill Creek Subwatershed that would classify as OFSS in 50 years; the Forest Vegetation Simulator (FVS) model and fire behavior extension was used to make these projections and are intended to be used as a comparison tool between alternatives.

A negligible number of acres of OFMS to OFSS conversion treatments are proposed in the hot-dry biophysical environment in Alternatives 2 and 3. In the warm-dry biophysical environment, a small number of acres in OFSS stands would be treated to maintain the current structure in Alternatives 2, 3, and 4. The warm-dry OFMS structural stage is currently below HRV, so treatment would not occur in that structure. Following treatment, stands would be more open and better mimic historic conditions. Table WL – 7 displays acres treated; acres do not vary significantly between alternatives and treat only a small percentage of the total OFMS/OFSS acres in the subwatershed. Treatments at such levels at the landscape level would be insignificant.

Table WL – 7. OFSS Treatments. Acres of OFSS Development by Alternative. Projected OFSS at 50 years by Alternative. Existing OFSS comprises 3% of the Mill Creek Subwatershed.

	Alt. 1	Alt 2	Alt 3	Alt 4
Treatment Acres in OFMS – OFMS to OFSS conversion	0	6*	1*	0
Treatment Acres in OFSS – OFSS Maintenance	0	17	14	6
Treatment Acres – OFSS Development[1]	0	2,130	1,452	750
% of Mill Creek Subwatershed in OFSS in 50 years	15%	27%	24%	15%
[1]Thinning acres in YFMS, UR, SECC, and SEOC stands.				

*OFSS conversion acres are located in the hot-dry biophysical environment. These consist of several small pieces within harvest units that are primarily younger forest structures.

Proposed OFSS development treatments have a much greater influence on white-headed wood-pecker habitat. The three action alternatives prescribe commercial and/or precommercial thinning of mid-successional stands (YFMS, UR, SECC, and SEOC) to help develop OFSS habitat over the mid- to long-term. The majority of the proposed thinning units are in the warm-dry biophysical environment. OFSS development in treated stands would depend upon the current availability of large diameter trees (21+ inch dbh), the thinning intensity, and the resultant time it takes for small diameter trees to grow into large diameter trees. Shelterwood harvest would also be used to shift multi-strata stands back towards single-stratum stands. Table WL – 7 indicates that Alternative 2, followed by Alternative 3, would implement the most OFSS development treatments. Although proposed thinning would be intended to benefit these species in the mid- to long-term, some habitats may actually be used soon after treatment. In the short-term, canopy cover would be reduced and herbaceous vegetation and shrub growth would be stimulated. Populations of species that use OFSS, including the white-headed woodpecker, would be expected to increase. Alternative 4 is restricted to precommercial thinning of small diameter trees, and therefore, does little to accelerate growth of residual trees; although treatment would open understories and improve habitat for white-headed woodpeckers, development of OFSS would likely take longer than under Alternatives 2 and 3. Under all action alternatives, prescribed burning would be utilized in many of these stands to maintain open conditions (See Fire & Fuels section for discussion on prescribed fire and large diameter trees).

Table WL – 7 displays the percentage of the Mill Creek Subwatershed that would classify as OFSS in 50 years. Currently, about 3% of the subwatershed classifies as OFSS. Under Alternatives 2 and 3, 27% and 24% (combination of all biophysical environments) of the subwatershed would be expected to classify as OFSS in 50 years compared to 15% under the No Action Alternative. In the hot-dry and warm-dry biophysical environments substantial increases in OFSS are projected over the next 50 years. In Alternative 2, OFSS increases from 0 to 46% in the hot-dry, and 3 to 21% in the warm dry biophysical environments. Slightly lower increases are estimated in hot-dry (0 to 44%) and warm-dry (3 to 16%) biophysical environments in Alternative 3.

Alternative 4 does little to accelerate growth of residual trees; development of OFSS over time would be similar to levels expected under the No Action Alternative. Populations of species that use OFSS, including the white-headed woodpecker and flammulated owl, would be expected to increase under all alternatives, but available habitat would be substantially higher under Alternatives 2 and 3.

Old Forest Multi-Strata

Direct and Indirect Effects

OFSS development would come at the expense of YFMS habitat. Development treatments would alter stand structures in multi-strata stands in the short-, mid- and long- term, making them less suitable to multi-strata associated species. Table WL – 8 displays the number of acres of OFMS and YFMS habitat that would be treated. Table WL – 8 also displays the percentage of the Mill Creek Subwatershed that would classify as OFMS in 50 years; the Forest Vegetation Simulator (FVS) model and fire behavior extension were used to make these projections and are intended to be used as a comparison tool between alternatives.

Table WL – 8. Acres of OFMS/YFMS treatment by Alternative. Projected OFMS at 50 years by Alternative. Existing OFMS comprises approximately 15% of the Mill Creek Subwatershed.

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Treatment Acres – OFMS/YFMS	0	418	248	135
% of Mill Creek Subwatershed in OFMS in 50 years	29%	28%	29%	29%

As discussed previously, YFMS stands would be moved towards a single-stratum habitat condition in the mid- and long-term. Thinning would result in immediate reductions to overall canopy closure as well as substantial changes in stand structure (multi-strata to single-stratum) in the stands entered. Prescribed burning would help maintain these conditions and support development of OFSS. Approximately 340 acres of ROG are proposed for underburning. Prescribed fire in this area would minimize mortality in the larger trees as described above and minimize loss of snags and LWD.

Stand density and canopy cover would be reduced to levels below what is considered primary habitat for pileated woodpecker and American marten. Habitats would generally classify as secondary habitat for these species at best, and as such are less valuable for nesting and denning habitat. Habitat conditions after harvest would generally preclude nesting by the pileated woodpecker, however, existing snag and downed wood densities would generally be maintained in the short- and mid-term (slight decreases are likely to result from harvest activities). These stands could be used by the pileated woodpecker for foraging. American marten would likely avoid these areas after treatment.

A negligible number of acres of OFMS to OFSS conversion treatments are proposed in the hot-dry biophysical environment in Alternatives 2 (6 acres) and 3 (1 acre). OFSS conversion acres are located in the hot-dry biophysical environment. These consist of several small pieces within harvest units that are primarily younger forest structures. All alternatives would thin 39 acres of OFMS (portion of Unit 78- outside ROGS). Treatment acres are in the cool dry, biophysical environment. OFMS likely provides nesting/ denning habitat as well as foraging habitat for pileated woodpeckers and marten. Alternatives 2 and 3 would commercially thin trees to about 65 square feet of basal area retaining the larger diameter trees in the unit and multiple canopy structures. Stands would still classify as OFMS following treatment, although tree stocking and canopy cover would be reduced. In the short- to mid-term, thinning would reduce the suitability of these stands for pileated woodpeckers and American martens. Thinning would, however, reduce fire risk and increase growth rates on residual trees. Alternative 4 would be strictly precommercial thinning of smaller diameter trees. This treatment is not as intensive as thinning proposed in Alternatives 2 and 3; post-treatment canopy cover would be greater, but growth rates on residual trees would be lower. Habitat for pileated woodpeckers and American martens would be reduced.

In the biophysical environments being treated, OFMS and YFMS would remain within HRV immediately after treatment. Treatment units are generally smaller and isolated, so large core habitat areas for these species would remain. Due to the DOG/ROG network and the availability of suitable multi-strata habitat elsewhere in the analysis area, it is unlikely that proposed reductions in multi-strata habitat would affect pileated or American marten populations or their distribution in the analysis area.

Under all alternatives, OFMS would be expected to increase over time. At year 50, about 28% to 29% (combination of all biophysical environments) of the subwatershed would classify as OFMS compared to 15% today. Essentially all alternatives would develop about the same amount of

OFMS over time. OFMS stands would remain at risk to a large-scale; stand-replacing fires that could set back structural stage development, resulting in large areas of young trees and longer time spans to develop old forest structures.

Implementation of any of the action alternatives would meet direction in the Forest Plan, which should provide for the viability needs of the pileated woodpecker, American marten, and other OFMS associated wildlife species. Habitat would increase over time.

Connectivity

Direct and Indirect Effects

With the implementation of each of the action alternatives, there are some activities that would occur within connectivity corridors. Table WL – 9 shows the acres of connectivity habitat that would be treated under each action alternative and the percentage of the connectivity network that would be affected.

Under Alternatives 2 and 3, commercial and precommercial thinning would be implemented. Alternative 4 would strictly use precommercial thinning of small diameter trees. All acres would be treated with an OFSS development prescription as described previously. This prescription would begin to move these stands toward an OFSS stand structure by thinning the stands from below, removing a portion of the understory tree layer. Thinning intensity would depend on the biophysical environment being treated.

Table WL – 9. Acres and Percent of Connectivity Habitat Commercially or Precommercially Thinned by Alternative.

Alternative	Acres of Connectivity Habitat Treated by Commercial or Precommercial Thinning	% of Connectivity Habitat Treated by Commercial or Precommercial Thinning
Alternative 1	0	0%
Alternative 2	257	7%
Alternative 3	187	5 %
Alternative 4	177	5 %

In the short-term, canopy cover and screening cover would be impacted in these stands. Canopy cover would not be reduced below standards for connectivity in the amended Forest Plan; i.e., cover would not be reduced below 2/3rds of site potential. Canopy closure in these stands would range from 32% to 50% (with at least 60 sq. feet basal area) following treatment. A minimum of 25% of each stand would be retained in untreated patches at least 1 acre in size to maintain additional hiding/screening cover. Maintenance of existing downed woody material in the stands would maintain a portion of understory screening cover as well. Understory screening cover (shrubs, grasses, and forbs) impacted by harvest activities (felling and skidder use) would recover in the mid-term.

Although treatment acres would vary by alternative, differences are minimal and less than 10% of the connectivity corridors would be harvested under all alternatives. Prescribed burning would also be used in the connectivity corridors; stands would be burned in a mosaic of treated and untreated patches. Mortality in trees greater than 10 inches in diameter would be kept relatively low and would be expected to range from 1 to 15%. Although burning would reduce cover, prescriptions would be designed to meet Forest Plan Standards for connectivity. Treatments would not result in changes that would prevent the use or free movement of old-growth associated species, wide ranging carnivores or big game animals.

All Alternatives

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on old-growth, connectivity habitat and associated species. The following discussion focuses on those past, ongoing and foreseeable future activities that may contribute positive or negative effects. Past timber harvest and road building have significantly reduced and fragmented the amount and effectiveness of old-growth habitat.

Old-growth habitat is deficient in many biophysical environments as reflected in the HRV tables in the Vegetation Section of this document. OFSS is well outside HRV, particularly in the hot-dry and warm-dry biophysical environments. Loss of OFSS is due to a combination of timber harvest and fire suppression activities. Fire suppression allowed tree densities to increase, shifting many stands from OFSS to OFMS. Removal of large diameter trees then converted these stands to YFMS or younger, even-aged structural stages. OFMS is within HRV for all biophysical environments expect the warm-dry type. OFMS habitats in the warm-dry biophysical environment have been reduced below HRV, primarily due to past timber harvest.

Forest Plan, Management Area 13 (MA–13) provides for the management of old-growth habitat through a system of DOGs and ROGs. Under the action alternatives, the additional protections afforded through the DOG, ROG, and PWFA designations and re-delineations would create a beneficial cumulative effect on the viability of old-growth MIS by ensuring management of those habitat conditions needed for these species. These areas would be managed in the future to maintain their suitability (habitat conditions and size) for American marten and pileated woodpecker, and help ensure the viability of these species within the analysis area. The No Action Alternative does not meet Forest Plan Standards for MA–13, and therefore, may not be as effective as the action alternatives in protecting old-growth.

Since 1993, the Forest Plan as amended has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages, regardless of whether or not they are in MA–13. Timber sales planned since that time have not contributed to loss of late and old-growth forest, although understory stocking may have been reduced to shift stands from OFMS to OFSS to better reflect HRV.

Shifting a small number of acres from OFMS to OFSS (Alternatives 2 and 3) would impact a negligible amount habitat for canopy dependent species such as pileated woodpecker and American marten. Proposed OFSS development treatments would alter stand structures in multi-strata stands in the short-, mid- and long- term, making them less suitable to multi-strata associated species. These treatments would have a much greater influence on white-headed wood-pecker habitat. The three action alternatives prescribe commercial and/or precommercial thinning of mid-successional stands (YFMS, UR, SECC, and SEOC) to help develop OFSS habitat over the mid- to long-term. Although proposed thinning would be intended to benefit these species in the mid- to long-term, some habitats may actually be used soon after treatment. In the short-term, canopy cover would be reduced and herbaceous vegetation and shrub growth would be stimulated. Populations of species that use OFSS, including the white-headed woodpecker, would be expected to increase. Alternative 4 is restricted to precommercial thinning of small diameter trees, and therefore, does little to accelerate growth of residual trees; although treatment would open understories and improve habitat for white-headed woodpeckers, development of OFSS would likely take longer than under Alternatives 2 and 3. OFSS development would come at the expense of YFMS habitat.

Wrac Lodgepole is a 60 acre commercial thinning project located in the Mill Creek Subwatershed, scheduled to be implemented in 2008. Thinning would remove 4 to 10 inch dbh lodgepole pine. The average target density of the stand is 60 square feet per acre of basal area. The basal area may be varied up to 50% to select the best leave trees in the stand. Clumps marked to a density of up to 90 square feet per acre of basal area and ¼ to 1 acre in size will be maintained to provide structural diversity. No trees over 21 inches dbh will be removed. By thinning from below, forage and hiding cover will be created for big game, and small mammals. By increasing structural and age diversity by retaining snags, down logs, mature trees and “wolfy” trees, habitat constituents for primary cavity excavators, furbearers, and raptors will be maintained and increased.

The proposed project will not require new or temporary road construction. In this thinning project, the unit is located outside Management Area 13, Dedicated Old-Growth, Dedicated Old-Growth (DOG) area or Replacement Old-Growth (ROG). The unit is not classified as late or old structure; rather it is a mid-seral stand. This unit is not located in a designated connectivity corridor for movement of wildlife between old-growth areas. Treatment of these stands will not affect old-growth MIS. Large diameter snags 20 inches dbh and greater are deficient. During harvest operations, it is expected that individual snags would be lost through felling of snags that pose a hazard to workers and equipment. Professional Forest’s sale administrators indicate ground-based logging could result in a loss of 2 to 10% of the existing snags. Snags felled would be left on site to provide down wood. In Wrac LP (Approximately 60 acres), snags will be buffered by either excluding them from the unit or by retaining snags in the unit and using a variable thin treatment with a higher basal area around large snags or a no-cut buffer at the height of the snag.

Past management activities have reduced snags and down wood in old old-growth habitats. Design measures for the action alternatives would minimize additional loss of these habitats; additional losses would be considered incidental. The Forest’s firewood policy prohibits the cutting of firewood in DOG/ROG areas, so prescribed snag and downed wood levels should be maintained in these areas. In OFMS and OFSS outside the DOG/ROG network, snags along roads would continue to be removed as firewood, reducing habitat for pileated woodpeckers, American martens, white-headed woodpeckers, three-toed woodpeckers and other species that use deadwood habitats. The low road density in the subwatershed would be maintained at 1.8 miles per square mile in all alternatives, and will help minimize snag losses to firewood cutting.

Adjacent private lands have been managed in the past. Most adjacent private lands have been lightly commercially thinned within the last decade. In the past, private lands appear not to have been managed for old-growth habitat and no change in this strategy is expected. These areas are not expected to provide OFMS or OFSS habitat in the future.

Past harvest has reduced the quantity and quality of connectivity between old-growth stands. Since 1993, the Forest Plan as amended has directed the Malheur National Forest to protect connectivity habitat between LOS stands. Recent timber sales such as Clear, Olmstead, and Dry designated connectivity habitat in the landscape surrounding Crawford. The Crawford Analysis considered these connectivity corridors when identifying corridors with the Crawford Area. The nearby Easy Fire burned both old-growth and connectivity habitat, and opportunities to designate connectivity habitat in the fire area has been reduced. Even though the action alternatives proposed in Crawford would conduct harvest and prescribed burning activities within connectivity corridors, the prescriptions would maintain Forest Plan Standards for connectivity, permitting movement of wildlife species across the landscape. Alternatives proposed in Crawford would not have an adverse cumulative effect on the quantity and quality of connectivity. There are no foreseeable future activities that would affect connectivity.

In the short-term, the No Action Alternative would not contribute to cumulative losses of old-growth or connectivity habitat because stands would not be treated. In the long-term, the No Action Alternative, by forgoing action, could negatively contribute to the loss of OFSS and associated species.

In the short-term, the action alternatives would not contribute to cumulative losses of mature and old-growth habitat because stands would not be treated except to enhance old-growth attributes. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of OFSS and maintaining connectivity habitat between LOS. Therefore, proposal activities would contribute positively toward the viability of species that use these habitats. There are no significant adverse cumulative effects to pileated woodpeckers or American martens or their habitat from any of the alternatives; there are positive effects to white-headed woodpeckers from OFSS development.

Affected Environment – Big Game Habitat

Rocky Mountain elk and mule deer are big game species of concern due to their high public value. Species are considered wildly distributed across the District, Forest and the Blue Mountain Region. Rocky Mountain elk are identified in the Forest Plan as a Management Indicator Species (MIS); habitat quality is evaluated in terms of forest cover, forage, cover/ forage spacing and open road density.

The project area is entirely within big-game summer range (predominately ponderosa pine and mixed conifer stands above 4,600 feet elevation). Lower elevations in the area represent transition range, although some elk are observed here in summer months. Due to significant snow accumulations, most elk leave the area to winter at lower elevations. The amount of big game sign; pellets and beds, and animals observed indicates a moderate to high use of the area.

Elk habitat was evaluated using the Habitat Effectiveness Index (HEI) (Thomas et al. 1988), satisfactory and marginal cover percentages, and open road densities. Big game cover was designated using stand exams, Most Similar Neighbor Analysis, aerial photograph interpretation and field reconnaissance.

Big Game Populations

Big game management on the Malheur National Forest is a cooperative effort between the Forest Service (FS) and the Oregon Department of Fish and Wildlife (ODFW) where the FS manages habitat while ODFW manages populations. The agencies cooperate by managing big game according to pre-established Management Objectives (MOs) for each big game management unit. The Crawford Project Area lies within portions of the Sumpter and Desolation Big Game Management Units. Table WL – 10 displays Management Objectives for elk populations, bull to cow ratios, and calf to cow ratios by Management Unit. Annual estimates are displayed since 1995.

Table WL – 10. Wintering Elk Populations' Estimates and Management Objectives.

Year	Population	Bulls per 100 cows	Calves per 100 cows
Desolation Unit			
	Management Objectives (MOs) 1,300		
2008	1195	9	21
2007	1400	6	21
2006	1,300	10	45
2005	1,235	8	33
2004	1,200	8	28
2003	1,365	6	17
2002	1,625	9	25
2001	1,400	12	40
2000	1,300	11	32
1999	1,350	9	37
1998	1,500	12	31
1997	1,600	10	52
1996	1,400	10	27
1995	1,400	6	48
Sumpter Unit			
Year	**Management Objectives (MOs) 2,000**		
2008	1581	19	32
2006	2,000	10	35
2005	1,800	15	35
2004	1,700	13	34
2003	2,000	9	35
2002	2,000	14	34
2001	2,000	12	33
2000	2,005	13	33
1999	2,070	11	39
1998	2,150	13	43
1997	2,305	14	38
1996	2,310	13	27
1995	2,330	2*	27
2007 number for Sumpter Unit were not available.			

Table WL – 10 indicates that elk population levels have remained relatively stable over the last 13 to 14 years in both the Sumpter and Desolation Management units in spite of past forest management activities. Population numbers and management objectives are being met at the 79% level for the Sumpter Management Unit and at 92% level for the Desolation Management Unit (ODFW 2006). Wintering elk populations have met population MOs in the Desolation Unit except for 2004, 2005, and 2008. ODFW Biologists Darren Bruning and George Keister (personal communication, 2006) stated that although animal numbers fell below MOs in recent years, the lower values are considered insignificant and adjustments in hunting permits can quickly recover populations.

Bull to cow ratios have generally exceeded MOs in the Sumpter Management Units and dropped below MOs in the Desolation Management Units. As bull/cow ratios decline below 10 bulls/100 cows, breeding dynamics within a herd also change, and there can be a corresponding reduction in cow/calf ratios (ODFW 2003). Bull-to-cow ratios are influenced by a number of factors including numbers of hunters, length of hunting seasons, including the rutting period in the hunting season, lack of restrictions of antler class in harvest, lack of hiding cover, and high open road densities (Wisdom and Thomas 1996, Irwin et al. 1994, Schommer and Johnson 2003).

Calf recruitment is the number of sub-adult animals added to the population each year. Recruitment levels are expressed as the number of calves per 100 cows. ODFW does not establish MOs for calf to cow ratios because the level of recruitment necessary for population maintenance varies annually depending on the rate of adult mortality. The average number of calves needed to sustain elk populations' ranges between 20 to 40 calves per 100 cows, depending on the annual adult mortality. Both the Sumpter and Desolation Management Units have generally supported ratios within this range.

Since the 1960s, there has been a general decline in calf to cow ratios in many of the Management Units in Eastern Oregon. Several ODFW biologists feel predation by bears, cougars, and coyotes are the main reason for poor calf survival (Communication with ODFW biologists Darren Bruning 2006 and George Keister 2004). Another factor affecting the low calf survival may be the lack of hiding cover especially in riparian areas which contributes to increased predation. ODFW is currently conducting a three-year study in the northern Blue Mountains to investigate the potential causes of calf mortality. The data collected to date has not been analyzed and so inferences cannot be made at this time. (Personal communication with ODFW biologist Greg Jackle 9/2007)

Habitat Effectiveness Index (HEI)

Thomas et al. (1988) developed the Habitat Effectiveness Index (HEI) model for estimating elk habitat effectiveness on the landscape. Overall habitat effectiveness (HEscr) incorporates three variables or indices for summer range: cover quality (HEc), size and spacing of cover (HEs) and open road density (HEr). The Forest Plan establishes minimum standards for these indices. In addition, the Forest Plan establishes minimum standards for retention of satisfactory cover (%S), marginal cover (%M), total cover (%S and %M), and open road density (see Table WL – 11).

Table WL – 11. Existing HEI Values, Cover Percentages and Open Road Densities.

Subwatershed	HEc	HEs	HEr	HEcsr (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
Forest Plan Standard	.30	.30	.40	.40	12%	5%	20%	3.2
Mill Creek	.53	.69	.50	.57	2.5%	47.5 %	50%	1.8

HEI = HEcsr = Habitat Effectiveness Index.
HEr = habitat effectiveness derived from the density or roads open to vehicular traffic
HEc = habitat effectiveness derived from the quality of cover.
HEs = habitat effectiveness derived from the size and spacing of cover
%S = Satisfactory Cover. %M = Marginal Cover. % Total Cover = %S + %M.

Habitat components; thermal/hiding cover and forage, have been altered due to past management and fire suppression; however, cover habitats tend to be adequately distributed throughout the analysis area. Past timber harvest, fragmentation, fire suppression and natural openings result in a cover/forage ratio of about 50% cover and 50% forage. Travel and migration corridors are provided for daily and seasonal movements.

Table WL – 11 displays existing HEI values, cover percentages, and open road densities for the Mill Creek Subwatershed. Field validation reduced satisfactory cover by 43 acres. The percent satisfactory and percent marginal total cover has been updated to reflect these changes. Due to the small amount of acreage change, the HEI model was not re-run because it would not have changed the values**.**

Timber harvest, precommercial thinning, road construction, fire suppression, wildfires, insect and diseases, livestock grazing and natural site capabilities have all contributed to the current habitat conditions displayed in Table WL – 11. The current cover/forage ratio is 50:50. The following sections discuss the various habitat components in more detail.

Forage

Approximately 8,900 acres or 50% of the subwatershed currently classifies as forage. For the purpose of this analysis, forage areas include areas ranging from grasslands to forested stands with less than 40% canopy cover. Current forage conditions are primarily the result of site productivity, fire suppression, and timber and grazing management. Overstocked forested stands tend to reduce forage; many shrubs, grass and forb species are inhibited by reduced sunlight reaching the forest floor. Livestock grazing can be beneficial or detrimental to big game. Range standards and AUMs (animal unit months) are set to meet the forage needs for both livestock and big game. Under Term Grazing Permits, livestock are authorized to utilize 45% of available forage with the remaining forage available for big game.

Cover

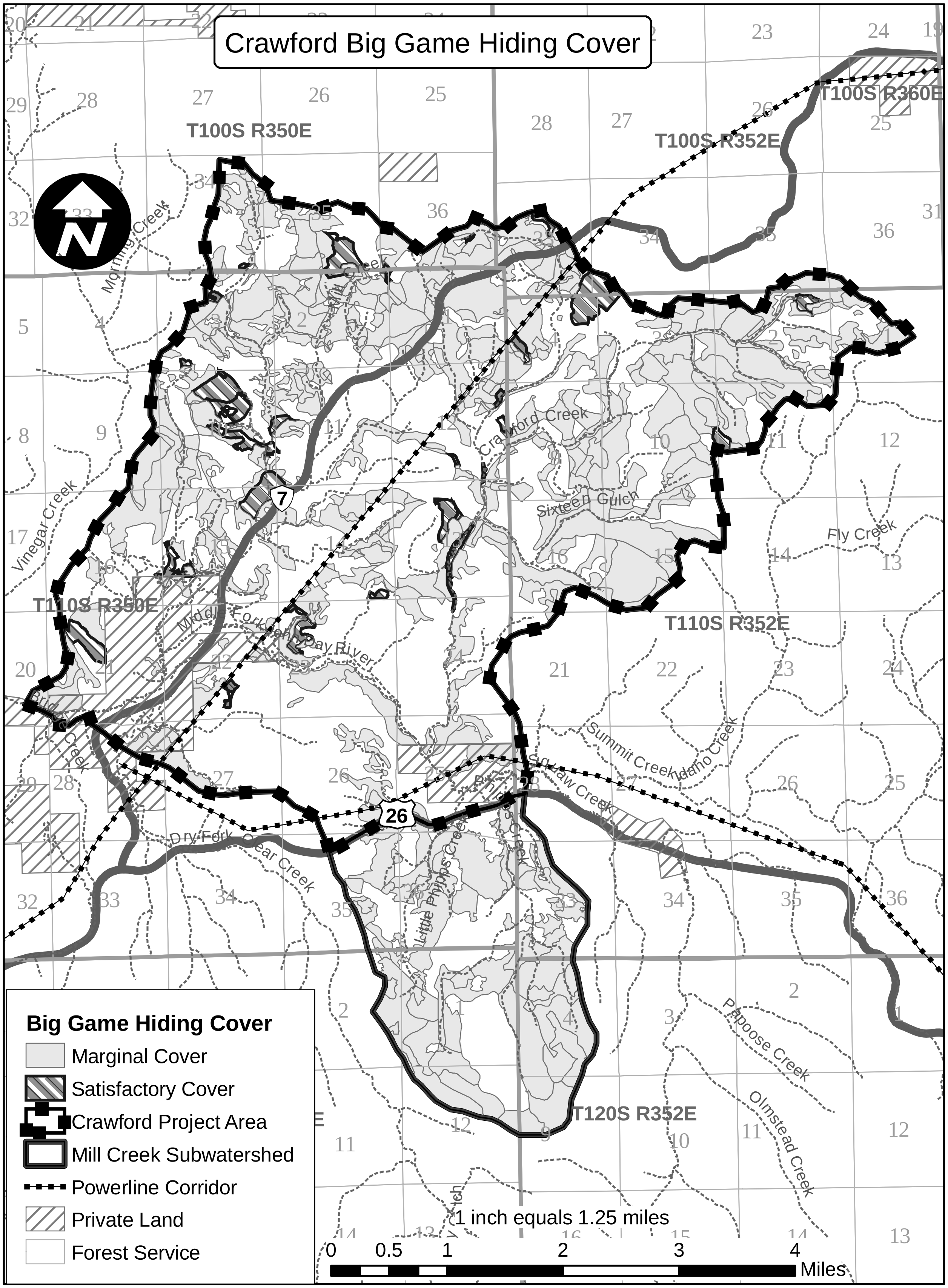
Satisfactory and marginal cover is sometimes referred to as thermal cover. Deer and elk use thermal cover to moderate harsh weather conditions, i.e., to keep cooler on hot days and to keep warmer on cold days. Under thermal cover, animals need to expend less energy for thermal regulation. The Forest Plan defines satisfactory cover for elk as a stand of coniferous trees 40 or more feet tall with an average canopy closure equal to or exceeding 50% for ponderosa pine and 60% for mixed conifer. Acres of satisfactory cover equal 449 acres, 2.5% of the subwatershed. Satisfactory cover is below the Forest Plan Standard of 12%. Marginal cover is defined as a stand of coniferous trees greater than 10 feet tall with an average canopy cover meeting or exceeding 40 percent. This habitat type is present on 8,429 acres, 47.5% of the subwatershed. Total cover equals nearly 50%, above the Forest Plan Standard of 20%. See Figure WL – 1.

It is important to note that recent research at the Starkey Experimental Station in La Grande, Oregon (Cook et al. 1998) has raised the concern that resource managers may be overstating the importance of thermal cover on elk condition. Studies suggest that the energetic benefits of cover may be inconsequential to elk performance, and that it is forage or nutritional effects that may have the greater impact on individual animal performance. However, these studies do not dispute elk's preference for dense forest stands or the numerous studies that show elk using dense stands disproportionately to their availability. Dense conifer cover contributes to better distribution of elk across available habitat, and may be more of a disturbance/hiding cover issue than a thermal regulation issue.

Hiding cover, also referred to as security cover, is also important to big game animals. Hiding cover provides a visual barrier between big game animals and disturbance sources. This is especially important during hunting season when big game animals alter their travel patterns to avoid humans. Hiding cover is difficult to quantify. Many stands classified as satisfactory or marginal cover provide hiding cover. Even in non-thermal cover stands, small thickets of saplings 1 to 2 acres in size can offer security. Generally, hiding cover is more prevalent in the moist forest environments at higher elevations and less prevalent in the dry forest environments at lower elevations.

Table W – 11 displays levels of satisfactory and marginal cover; these cover percentages provide some indication of the availability of hiding cover in the subwatershed. Satisfactory cover is typically multi-storied and often meets elk hiding cover criteria. Satisfactory cover is limited (449 acres) and is in small 1 to 73 acres patches distributed throughout the subwatershed.

Figure WL – 1. Crawford Big Game Hiding Cover.



However, there are 8,429 acres of marginal cover, much of which will contribute to hiding cover at various levels. Due to the relatively flat topography, existing levels of hiding cover are generally not mitigated by landforms.

Historically, this area may not have had a substantial amount of cover. About 64% (11400 acres) of the subwatershed is in the hot-dry and warm-dry biophysical environments. These environments typically do not support high densities of conifer stems for more than 40 years. In recent years, commercial and precommercial thinning in the dry biophysical environments have started shifting stands back towards more historic conditions, reducing hiding cover in size and quality. Nevertheless, cover is currently believed to be at levels that exceed HRV.

Roads

The open road density for the Mill Creek Subwatershed is 1.8 open miles per square mile. This density is below the Forest Plan Standard of 3.2 miles per square mile for summer range (USDA 1990, IV – 6), and very near the Forest Plan desired condition of 1.5 open miles per square mile.

The northeast boundary of the Mill Creek Subwatershed is shared with the Patrick Creek Cooperative Travel Management Area (also known as a green dot closure area) on the Wallowa-Whitman National Forest. Restriction periods reduce some traffic in the fall and correspond to general deer and elk hunting seasons. Open road densities in Table WL – 11 do not reflect seasonal closures. The change in numbers would benefit big game; however, the change is relatively small and would not change the overall HEI and HEr values.

Even with this relatively low road density there is concern regarding impacts to big game. Road closures have not been effective in some areas of the subwatershed. The greatest potential for impact is during hunting seasons, when hunter traffic and the associated "stimulus" associated with those activities are at their highest level. Road closures are difficult to enforce, even those with barricades and gates, due to flat topography, open forest vegetation and a lack of enforcement personnel.

Perhaps more important than the impacts of road densities upon elk habit use and selection is the spatial relationships of those roads. Recent studies at the Starkey Experimental Station found a strong correlation between road activity and habitat selection (USDA 2006). The research determined distance from roads was more accurate for estimating disturbance to elk than open road density alone. Researchers found a strong correlation between road activity and habitat selection. Elk response was affected by traffic rates, amount of forest cover near roads, and the type of road (which related to traffic rates). Cow elk consistently selected areas away from open roads in both spring and summer. Once the elk were farther away from roads, they were more influenced by other factors such as conditions affecting forage. When elk were unable to avoid roads and trails, subsequent studies showed that animals increased their movement rates, which can increase energy expenditures. Higher movement rates could thus reduce the animals' fat reserves and undermine general animal condition and winter survival. The same research indicated that mule deer behavior seemed to be affected more by elk than by roads. Mule deer tended to avoid elk and so the deer often used areas near roads. That is, mule deer are more likely to use areas least used by elk, which means deer end up in roaded areas with more traffic.

Starkey research (USDA 2006) suggests the spatial arrangement of roads has a greater influence on elk and deer than the Forest Plan road density model suggests. The research has shown that distance bands are more accurate for estimating disturbance to elk than road density alone. Traffic effects would gradually decrease as distance from open roads increases. All habitats in the analysis area are within 1,000 meters of an open road. About 97% of the area is within 500 meters of an open road; i.e., only 3% of the area is further than 500 meters. Therefore, the presence of open roads likely reduces the habitat effectiveness of the area. This is particularly important given the existing cover levels and the gentle topography for much of the area.

Fawning/Calving Habitat

To determine the amount of fawning/calving habitat within the Mill Creek Subwatershed a GIS analysis was conducted. The following habitat variables were considered in this analysis; slopes less than 15%, canopy cover greater than 37%, and proximity to water (streams, pond, and springs) less than 400 meters (Toweill and Thomas 2002). This analysis determined that there are approximately 430 acres of fawning/calving habitat that meet the criteria within the analysis area. However, this could be an underestimate due to the variable nature of fawning/calving habitat selection by female deer and elk. At first consideration, 430 acres does not seem to be adequate. However, the elk and mule deer populations in the Sumpter and Desolation Game Management Units have had a stable population for the last 11 years (see Table WL – 10). According to Greg Jackle, ODFW biologist the upper elevations of Crawford Project Area is elk calving habitat.

Environmental Consequences – Big Game Habitat

Alternative 1 – No Action

Direct and Indirect Effects

Existing conditions would be maintained in the Mill Creek Subwatershed, resulting in no change in the Habitat Effectiveness Index (HEI) for elk. HEI would remain at .57 in the short-term (0 to 5 years) and mid-term (5 to 25 years). The existing cover to forage ratio (50:50) would be maintained in the short-term and mid-term. In the long-term (greater than 25 years), HEI would likely remain stable.

Future development of multi-strata stands (with continued fire suppression) would create additional satisfactory and marginal cover stands in the long-term, increasing hiding and security cover for elk. These stands would become denser, and downed wood would be expected to increase as insect and disease levels increase. Increasing stand density and downed wood would improve hiding cover by increasing understory screening structure. These long-term (greater than 25 years) changes could improve HEI over time, although forage would continue to decline.

In the short-term, the current quantity, quality and distribution of forage habitat within the analysis area would be unchanged. In the mid- to long-term, forage would decrease as tree canopies close in forested stands and shade the ground. Use of these habitats would not change from the way they are currently utilized by deer and elk.

Habitat changes would increase the chance of a high severity wildfire in the analysis area. A fire of moderate to intense magnitude and severity could convert multi-strata cover habitat to stand initiation forage habitat in the short- and mid-term, increasing vulnerability of big game to hunting in the roaded portion of the analysis area.

With the selection of this alternative, open road densities would be maintained at the existing levels as described in the Affected Environment section. Within the Mill Creek Subwatershed, open road densities meet the desired condition (for the year 1999) identified in the Forest Plan

(USDA 1990, IV – 6). Existing road densities would remain at 1.8 miles per square mile, below the 3.2 miles per square mile in summer range habitat identified in the Forest Plan (USDA 1990, IV – 6), and very near the 1.5 miles per square mile desired condition in summer range. This alternative would not result in direct effects to big game security through its implementation.

Relationships between the spatial distribution and disturbance associated with open roads and hiding cover habitat would also not change, as existing road densities and levels of use are expected to remain the same in the short- to long-term. Implementation of this alternative would construct no new roads, but at the same time, it would do nothing to modify existing open road densities or road management.

In the short-term, fawning/calving habitat would remain as described in the existing condition section. In the mid- to long-term increasing cover would likely increase habitat.

Table WL – 10 indicates that elk population levels have remained relatively stable over the last 13 to 14 years in both the Sumpter and Desolation Management units in spite of past forest manage-ment activities. Population numbers and management objectives are being met at the 79% level for the Sumpter Management Unit and at 92% level for the Desolation Management Unit (ODFW 2006). In the absence of a large disturbance event such as wildlife, the No Action Alternative would likely maintain big game habitat and populations in the short- to long-term.

Action Alternatives – Alternatives 2, 3, and 4

Direct and Indirect Effects

Table W – 12 displays HEI, cover percentage and open road density values for the Mill Creek Subwatershed for the action alternatives. The No Action Alternative is also displayed for comparison purposes. All of the action alternatives would affect marginal cover and hiding cover. Table WL – 13 displays the number of acres (and percentage) of satisfactory and marginal cover treated by each alternative. The magnitude of change would depend on the acres of satisfactory and marginal habitat converted to forage and the distribution of these habitats across the analysis area. Overall HEI for all alternatives would be .57; cover reductions were not great enough to change HEI from the existing condition. Under all action alternatives, open road densities would be increased by 0.7 miles in the Mill Creek Subwatershed; as with cover, the magnitude of this change is insufficient to change open road density or the HEr value at the subwatershed level. Following Tables WL – 12 and WL – 13, the effects of the action alternatives will be discussed in more detail.

Table WL – 12. Big Game HEI, Cover Percentages, and Open Road Density for Mill Creek Subwatershed by Alternative.

Alternatives	HEc	HEs	HEr	HEcsr (HEI)	% S	% M	Total Cover %	Open Road Density (miles per square mile)
Forest Plan Standard	**.30**	**.30**	**.40**	**.40**	**12%**	**5%**	**20%**	**3.2**
Alt 1 – Existing Condition No Action Alternative	.53	.69	.50	.57	2.5	47.5	50	1.8
Alternative 2	.53	.70	.50	.57	2.4	42	44.4	1.8
Alternative 3	.53	.71	.50	.57	2.5	43.3	45.8	1.8
Alternative 4	.53	.69	.50	.57	2.5	45.8	48.3	1.8

HEI = HEcsr = Habitat Effectiveness Index.
HEc = habitat effectiveness derived from the quality of cover.
HEs = habitat effectiveness derived from the size and spacing of cover.
HEr = habitat effectiveness derived from the density or roads open to vehicular traffic.
%S = Satisfactory Cover. %M = Marginal Cover. % Total Cover = %S + %M.

The most direct effect from the action alternatives would be the reduction in satisfactory and marginal cover and the change in cover/forage distribution. Mechanical harvest, i.e., commercial thinning, shelterwood harvest and/or precommercial thinning would drop stands out of cover classification. Cover stands would be converted to forage habitat. Table WL – 13 displays the number of acres of satisfactory and marginal cover proposed to be treated.

Table WL – 13. Treatments in Satisfactory and Marginal Cover by Acres and Percentage.

	Alt. 1		Alt. 2		Alt. 3		Alt. 4	
	Mechanical Treatment[1]	Prescribed Fire[2]	Mechanical Treatment[1]	Prescribed Fire[2]	Mechanical Treatment[1]	Prescribed Fire[2]	Mechanical Treatment[1]	Prescribed Fire[2]
Satisfactory Cover – Acres and % Treated	0	0	27 (-6%)	135 (30%)	0	55 (12%)	0	0
Marginal Cover – Acres and % Treated	0	0	957 (-11%)	990 (12%)	704 (-8%)	990 (12%)	264 (–3%)	990 (12%)
Calving & Fawning Acres (%) Treated	0	0	84 (19.5%)		84 (19.5%)		84 (19.5%)	
Forage Acres (%) Created	0	0	984 (+10%)	NA	704 (+10%)	NA	264 (+3%)	NA

[1]Mechanical treatment refers to removal of trees by cutting; following treatment, stands would no longer classify as satisfactory or marginal cover.
[2] Prescribed fire prescriptions are designed to maintain overstory canopy cover. Prescribed fire would kill some trees, but given design features, would not be expected to take stands out of satisfactory or marginal cover classification. Although stands would not be formally classified as "forage," prescribed fire would enhance/increase forage over time.

Alternative 2 would reduce satisfactory cover by 27 acres or 6% of existing satisfactory cover. Satisfactory cover is already below Forest Plan Standards; further reductions would require a non-significant Forest Plan amendment. The potential negative effects of removing understory trees would be reduced by the design requirement to retain unthinned patches of dense trees throughout the project area. Unthinned patches would comprise 5 to 15% of each unit and range from 2 to 5 acres in size depending on the density of understory trees. Alternatives 3 and 4 do not reduce satisfactory cover.

All action alternatives would prescribe burn an estimated 5,300 acres of the project area over the next 3 to 5 years with no more than 3,000 acres burned in any one year. Multiple entries may be needed to gradually reduce the litter layer that has increased beyond historical conditions. Table WL – 13 displays the number of acres of satisfactory and marginal cover that would be under-burned under each alternative. The objective of utilizing prescribed fire in cover stands is to reduce surface fuels and litter depth. Prescribed fire is not being utilized to change the structural stage or canopy cover of the stands in these identified areas. After implementation, these areas would still meet the requirements of satisfactory cover

Note that timber harvest units could also be underburned and acres affected are reflected in the mechanical treatment acres displayed. Burning would occur during spring or fall periods annually for five years. Scheduling is highly dependent on weather conditions. Burning would be limited to one grazing pasture per year and would not occur within harvest or commercial thinning units until these activities including fuels treatments are completed.

The action alternatives would cause the loss of hiding/security cover during and immediately after mechanical and burning operations. The potential negative effects of removing understory trees would be reduced by the design requirement to retain unthinned patches of dense trees throughout the project area. Unthinned patches would comprise 5 to 15% of each unit and range from 2 to 5 acres in size depending on the density of understory trees. In units where treatment is limited to prescribed burning, losses in hiding cover would be lower. Burning occurs in a mosaic of burned and unburned patches. In the absence of additional treatments, hiding cover should begin to recover between 5 to 10 years.

Thinning and burning would improve forage conditions by opening canopies and allowing more light to the forest floor. Most native grasses and forbs and many shrubs respond positively to fire. Plants tend to sprout vigorously from their roots if the above ground portions are killed by fire, although it may take 2 to 3 years for grass and forb species and 10 to 15 years for shrubs to return to their pre-fire abundance and volume. Fire can also increase nutrient content and palatability of forage, although the increased quantity of forage after a fire may be more significant than the increased quality of that forage. Species that respond favorably to fire include pinegrass, elk sedge, wild rose, snowberry, ceanothus, serviceberry, chokecherry, and currant.

Mountain mahogany and bitterbrush appear to be somewhat dependent on fire for long-term viability, although short-term effects can be detrimental to these plants. Fire may kill existing plants, but would prepare the necessary seedbed for regeneration. Sagebrush is also killed by fire, but seed germination can be fostered by improved seedbeds as well. The project is not intending to burn through large, expansive shrublands. Mortality and damage of smaller shrub stands and scattered individual plants would be expected. Mosaic burning would retain shrubs throughout the project area. Over browsing has been detrimental to existing shrubs and fire might increase abundance and vigor of many species, thus reducing the level of browsing on any individual species or plant. Ideally, landscapes would be underburned every 10 to 15 years to enhance forage quality and quantity.

Action alternatives would change the cover/forage ratio in the Mill Creek Subwatershed. Alternative 2 would change the cover/forage ratio from 50:50 to 44:56. Alternative 3 would create a cover/forage ratio of 46:54 and Alternative 4 would create a ratio of 48:52. Cover/forage edge is calculated in the HEs variable of the HEI model. Alternatives 2 and 3 would increase HEs from .69 to .70 and .71 respectively, indicating there will be more cover/forage edge. The cover/forage edge provides both cover and forage within a short distance and is beneficial to elk. As discussed previously, research from Starkey (Cook et al. 1998) suggests that the energetic benefits of cover may be inconsequential to elk performance, and that it is forage or nutritional effects that may have the greater impact on individual animal performance. Under Alternative 4, HEs does not change from the No Action Alternative.

Harvest and burning treatments would occur primarily in the warm-dry and hot-dry biophysical environments. These stands are considered outside HRV, i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe fire and insect epidemics. Many of these stands could fall out of cover within the next 25 years even if not treated.

Table WL – 13 displays the number of acres of fawning/calving habitat that would be modified by alternative. There could be limited, short term effect to calving and fawning habitat by spring under-burning and thinning. Attempts to locate calves or fawns would occur if lone cows or does are observed. (See the Design Measures in Chapter 2). There would be an approximate 84 acres or 19.5% of the 430 acres potential fawning/calving habitat modified by under-burning and thinning over a 5 year period. In addition the total acres of fawning/calving habitat could be underestimated or overestimated due to the variable nature of fawning/calving habitat selection by does and cows. This being the case, it is not anticipated that activities proposed in this alternative will likely adversely affect fawning/calving habitat. Interestingly, the elk and mule deer populations in the Sumpter and Desolation game management units have had a stable population for the last 13 to 14 years (see Table WL – 10).

Open road densities would increase during timber sale operations to facilitate harvest and log haul. There would be a short-term increase in big game disturbance during logging. Alternative 2 would construct about 8.6 miles of temporary roads to support timber harvest. Alternative 3 would construct 1.5 miles of temporary road. Alternative 4 would not construct temporary road. These roads would increase open road densities only for the duration of the timber harvest activities. All temporary roads would be ripped and seeded as needed after use. An additional 11.9 miles of closed roads would be opened to help facilitate log haul, with most being closed upon completion of timber work. Temporary increases in open road densities would not significantly impact big game.

Recent results from long-term big game studies at the Starkey Project indicates that elk avoided the short-term disturbance of logging activity itself, but elk did not avoid the harvests units or the log-hauling roads during and after timber harvest. In general, the elk populations become more dispersed during and after timber harvest which suggests that elk were moving farther over larger areas to meet their needs. Elk productivity was not negatively affected by timber harvest; however, the vulnerability of elk to hunting did increase. Open landscapes and relatively flat topography make elk more visible to hunters. This would increase hunter success, but would have little effect on elk performance (weight gain, general body condition) (USDA 2006).

Action alternatives would permanently reopen 1.7 miles of closed road, close 0.7 miles of open road and decommission 0.3 miles of open road, for a net increase of 0.7 miles of open roads in the Mill Creek Subwatershed. Open road miles would increase from 50.7 to 51.4 miles, slightly reducing available habitat but the change is not large enough to cause a change in the HEr variable. The open road density of 1.8 miles per square mile is below the Forest Plan Standard of 3.2 miles per square mile, but slightly higher than the desired condition of 1.5 miles per square mile in summer range. Current road distribution could also continue to affect big game use with only 3% of the analysis area further than 500 meters from an open road. Further reduction in cover, with essentially the same open road density, would decrease security for elk. Activities would likely change big game distribution, but not affect populations. Minor amounts of proposed road closures (0.8 miles) and decommissioning (0.2 miles) extend into the adjacent Idaho/Summit Creek and Dry Fork subwatersheds. It is important to close or decommission roads at locations where the public has a safe place to park or turn-around. Therefore, short segments of closure/decommissioning were extended into adjacent subwatersheds to meet this objective. These closures would provide an additional benefit to big game security, but would not result in a measurable change to HEI in the Idaho/Summit Creek or Dry Fork Subwatersheds.

Reductions in cover may displace some elk onto private land (George Keister, ODFW Wildlife Biologist, personal communication 2006). This could be a problem for private land owners because their forage and economic resources may be unable to absorb the effects of increases in wild ungulates. This could also be a problem for elk since the current remedy for the private land owner is to issue depredation tags to remove the problem elk. ODFW would continue to adjust hunting permits to maintain populations.

In summary, overall HEI would remain the same under all alternatives. Reductions in thermal and hiding cover would likely affect big game distribution, but would not be expected to affect population numbers. Although satisfactory cover is below Forest Plan Standards, total cover remains near or in excess of standards. Retention of unthinned patches in units would help mitigate losses in cover. Forage would increase. Elk populations have remained relatively stable during the last 13 to 14 years. Implementation of the action alternatives would not be expected to reduce populations.

All Alternatives

Cumulative Effects

All of the activities in Appendix D have been considered for their cumulative effects on big game habitat and associated species. The following discussion focuses on those past, ongoing and foreseeable future activities that may contribute positive or negative effects.

Wrac Lodgepole (LP) Thinning Project is within the Crawford Project Area boundary and Mill Creek Subwatershed. This proposed thinning project would remove lodgepole pine (4 to 10 inches dbh) on approximately 60 acres. The project is scheduled to be implemented in 2008. This sale is within big game summer range and is classified as marginal habitat. Proposed treatments would reduce canopy cover and convert these stands to forage habitat. This document analyzed effects to big game habitat within the Mill Creek Subwatershed. This analysis determined that cover reductions would not be sufficient to adversely affect big game populations. Implementation of Wrac LP would further reduce total cover, but by less than 1%. Following treatment of both the Crawford and Wrac LP, total cover would comprise about 43% of the Mill Subwatershed, well in excess of the Forest Plan standard of 20%. Hiding cover would also be reduced but losses would be considered incidental at the subwatershed level. Lodgepole pine tends to regenerate rapidly once overstory canopies are opened; in the absence of additional treatments, hiding cover could start to recover in 5 to 10 years. Following treatment, the Habitat Effectiveness Index (HEI) for elk would be 0.57, exceeding the Forest Plan standard of 0.40. The Wrac LP could have a minimal effect on big game distributions, but would have little to no effect on big game populations.

Past timber harvest, road construction, and fire suppression in the analysis area has affected the quantity, quality, and distribution of cover habitat. In the past there have been 25 timber sales in the Mill Creek Subwatershed and many in the surrounding area. From 1910 thru 1998 some 4,330 acres have been treated; some of these acres have had multiple entries. Road construction has increased road-related disturbance on big game animals and their habitats. Historic livestock grazing may have affected forage, but today's livestock grazing is considered compatible with big game use. Past activities are reflected in the HEI, cover and road density values described at the beginning of this section. Overall HEI, total cover and marginal cover meet Forest Plan Standards; satisfactory cover does not meet standards.

As discussed previously, Starkey research (USDA 2006) indicates that elk avoided the short-term disturbance of logging activity itself, but elk did not avoid the harvests units or the log-hauling roads during and after timber harvest. In general, the elk populations become more dispersed during and after timber harvest which suggests that elk were moving farther over larger areas to meet their needs. Elk productivity was not negatively affected by timber harvest; however, the vulnerability of elk to hunting did increase. Open landscapes and relatively flat topography make elk more visible to hunters. This would increase hunter success, but would have little effect on elk performance (weight gain, general body condition).

The Malheur National Forest is proposing to treat approximately 3,800 acres of noxious/invasive plants across the Forest. A proposed action has been scoped and includes manual pulling or use of hand tools, herbicide, cultural methods such as grazing or mulching, and biological controls. It is foreseeable that treatment of noxious/invasive species found in the Crawford Project Area would occur to some level, helping to promote recovery of desirable native vegetation for big game forage. Noxious/invasive weeds are not always palatable to wildlife and compete with native grasses desired by elk for forage.

Other ongoing and foreseeable actions, i.e., summer and winter recreation, hunting, firewood cutting, and livestock grazing would continue to occur in the area but are not expected to affect big game on the large scale. These actions may temporarily and in the short-term affect individual animals but are not expected to affect populations.

Disturbance of elk by hunting along open roads and off-road vehicle use would have more impact on big game populations than big game cover conditions created by the Crawford alternatives. Crawford proposes a small increase in overall open roads of 0.7 miles; however, the overall trend in the Forest Service is to reduce open road densities below Forest Plan Standards whenever possible. In fact the Mill Creek Subwatershed is already 1.4 miles/square mile below Forest Plan Standards. The proposed increase in open road miles is not large enough to change open road densities at the subwatershed level. Included in the proposal are minor amounts of road closure (0.8 miles) and decommissioning (0.2) in adjacent subwatersheds. These closures will provide additional big game security benefits.

Forest lands on adjacent private lands have been managed in the past and are expected to be managed the same way in the future; forests would be expected to provide forage for big game rather than cover. Cover/forage classification is reflected in the HEI and cover values in the existing condition section.

Elk population census data for the Desolation and Sumpter Management Units indicate a relatively stable, level, population trend (Table WL – 10). It appears that past forest management has not been detrimental to elk populations in this management unit. It is not anticipated that planned activities under any of the action alternatives would cause a decline in elk populations either. However, activities would likely cause a redistribution of animals across the landscape.

The No Action Alternative would not contribute significant adverse cumulative effects to big game populations. The combined effects of the Crawford action alternatives and past, present, and reasonably foreseeable future activities would not be expected to adversely affect populations or viability of big game species within the analysis area. Combined, projects would be expected to maintain overall HEI at or above Forest Plan Standards.

Affected Environment – Primary Cavity Excavator Species

Primary Cavity Excavators (PCEs) depend on standing and downed wood for foraging, nesting, and roosting. These species create cavities in dead and live trees. Secondary cavity users (flying squirrels, etc.) can use cavities excavated by these species. Cavity nester habitat can occur in a variety of vegetative communities and various structural conditions (Thomas 1979).

The Forest Plan identifies 11 primary cavity excavators as Management Indicator Species for the availability and quality of dead and defective wood habitat: black-backed woodpecker, three-toed woodpecker, downy woodpecker, Lewis' woodpecker, white-headed woodpecker, pileated woodpecker, hairy woodpecker, northern flicker, Williamson's sapsucker, red-breasted sapsucker and yellow-bellied sapsucker (USDA 1990, IV – 32). Because sapsucker species have been re-classified in recent years, the red-naped sapsucker will be used as a surrogate for the red-breasted and yellow-bellied sapsuckers.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) was reviewed. Habitat trends vary across the Blue Mountains with some watersheds experiencing increased habitat and others decreased habitats, but overall, the trend is towards a loss of habitat. Population trends show declines for several species including the pileated, white-headed, Lewis', and black-backed woodpeckers (Wisdom et al. 2000).

In general, existing and potential habitat can be found throughout the analysis area, except for non-forest areas and forest stands in the process of regeneration (stand initiation and stem exclusion structures). Few large snags and down logs occur in many of the previously harvested stands. Untreated stands, stands within the wilderness area, and DOG stands have relatively high snag densities when compared to previously harvested stands.

Forest Plan Standard for Wildlife Snags

The Malheur National Forest Land and Resource Management Plan (USDA 1990) establishes standards and guidelines for dead standing and downed wood for various levels of biological potential in each management area for Primary Cavity Excavators (PCEs). The plan was amended in 1995 by the Regional Forester's Forest Plan Amendment 2, also known as the "Eastside Screens." This amendment requires the retention of snags and green replacement trees greater than or equal to 21 inches diameter breast height (or the representative diameter in the overstory) at 100% potential population levels for primary cavity excavators as described in the Forest Plan or as described by the best available science. The Forest Plan, as amended, requires that an average 2.39 snags per acre, 21 inches dbh and greater, be maintained within forested stands. It is assumed that these snag and down log levels will provide the minimum level required for 100% of potential population levels of primary cavity excavators (USDA 1990).

Decayed Wood Advisor (DecAID)

DecAID 2.0 is an internet-based advisory tool developed to help land managers describe snag and down wood conditions and to evaluate the effects of proposed management activities on wildlife that use these habitats (Mellen et al. 2006). DecAID is a summary, synthesis and integration of published literature, research data, forest inventory databases, wildlife databases, and expert judgment and experience. Forest Plan guidance recommends using the "best available science." For deadwood MIS, DecAID is considered the best source and synthesis of available science (Mellen et al. 2006).

DecAID contains two major data sets: *vegetation inventory* data or snag and down wood data and *wildlife use* data. Vegetation data collected across the region is used to characterize a reference condition and wildlife data is used to characterize habitat use by various species. DecAID is not intended to be prescriptive; i.e., it is not used to establish standards for snags and down logs. Information is used primarily as a comparison tool.

Existing Snag Densities in Crawford

Table WL – 14 displays existing snag densities for the Crawford Project Analysis Area. Snags were estimated using data obtained through stand exams, Most Similar Neighbor analysis, and field reconnaissance. Snag analysis was conducted on the 17,800-acre Mill Creek Subwatershed.

DecAID uses somewhat different language than the Forest Vegetation section of this FEIS. Stands within the hot-dry and warm-dry biophysical environments are classified as the ponderosa pine/Douglas-fir habitat type in DecAID. Stands within the cool-moist biophysical environment are classified as eastside mixed conifer habitat type. Cool-dry and cold-dry biophysical environments are classified as the lodgepole habitat type.

Table WL – 14. Estimated Snag Densities in Crawford Analysis Area by Habitat Type and Diameter.

Wildlife Habitat Type	Snag Diameter at Breast Height (dbh) DecAID Categories	
	> 10 inches	> 20 inches
Ponderosa Pine/Douglas–fir	1.3 snags/acre[1]	0.1 snags/acre[2]
Eastside Mixed Conifer – East Cascades/Blue Mountains	8.6 snags/acre[1]	0.1 snags/acre[2]
Lodgepole Pine	4.1 snags/acre[1]	0.1 snags/acre[2]

Snag density data in stand exams does not exactly match snag density categories in DecAID.
[1] Snag density is for snags greater than or equal to 12 inches dbh. Data was not collected down to the 10–inch level.
[2] Snag density is for snags greater than or equal to 21 inches dbh. Data was not collected down to the 20–inch level. Therefore, snag estimates are likely conservative.

On average, current snag densities do not meet Forest Plan standards, i.e., 2.39 snags per acres 21 inches dbh and greater. This is likely due to past timber harvest. Past harvest removed a large proportion of the snags and existing mature trees (snag replacement trees) from the area. In particular, large diameter snags 21 inches dbh and greater are deficient.

Current snag densities were also compared to snag densities found in 1927 timber surveys conducted south of the project area on the Prairie City Ranger District (Matz 1927). Forest types on the Prairie City Ranger District are similar to those found in Crawford. Snag densities calculated by Matz averaged 1.7 snags per acre 12 - 20” dbh and 1.2 snags per acre greater than 20” dbh (Matz 1927). Crawford data suggests that densities of small diameter snags are similar to or in excess of those estimated by Matz. This comparison also suggests that large diameter snags are deficient.

Existing snag distributions in Crawford were compared to inventory distribution data in DecAID 2.0 (Mellen et al. 2006). See Diagrams 1 and 2. The analysis focused on the ponderosa pine/ Douglas-fir (PP/DF) habitat type since 1) this is the primary habitat type proposed for treatment and 2) the other two habitat types are not sufficiently represented in the project area to permit comparison to the DecAID inventory data.

The unharvested inventory data in DecAID is used to represent a “natural” or “reference” condition for snag levels. Caution should be used when assuming unharvested stands represent a “natural’ or “reference” condition for snag levels. Due to years of fire exclusion, current levels and composition of snags and down wood may not accurately reflect “pre-*settlement*’ or “natural” condition in eastside forest (Mellen et al. 2006). Although snag and down wood levels found in DecAID may not accurately reflect “natural” conditions, within reason, they are comparable to recent research (Agee 2002, Ohmann and Wadell 2002) regarding historical dead wood densities, and therefore, are appropriate to use in this analysis. Until new information becomes accessible; DecAID vegetation data provides current empirical data for dead wood evaluations.

Diagram 1 – DecAID Snag Inventory Comparison for ponderosa pine/Douglas-fir (PP/DF) Habitat Type, snags 10 inches dbh and greater. The solid bars represent the DecAID reference condition; unharvested plot data was weighted by structural class in DecAID and HRV data in the Vegetation Section of this EIS. The striped bars represent the existing snag distribution in the Crawford Project Analysis Area.

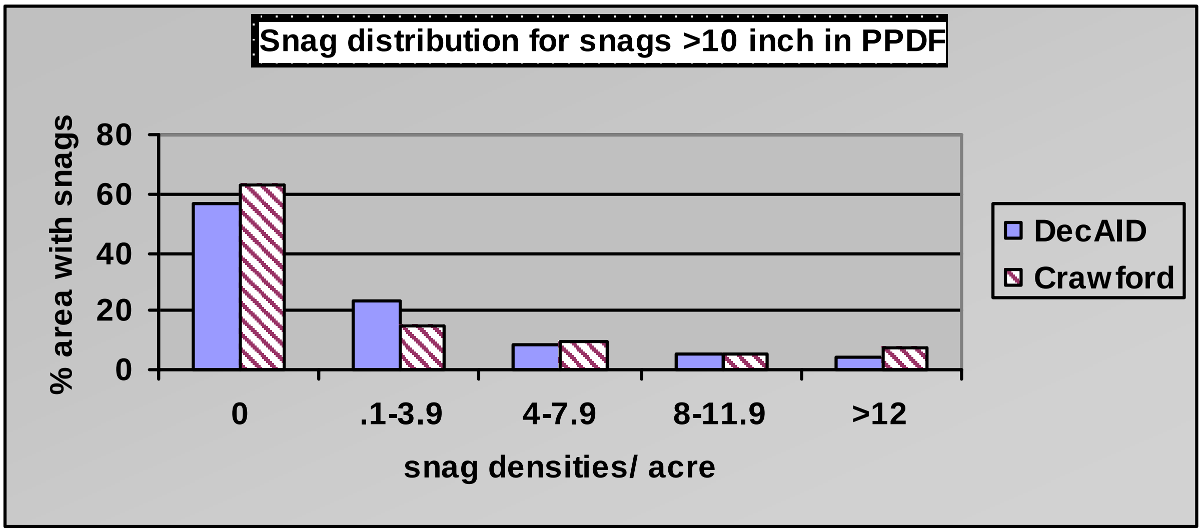
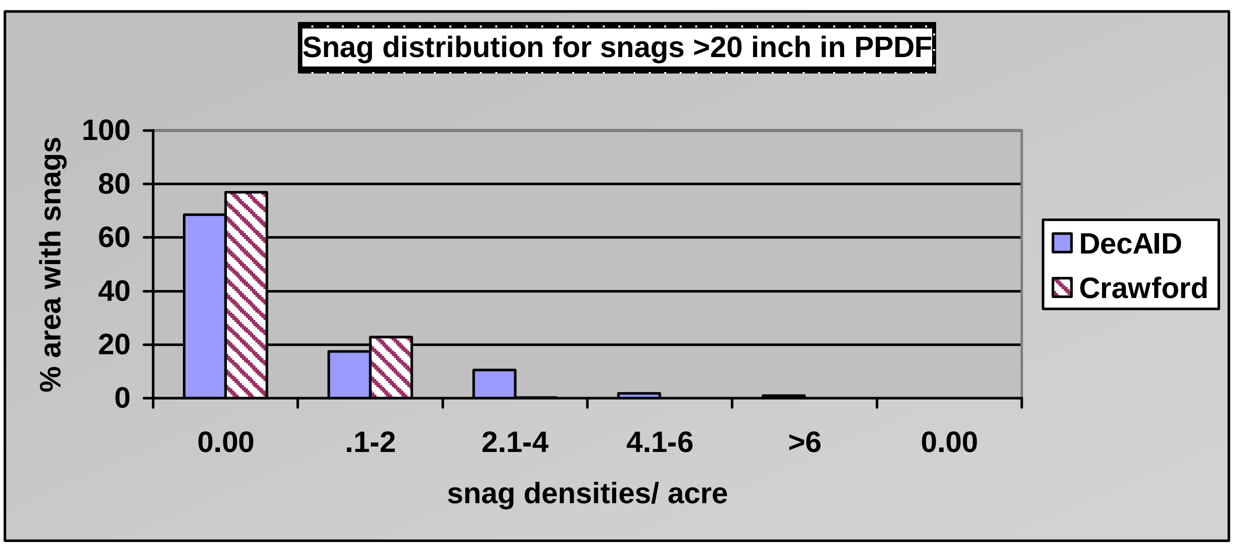


Diagram 2 – DecAID snag inventory comparison for ponderosa pine/Douglas-fir (PP/DF) Habitat Type, snags 20 inches dbh and greater. The solid bars represent the DecAID reference condition; unharvested plot data was weighted by structural class in DecAID and HRV data in the Vegetation Section of this EIS. The striped bars represent the snag distribution in the Crawford Project Analysis Area.



The DecAID comparison illustrates an important aspect of snag habitats. Historically, land-scapes did not support snags at a uniform level (e.g. 2 snags on every acre); rather, snag levels were quiet variable. For example, Diagram 1 indicates that historically snags in the PP/DF habitat type ranged from 0 snags per acre to 12+ snags per acre. Historically about 58% of the PP/DF habitat type had 0 snags; today, Crawford is devoid of snags on about 61% of the habitat type. Also, the data suggest that historically the habitat type had high concentrations of snags

(12+ snags per acre) on about 3% of the area; today Crawford supports high concentrations of snags on about 7% of the area.

Diagrams 1 and 2 indicate that the distribution of snags 10 inches dbh and greater, are relatively similar when comparing the Crawford distribution to the DecAID distribution. However, the snag comparison also suggests that large snags, 20 inches dbh and greater, are deficient relative to the reference condition; in particular, high concentrations of large snags are lacking.

Snag densities are important for determining the level of habitat provided for a particular PCE species. DecAID 2.0 displays wildlife tolerance levels for four of the cavity excavator MIS: black-backed woodpecker, white-headed woodpecker, pileated woodpecker and Williamson’s sapsucker. DecAID wildlife data is summarized in Appendix 1 of the Wildlife Specialist’s Report. Snag density data is synthesized by habitat type, structural stage, snag size, and tolerance level. It should be noted that snag density use varies between the four species.

In DecAID, wildlife tolerance levels (30, 50 and 80%) are used to describe the percent of a population that utilizes various snag densities. Lower snag densities equate to lower tolerance levels. Essentially, the lower the tolerance level, the fewer individuals will likely use the area (landscape, watershed, etc.). For example, at the 30% tolerance level for any given species, it would be expected that 30% of a population would find suitable or usable habitat at the specified snag density. Consequently, 70% of a population would not find suitable habitat conditions at that snag density. It should not be assumed the highest tolerance level (80%) is always the goal for management. In many instances, historic conditions, particularly in the dry forest types did not support the density of snags at the 80% level. Therefore, it may be better to tie an appropriate tolerance level to a landscape by the capability of that landscape to produce snags.

In the analysis area, existing snag levels correlate to the lower tolerance levels for various PCE species, primarily at the 0 – 30% tolerance (see Appendix 1 in the Wildlife Specialists Report for DecAID wildlife tolerance levels by wildlife species and habitat type). The 1927 local data (Matz 1927) suggests that historically much of the landscape would have provided for dead wood conditions at these lower tolerance levels. A small percentage of the landscape (likely up to about 20%) would have supported PCE at the higher (50 – 80%) tolerance levels. Today, the lack of large diameter snags and large diameter live trees (green tree replacements) is likely the most limiting factor in providing for PCE species. As suspected, historically the warm-dry and hot-dry biophysical environments better provided for species such as the white-headed wood-pecker and less so for black-backed woodpecker, pileated woodpecker and Williamson’s sapsucker.

While DecAID provides data on wildlife use of snags, it does not measure the biological potential of wildlife populations. There is no direct relationship between tolerances, snag densities and snag sizes used in DecAID and snag densities and sizes that measure potential population levels (Mellen et al 2006). Therefore, DecAID wildlife tolerance levels are only one component used to evaluate the effects of this project on dead wood habitats and associated species. This analysis also used species ecology, project design features, Forest Plan standards, local historic snag data and projected changes in snag levels to analyze effects.

Downed Wood

Currently, retention of downed logs is based on the Forest Plan, as amended by the Regional Forester’s Eastside Forest Plan Amendment 2. Forest Plan Standards and current downed wood densities within the analysis area are displayed in Table WL – 15. Current downed wood densities in the analysis area meet Forest Plan Standards, based on data collected during stand exams. DecAID was not used to analyze the effects of treatment on downed wood in the analysis area for several reasons. DecAID provides estimates of percent cover of downed wood. Available data for the analysis area could be converted to percent cover; however, without the length of each piece of wood counted (data which was unavailable), this analysis would likely underestimate percent cover. It is expected that current levels of downed wood provide habitat between the 30 and 50% tolerance level.

Table WL – 15. Forest Plan Standards/Existing Downed Wood Densities in Analysis Area.

Regional Forester's Forest Plan Amendment 2 (USDA 1995)			Crawford Project Area (Mill Creek Subwatershed) Stand Exam Data		
Species	**Minimum Log Size Criteria**	**Down Wood Density**	**Potential Vegetation**	**Minimum Log Size Criteria**	**Down Wood Density**
Ponderosa pine	Small end diameter >12” & Piece length >6’	3 – 6 pieces	Ponderosa pine/Douglas-fir	Small end diameter >12” & Piece length >6’	12.3
	Total length	20’– 40’		Total length	74’ (minimum)
Mixed Conifer	Small end diameter>12” & Piece length >6’	15–20 pieces	Mixed Conifer (grand/white fir, sub-alpine fir, lodgepole pine)	Small end diameter >12” & Piece length >6’	16.3
	Total length	100’–140‘		Total length 100’–140‘	100’ (minimum)

Primary Cavity Excavators

The following sections summarize species ecology for the various primary cavity excavators identified in the Malheur Forest Plan as Management Indicator Species (MIS).

Pileated Woodpecker (Dryocopus pileatus)

See the Old-Growth section for the ecology, habitat, and population status.

White-headed Woodpecker (Picoides albolarvatus)

See the Old-Growth section for the ecology, habitat, and population status.

Three-toed Woodpecker (Picoides arcticus)

The three-toed woodpecker is designated in the Forest Plan as a MIS species for old-growth lodgepole pine and was discussed in the Old-Growth section. There are no pure lodgepole pine stands within the proposed project area. These species are similar in appearance and some habitat needs overlap. Marshall (1992) described the similarities and differences in life history, distribution, and habitat requirements. Both species are similar in size, appearance, and forage almost solely on bark beetle larvae. The black-backed woodpecker forages in a broader range of mixed conifer types compared to the three-toed woodpecker. Both species are associated with mature and over mature stand structures. Home range size for the black-backed is estimated at averaging 430 acres, and for three-toed 130 – 750 acres. Suitable habitat for both species is tied to existing levels of diseased and decaying trees with heart rot for nesting and roosting, as well as decaying substrate to provide a prey base for wood-boring insects (Goggins et al. 1987).

Nest trees for these woodpeckers may be living or dead with heart rot (Marshall 1992). Black-backed woodpeckers selected nest sites with high densities of small diameter snags in a study by

Saab et al. (1999). Black-backed woodpeckers were noted selecting unlogged stands with high snag densities for both nesting and foraging habitat.

Available habitat exists for black-backed woodpeckers. Grand fir stands in the Mill Creek Subwatershed have some degree of insect mortality, and grand fir or ponderosa pine trees are available for nesting. These woodpeckers were sighted in the Mill Creek Subwatershed during wildlife surveys.

*Lewis' Woodpecker (*Melanerpes lewis*)*

The Lewis’ woodpecker is a Management Indicator Species (MIS) for the Malheur National Forest.

According to *The Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin,* source habitats declined in 70% of watersheds basin wide between the current and historical periods. Declines in source habitats for family 1 (including Lewis’ and white-headed woodpeckers) are related largely to reductions in the old-forest lower montane community type.

Unlike most other woodpecker species in Oregon, Lewis' woodpecker inhabits primarily open forest and woodlands since its primary foraging strategy is fly catching. Nesting habitat consists of two distinct types in eastern Oregon: riparian areas with large cottonwoods, and fire maintained or burned old-growth ponderosa pine forests (NatureServe 2005). This species seldom excavates its own nest cavity, instead using cavities created by other woodpeckers (Bock 1970). In burned areas, ponderosa pine snags greater than 16 inches dbh are chosen for nesting. Similar diameter cottonwood snags in riparian areas are selected (Galen 1989).

Habitat trend information derived from Interior Columbia Basin studies indicated that According to *Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin,*” (Wisdom et al. 2000) Source habitat declined in 70% of watersheds basin-wide between the historical and current periods. Declines in source habitats are among the most widespread and strongest of any declines observed for any set of species that were analyzed. Eleven ERU’s exhibited declining trends in 75% of watersheds; 13% had increasing trends and the remaining 17 were stable. No suitable habitat containing burned ponderosa pine or large diameter cottonwoods are known to exist within the planning area. There are no reported sightings of this species in the project area nor was this species located during breeding bird surveys (Adamus et al. 2001).

Black-backed Woodpecker (Picoides arcticus)

The black-backed woodpecker is an indicator of primary cavity nesting habitat. It inhabits standing dead lodgepole pine, ponderosa pine, western larch and mixed coniferous forests (Dixon and Saab 2000, Kotliar et al. 2002). This species dependence on burned forests and forests that have undergone other types of large scale disturbances is well documented (Hutto 1995, Caton 1996, Kreisel and Stein 1999, Dixon and Saab 2000, Kotliar et al. 2002). They have a scattered distribution with populations responding to prey abundance (Caton 1996). Disturbed forests are attractive to the black-backed woodpecker because they feed on insects (mainly larvae of wood-boring beetles) that are particularly abundant following a disturbance event. It forages in a broader range of mixed conifer types compared to the three-toed woodpecker. Home range size for the black-backed is estimated at averaging 478 acres. Black-backed woodpeckers selected nest sites with high densities of small diameter snags in a study by Saab et al. (1999). In mature ponderosa pine and mixed conifer forests, black-backed woodpeckers nest predominantly in ponderosa and lodgepole pine (Bull et al. 1986). However, tree species composition varies regionally (Dixon and Saab 2000) and appears not to be as an important a factor as forest condition (e.g. burned, insect damaged) for explaining the presence of nesting birds. This species were commonly found in unlogged ponderosa pine/Douglas-fir forests with a high density of relatively small, hard snags (Saab and Dudley 1997). Johnsgard (1986) found black-backed woodpeckers nesting in similar habitat as the three-toed woodpecker. In central Oregon's mixed conifer and lodgepole pine forests, black-backed woodpeckers selected mature and old-growth stands, and nested exclusively in lodgepole pine (Goggins et al. 1988). They avoided young stands and logged areas for both nesting and feeding

The availability of burned areas that are not subjected to salvage logging, and of insect damaged forest with numerous snags, limits the distribution of the black-backed woodpecker (Kotliar et al. 2002). Hutto (1995) found that this species is highly restricted to early post-fire conditions that become less suitable 5 to 6 years after a fire due to declining prey availability. Historical and recent high intensity fire management policies have negatively impacted this species by reducing the chance of large, high intensity wildfires that create suitable conditions for the black-backed woodpecker (Dixon and Saab 2000).

The black-backed woodpecker has been sighted in the Mill Creek Subwatershed during wildlife surveys.

Williamson's Sapsucker (Sphyrapicus thyroideus)

In northeastern Oregon Bull et al. (1986) described this species as occurring in mature and old-growth mixed conifer forests at 3,500 – 6,500 feet elevations. Nesting occurs in both live and dead tree species comprised mainly of western larch, but also ponderosa pine, Douglas-fir, and grand fir, in trees and snags averaging 27 inches diameter at breast height with 53% of nesting occurred in grand fir forest types. References to home range size were not found in the literature. A majority of foraging consisted of feeding at sapwells of western larch and Douglas-fir with diameters averaging 8.5 inches.

Analysis of BBS data indicates a decreasing population trend (DeSante). Populations showed highly significant declines throughout the U.S range, with particular strong declines in the Pacific Northwest. Wildlife agencies in Oregon and Utah refer to this sapsucker as a sensitive species due to either a declining population and limited range or habitat or an undetermined status (Atwood 1994).

Suitable old-growth comprises approximately 17% of the area, however snags are variable throughout. Sapsucker foraging sign was noted during surveys and one nest site was located.

Red-naped Sapsucker (Sphyrapicus nuchalis)

The red-naped sapsucker, *Sphyrapicus nuchalis*, is a woodpecker that breeds in coniferous forests and montane riparian woodlands of the western United States and southwestern Canada. It winters in Baja California and western Mexico. In the summer, it is commonly found along riparian woodlands at mid-elevations. This species, formerly a subspecies of the yellow-bellied sapsucker, is described as inhabiting riparian habitats, especially aspen, as well as pine forests (Marshall et al. 2003). This species uses riparian willow communities for foraging (Csuti et al. 1997). Nest trees are most commonly aspen with heartrot, but ponderosa pine was also selected (DeGraaf 1991). Less than 1 pair per 100 acres was noted in northeast Oregon (Marshall ed 1993). One nest cavity was reported during surveys of the planning area.

Suitable habitat in the planning area has declined over time, is very limited, and follows the distribution of small isolated patches of existing aspen, 22 stands ranging in size of 1/15 to 11.69 acres are in the planning area. According to the Upper Middle Fork Watershed Analysis (1998) the decline in aspen has mainly been due to fire suppression and conifer encroachment, which has lowered water tables in many areas. Other factors may continue to inhibit aspen clone regeneration include cattle grazing and increases in deer and elk populations over historic levels. There are opportunities to maintain and enhance aspen habitat on the landscape, but recovery of larger diameter aspen as well as increases in stand size will demand an intense, long-term commitment.

In mountainous areas in which there are no other woodpecker species, sapsuckers play an important ecological role as they are the sole providers of nesting cavities for the myriad species that prefer and/or require them.

Hairy Woodpecker (Picoides villosus)

Suitable habitat for this species includes open stands with low basal areas along ridges, low slopes, and southerly aspects in the ponderosa pine forest types. It is more common in older forests, but readily uses burned areas and forest edges for foraging (Csuti et al. 1997). In northeastern Oregon, nesting occurs primarily in ponderosa pine 10 to 20 inches dbh. Grand fir is not selected, but other species may be used (Bull et al. 1986). Hairy woodpeckers feed primarily in ponderosa pine stands, and will use grand fir stand types as well. Live and dead trees greater than 10 inches dbh would serve as foraging habitat.

Habitat for this species is well distributed throughout the planning area. However, low snag densities in the ponderosa pine hot-dry communities may inhibit occupation in these areas. One hairy woodpecker was noted during wildlife surveys. Cavities were also reported.

Downy Woodpecker (Picoides pubescens)

Preferred habitat for this small woodpecker includes cottonwood and aspen stands and riparian areas, but they will use coniferous-deciduous and sometimes coniferous forests. Territories are 5 to 9 acres. Nesting occurs in trees and snags greater than 8 inches dbh at heights over 15 feet (Marshall et al. 2003). They forage by a variety of means such as pecking and flaking bark for insects, gleaning leaves, and fly catching (Csuti et al. 1997).

Potential habitat for this species is currently found in existing riparian areas and to a more limited extent in aspen stands in the planning area. However, this species may be relegated to breeding at lower elevations (Csuti et al. 1997), and may not breed in the elevations found in the Crawford Planning Area. No birds were reported during breeding bird surveys (Adamus et al. 2001).

Northern Flicker (Colaptes auratus)

This species uses a wide variety of plant communities and successional stages. It prefers open habitats, and is commonly found foraging on the ground in open woodlands, meadows, field and shelterwood harvest areas (DeGaaf et al. 1991 and Csuti et al. 1997). Thomas et al. (1979) report this species using all forest successional stages for foraging and young (40 to 79 years) to old-growth (160+ years) for reproduction. Limited reproductive use of earlier stages is due to the absence of snags that this species requires for nesting. Nesting occurs in open areas in snags with some decay. Marshall (2003) noted 71% nest trees had broken tops. Average nest tree diameter was 22 inch dbh and nest holes were averaged 49 feet. Flickers and their nest cavities were seen within the project area during surveys.

Environmental Consequences – Primary Cavity Excavator Species

Effects to Primary Cavity Excavators (PCE) species were evaluated using the following information: species' ecology, project design features, Forest Plan Standards, DecAID tolerance levels, local historic snag data and projected snag and down log levels. The effects of harvest activities and prescribed burning on the pileated woodpecker and white-headed woodpecker are discussed here as well as in the Old-Growth section of this document. This section also examines effects on other MIS species, including the downy and hairy wood-peckers, Lewis' woodpecker, the black-backed woodpecker, various sapsuckers, and other primary cavity excavator species described in the Forest Plan (IV – 32, Standard 61) as they relate to reductions in snags and downed wood habitat elements.

Alternative 1 – No Action

Direct and Indirect Effects

Selection of this alternative would maintain existing levels of snags and downed wood in the analysis area. No activities would be implemented, so there would be no human-induced creation or loss of existing snags or downed wood. Snags would continue to be recruited and fall at existing rates in the short- and mid-term. In the short- to mid-term, the number of large diameter snags would continue to fall below Forest Plan standards. In the long-term, continued fire suppression and multi-strata development would increase the chance of insect infestations and disease. These occurrences would potentially increase snag densities. In the Canyon Creek WUI Fuels Reduction Project (USDA 2006), snag levels were projected out 50 years using the Forest Vegetation Simulator (FVS). In Crawford, existing snag conditions, forest types and treatments are similar to those in Canyon Creek; therefore, snag projections in Crawford would be expected to be similar as well. Snag modeling indicated that snag levels would increase under the No Action Alternative, and would meet Forest Plan standards by year 50.

Downed wood densities would continue to meet Forest Plan Standards in the future. Where densities of these habitats are currently high, such as the unmanaged mixed conifer stands, habitat needs for a variety of deadwood dependent species would be met. Within stands where densities of deadwood habitats are low or non-existent, habitat needs for deadwood dependent species would not be met in the short- and mid-term. In the long-term, continued fire suppression and multi-strata development would increase the chance of insect infestations and disease. These occurrences would potentially increase down log densities.

In the short- to mid-term, the No Action Alternative would have minimal effects on the MIS species for deadwood habitats including 10 PCE species and the American marten. Habitat would remain unchanged. Snag and down wood used by these species would have the same availability, distribution and density described in the existing condition section. Deadwood habitat would remain stable. These habitats would continue to provide snags for foraging and nesting, as well as higher canopy closures and near ground level canopy development that provides protection from predators.

In the long-term, insect infestations, disease, and fire would have varying impacts on the quantity and quality of PCE habitat. Disease and insects would increase foraging and nesting habitat for these species. Increases in stand densities resulting from continued fire suppression would increase canopy densities. The growth of understory hardwood shrubs required by some PCE species would be inhibited by reduced solar radiation to the forest floor. In the long-term, without management, snag densities may meet or exceed Forest Plan standards.

Higher fuel loads would increase the chance of a high severity wildfire. A fire of this magnitude and severity would affect snag and downed wood densities to varying degrees; snags would be much higher than those displayed in Table WL – 14. Stand replacement wildfire would benefit some species (Lewis', black-backed, northern three-toed, and hairy woodpecker, and the northern flicker) while mixed severity fires would benefit others (such as the white-headed woodpecker and Williamson's sapsucker). Stand replacement fires would reduce habitat for several species less associated with fire (such as pileated woodpecker, downy woodpecker, and the red-naped sapsucker).

Alternatives 2, 3, and 4

Direct and Indirect Effects

Today, green timber sales are conducted differently than they were in the past. The Crawford Project is a green timber sale. As such, harvest would only remove live trees. Snags would not be targeted for removal under this project. Some snags may be lost in treatment units for safety reasons; however, these would be incidental to the harvest of live trees, and any snags felled for safety reasons would be left on the ground. However, these may be taken by woodcutters. Project design criteria, such as retaining clumps of live trees around snags and locating landings and temporary roads where there are few or no snags, would help minimize losses. Retention of untreated patches of trees would continue to provide avenues for snag creation.

Generally, the effects on existing snags and downed wood and the affected PCE populations would not vary considerably between the different treatment types. In relation to their impact on snag and downed wood habitat, the difference between alternatives would vary by the number of acres treated.

During harvest operations, it is expected that individual snags and pieces of downed wood would be lost through felling of snags that pose a hazard to workers and equipment. Snags felled to provide access to units or within treatment units would be left on site to provide downed wood. Generally, snags would be avoided during these operations. Downed wood could be directly affected by ground based (skidder/tractor) harvest operations. It is assumed that some level of direct impact would occur, as OSHA regulations requirements and the realities of ground based operations and activities would inevitably result in those impacts. The degree of the impact that these activities would have is expected to be low and negligible at the subwatershed scale. Project design criteria, such as retaining clumps of live trees around snags and locating landings and temporary roads where there are few or no snags, would help minimize losses.

Tables WL – 16, WL – 17, and WL – 18 display treated acres and changes to snag densities by alternative, for the Mill Creek Subwatershed. The data summarized in these tables was calculated on the assumption that 10% of the existing snags within treated stands (under all treatment types) would be lost during harvest operations. This assumption is based on observations of past green timber sales on the District, the type of equipment that would be used, and professional judgment. The 10% estimate is at the high end of expected losses of snags which have locally ranged form 2 to 10%.

Table WL – 16. Pre-Harvest and Post-Harvest Snag Densities within the Mill Creek Subwatershed Forest Habitat under Alternative 2.

			Diameter Group	
Evaluation Units		**Unit**	**> = 12 inch dbh**	**> = 21 inch dbh**
Snag Analysis Area	Affected Area	Acres	2,192	2,192
	Subwatershed		15,922	15,922
Snag Density	Affected Area	Snags/acre	1.3	.10
	Subwatershed			
Pre-Harvest	Affected Area	Total Snags	2,850	219
	Subwatershed		20,699	1,592
Post-Harvest	Affected Area	Snags/acre	1.17	.09
		Total Snags	2,565	197
	Subwatershed	Total Snags	20,414	1,570
		Snags/acre	1.3* (no change from existing)	0.1* (no change from existing)
See footnote in Table WL – 18. Assumptions apply here as well.				

Table WL – 17. Pre-Harvest and Post-Harvest Snag Densities within the Mill Creek Subwatershed Forest Habitat under Alternative 3.

			Diameter Group	
Evaluation Units		**Unit**	**> = 12 inch dbh**	**> = 21 inch dbh**
Snag Analysis Area	Affected Area	Acres	1,506	1,506
	Subwatershed		15,922	15,922
Snag Density	Affected Area	Snags/acre	1.3	.10
	Subwatershed			
Pre–Harvest	Affected Area	Total Snags	1,958	150
	Subwatershed		20,699	1,592
Post–Harvest	Affected Area	Snags/acre	1.17	.09
		Total Snags	1,762	136
	Subwatershed	Total Snags	20,503	1,556
		Snags/acre	1.3* (no change from existing)	0.1* (no change from existing)
See footnote in Table WL – 18. Assumptions apply here as well.				

Table WL – 18. Pre-Harvest and Post-Harvest Snag Densities within the Mill Creek Subwatershed Forest Habitat under Alternative 4.

			Diameter Group	
Evaluation Units		**Unit**	**> = 12 inch dbh**	**> = 21 inch dbh**
Snag Analysis Area	Affected Area	Acres	795	795
	Subwatershed		15,922	15,922
Snag Density	Affected Area	Snags/acre	1.3	.10
	Subwatershed			
Pre–Harvest	Affected Area	Total Snags	1,034	80
	Subwatershed		20,699	1,592
Post–Harvest	Affected Area	Snags/acre	1.17	.09
		Total Snags	931	72
	Subwatershed	Total Snags	20,596	1,570
		Snags/acre	1.3* (no change from existing)	0.1* (no change from existing)
*Snag densities and total snag numbers were calculated using the forested portions of the Mill Creek Subwatershed. Snag extrapolation was based on average snags estimated for the PP/DF type since the majority of the subwatershed is in this habitat type and because treatment is occurring in this type. Therefore, snag levels are under-estimated at the watershed scale.				

This level of impact is used to produce post-harvest snag densities that can be compared to data in the DecAID Advisor. No harvest is proposed in the Eastside Mixed Conifer Forest Habitat, so post-harvest snag estimates are only calculated for the ponderosa pine/Douglas-fir habitat type. For this reason, effects on Eastside Mixed Conifer Forest Habitat will not be considered further, and thus, effects would be as described under Alternative 1.

Analysis in Tables WL – 16, WL – 17 and WL – 18 indicate that timber harvest would have minimal effects on snag levels at the landscape scale because of the relatively small portion of the landscape being treated and the low expected snag loss in the harvest units.

A 10% snag loss in harvest units equates to a less than 1% loss of snags at the landscape level. Average snag levels at the landscape scale would essentially remain the same. This conclusion would apply to all action alternatives. This analysis only analyzes the effects of timber harvest during logging; the effects of fuels treatments are described below.

Within harvest units, activity fuels would be treated during harvest or soon after harvest. Where yard tops attached is proposed a portion of the activity fuels would be located at landings. The area around landings would generally be made snag free in order to ensure the safety of workers at the sites; otherwise, whole tree yarding would have little effect on snags and down logs. Grapple piling or hand piling combined with burning would minimize impacts to snags; only smaller material would be targeted for piling, so effects to large down logs would also be limited.

Prescribed burning would be expected to have the most effect on deadwood habitats. Burning can alter or remove vertical and horizontal stand structure including snags and down wood. Snags can be both lost and recruited during prescribed burning. The level of loss and replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load.

Prescribed fires would be expected to burn relatively cool, move slowly and burn in a mosaic of burned and unburned patches. There is a potential for existing snags to burn through and fall. For ground-based operations, design measures would require that ignition be avoided within 50 feet of snags 12 inches dbh and greater. Greater protection would be given to trees 21 inches dbh and greater. In other project areas, this measure appears to be successful in maintaining most hard snags; however, some larger snags probably would be burned. Many, if not most, soft snags would probably be lost.

Tree mortality directly from the implemented burns, and indirectly from subsequent insect attacks, would likely result in the creation of new snags. Fire would be expected to cause localized single or clumped tree mortality**.** Burning prescriptions would permit killing as much as 10% of the trees 10 inches dbh and greater, 15% of the trees 5 inches to 10 inches dbh, and 35% of the trees less than 5 inches dbh, although actual tree mortality levels are expected to be lower (See Alternative Descriptions and Design Measures in Chapter 2.) Although it is not the intent of this project to kill many dominant or codominant trees, some may be lost. Tree mortality would be greater under fall burns than spring burns due to drier weather conditions and lower fuel moistures. Fire-induced mortality could help offset snags lost during burning. This "snag exchange" may even increase local woodpecker numbers if fire created snag recruitment exceeds losses. Since the project area is considered deficient in snags, increased snag habitat would be considered a benefit to snag-dependent species. Since most of the mortality would be trees smaller than 7 inches dbh, most of the benefits would be to foraging habitat rather than nesting habitat. Most snag dependent species prefer larger snags, those greater than 10 inches dbh, for nesting opportunities.

Generally, prescribed burning would be expected to maintain or increase numbers of primary cavity excavators. The influx in woodpecker species is a response to increased forage and nesting opportunities created by fire-killed or stressed trees and changes in accumulations of ground litter/ladder fuels, senescent shrubs and dense regeneration.

Retention of untreated patches of trees would continue to provide avenues for snag creation.

As the incidence of insects and disease decreases in treated stands, it would be expected that these agents will create fewer snags. Endemic levels of insect and disease would continue to operate in the stands providing a flow of future snags.

Indirect effects on deadwood habitats include impacts to future deadwood habitats (green tree replacements). The relative affect to the species that would use post treatment habitats is expected to be minor because all stands would be fully stocked following treatment.

Forest Plan Standards for green tree replacements would be met following treatment. Sufficient snag replacement trees would be available to meet future needs in all treatment units.

Prescribed underburning can alter or remove vertical and horizontal stand structure including snags and down wood. Snags can be both lost and recruited during prescribed burning. The level of loss and replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load. In the Crawford Project Area, effects to existing dead wood habitats would be expected to be minimal.

Species that are strongly associated with fire-burned trees would likely benefit the most, particularly species such as the black-backed, three-toed, white-headed, hairy, Lewis' woodpeckers and northern flickers. Population increases would depend on the intensity of the burn and the resultant tree mortality.

Black-backed and three-toed woodpeckers, in particular, have been shown to respond favorably to these small pulses in snag creation (Knotts 1998). Foraging habitat should temporarily improve with the increase of fire-killed trees less than 7 inches dbh due to the increase in insect populations. These species require smaller diameter snags for nesting than other species; therefore, burning may provide additional opportunities. Once the insects decline and the snags fall, black-backed and three-toed woodpecker should return to pre-burn levels. With repeated burnings over the life of the project, habitat should be created and higher populations should be maintained for 2 to 5 years after each burn. If no more burning projects are implemented in the area, woodpecker numbers would be expected to decline to pre-burn levels.

Hairy and Lewis' woodpeckers and northern flickers show a positive correlation with burning. The influx in woodpecker species is a response to increased forage and nesting opportunities created by fire-killed or stressed trees and changes in accumulations of ground litter/ladder fuels, senescent shrubs and dense regeneration. Killing of smaller diameter trees, i.e., those less than 7 inches dbh would increase foraging habitat; although larger snags are preferred for foraging, these species would utilize the smaller snags. Increases in nesting opportunities would be more limited as these species prefer larger diameter snags, particularly the Lewis' woodpecker and northern flicker. The "exchange of snags" described previously may have a somewhat greater effect on Lewis' woodpecker. This species prefers soft snags, and a portion of the existing soft snags would be expected to be lost during burning, although design measures would minimize losses. Burning could eventually increase populations of Lewis' woodpeckers, but may be delayed for several years until newly created snags decay and shrub densities increase.

White-headed woodpecker populations would likely stay the same or increase slightly. White-headed woodpeckers prefer old forest single-stratum (OFSS). Harvest and burning treatments would be expected to increase OFSS habitats in the short- to long-term as discussed in the Old-Growth Habitat section.

The action alternatives would have a slightly negative impact to pileated woodpeckers and American marten habitat. Snag habitat for these species would increase, but treatment would also degrade (char) down log habitat and reduce cover. There could be a loss in foraging substrate because some large down logs could be consumed by fire; however, sufficient amounts would remain to meet Forest Plan Standards. Effects to cover are discussed in the old-growth section. The network of designated old-growth areas would continue to provide for pileated woodpecker and American marten populations. (See old-growth section for additional effects).

Pileated woodpeckers could benefit from increases in snags, but creation of large diameter snags would be low. For the pileated woodpecker, snag density estimates in the Crawford Analysis Area are below the 30% tolerance level in both the greater than 10 inch and greater than 20 inch diameter groups. The studies used to derive this data are largely from NE Oregon, and are applicable to the analysis area, although the habitat in the analysis area is near the southernmost extent of the range of the pileated woodpecker in north-central Oregon. The high number of snags per acre was derived from nest sites. Attaining snag densities at this level is only possible in the moist mixed conifer sites. The pileated woodpecker prefers moist, dense sites dominated by grand fir; sub-alpine fir, western larch, and Douglas-fir cover types. Data confirms that the dry forest types in the Crawford Area are probably not conducive to supporting pileated woodpeckers. The network of designated old-growth areas would continue to provide for populations (see Old- Growth section for additional effects).

Populations of Williamson’s and red-naped sapsucker, and downy woodpeckers would change little with this alternative. Species prefer larger snags for nesting and only a limited number of large snags would be created. Some riparian areas would be burned, potentially affecting downy woodpeckers and red-naped sapsuckers, but the fire would be low intensity and few logs and hard snags would be expected to burn in the RHCAs. With time, expansion of aspen stands would benefit both downy woodpeckers and red-naped sapsuckers. At the project level, large snag and aspen habitat is quite limited and would be expected to increase only slightly; consequently, populations of these species would not be expected to change with this project.

Fires would be kept at a low enough intensity to meet standards for large down logs as specified in Regional Forester’s Eastside Forest Plans Amendment 2. Burning in a mosaic of burned and unburned patches would help maintain levels. With spring burning, many large, sound down logs are charred or partially consumed, but few are completely consumed by the fire if fuel moistures are high. A sufficient number of uncharred logs would remain to provide habitat for species that prefer them. The Forest Plan, as amended, requires that no more than 3 inches of the log diameter, 1.5 inches on either side of a log, be consumed. There is no requirement to prevent charring. During fall burning, more logs would be charred or consumed by the fire; however, Forest Plan Standards would likely be met. Few uncharred logs would remain in units that are burned in the fall which could affect species that prefer uncharred logs. Although fire would be allowed to back into RHCAs, larger logs in RHCAs would probably be uncharred.

Temporary road construction could eliminate snags, but given the existing snag levels in the project area and the relatively flat topography, it is expected that road locations can be tweaked enough to minimize the need to remove snags. Alternative 2 would construct about 8.6 miles of temporary road; Alternative 3 would construct 1.5 miles. Hazard trees may need to be removed along haul routes, but will be retained as down wood except that portion that is in the roadway. Firewood cutting has removed most snags along open road systems. The existing low road density in the subwatershed would be maintained at 1.8 miles per square mile in all alternatives, and will help minimize future snag losses to firewood cutting.

Disturbance associated with implementation of any of the action alternatives could cause PCE species present in treatment units to temporarily move elsewhere. These movements are expected to be temporary; these species would return to treated stands following completion of activities. Indirect effects on deadwood habitats include impacts to future deadwood habitats (removal of live trees, i.e., future snag replacements). The relative effect to the species that would use post treatment habitats is expected to be minor because all stands would be fully stocked following treatment. Forest Plan standards for green tree replacements would be met following treatment. Sufficient snag replacement trees would be available to meet future needs in all treatment units.

As the incidence of insects and disease decreases in treated stands, it can be expected that these agents will create fewer snags; however, endemic levels of insect and disease would continue to operate in the stands providing a flow of future snags. Retention of untreated patches of trees would also continue to provide avenues for snag creation. In the Canyon Creek WUI Fuels Reduction Project (USDA 2006), snag levels were projected out 50 years using the Forest Vegetation Simulator (FVS). In Crawford, existing snag conditions, forest types and treatments are similar to those in Canyon Creek; therefore, snag projections in Crawford would be expected to be similar as well. Snag modeling indicated that snag levels would increase under the action alternatives, although at slightly lower levels than predicted for the No Action Alternative. This would be expected given proposed thinning treatments would be designed to help reduce the levels of insect and disease operating in the project area. By year 50, total snag levels were predicted to exceed Forest Plan Standards; large diameter snags were predicted to increase as well, but could remain deficient given the current lack of large diameter trees and snags. Thinning would accelerate growth of large trees; large diameter trees would be plentiful and a portion could be converted to snags to supplement naturally-occurring levels and address any shortfalls. In the future, snags would be expected to exceed historic levels reported by Matz (1927) and increases would better reflect levels in DecAID.

Overall, the project may have some effects on primary cavity excavators and other animals that use snags and down logs. Existing snags and downed wood used or potentially used by PCE species for nesting, foraging, or roosting could be affected by treatment activities. Effects would be minimal given alternative design and design measures that would be used to protect existing snags and down wood. Changes in snags from timber harvest would be expected to be minor due to the small area affected and the fact that snags would not be targeted for removal; snags felled for safety would be incidental to the harvest of live trees and at the most would impact 10% of the existing snags in the harvest units and less than 1% of snags at the landscape level. Prescribed fire would result in a snag exchange with some snags being lost and some snags being created; overall, fire would likely increase snags. Although the analysis area is below Forest Plans Standards, additional impacts are considered incidental and not expected to adversely affect PCE populations. Stand treatments would accelerate growth of large diameter trees that could provide snag replacements in the future. Because snag densities would be expected to stay the same or increase, no adverse effects to primary cavity excavator populations would be expected. DecAID wildlife tolerance levels would be expected to stay the same as described in Alternative 1 or would improve slightly.

All Alternatives

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on PCE species. The analysis area boundary is the Mill Creek Subwatershed.

Timber harvest, fire suppression, road construction, wildfire, and firewood cutting have impacted the quantity, quality, and distribution of deadwood habitats and PCE populations dependent on these habitat features across the analysis area. These activities have created the existing condition of deadwood habitats in the analysis area. The effects of past management is reflected in the existing snag and down wood conditions displayed in Tables WL – 14 and WL – 15 and in diagrams 1 and 2.

Past timber harvest projects were generally very intensive, focusing upon the removal of the larger, more valuable ponderosa pine, Douglas-fir, and western larch trees that were abundant in this area. Past timber harvest resulted in the near complete removal of large, mature trees (green tree replacements) in many of the stands entered. Timber harvest also fragmented large blocks of suitable habitat for PCE species. Likewise, merchantable snags and downed wood were also removed, burned, or otherwise disposed of. The extensive road network in the analysis area (largely a result of past harvest) has impacted snag densities by increasing accessibility of the area to firewood cutting. Firewood cutting has impacted snag habitat in close proximity to open roads. Fire suppression has resulted in dense, multi-strata stands. Snag densities in these stands are generally higher than less dense ponderosa pine stands.

Future projects with a potential to affect snag and downed wood habitat include underburning. Prescribed burning has the potential to consume existing snags and downed logs and create additional snags in treated stands. Prescribed fire also has the potential to create snags of all size classes within the affected area. Snags created by prescribed fire would provide PCE habitat and increase snag densities (as singles and clumps) in burned portions of the analysis area. Underburning would be timed to create a low intensity ground fire. A portion of existing downed wood (generally smaller diameter fine fuels) would be consumed by a low intensity underburn of the type proposed.

Wrac Lodgepole Thinning is designed to maintain large trees, snags and large downed wood. The objectives would reduce stocking levels which would promote vigor on large diameter leave trees. This would help to maintain and encourage foraging opportunities for PCE species. Any losses in snags could affect foraging and nesting habitat. Effects would be minimal given project design and protection measures that would be used to protect existing snags and down wood.

The Regional Forester’s Eastside Forest Plan Amendment 2 requires the retention of snags and dead and down material at the 100% potential population level, i.e., 2.39 snags per acre 21 inches dbh or greater or whatever is the best representative dbh of the overstory layer.

In the proposed Wrac units, large diameter snags, 21 inches dbh or greater, are less than 2.39 snags per acre, although this is to be expected in lodgepole pine stands which tend to have smaller, average snag diameters than ponderosa pine or mixed conifer stands. The project would retain down logs in sufficient quantities to meet Forest Plan Standards; down log levels are currently high, although most of the logs are 7 inches dbh or less.

Due to the low level of effect that is expected under all alternatives, it is not expected that adverse cumulative effects on snag and downed wood habitat and the species that depend on these habitats would result when combined with the residual and anticipated effects of past, present, and reasonably foreseeable future activities.

Affected Environment – Featured Species – Northern Goshawk

The northern goshawk inhabits conifer-dominated forests. Goshawks utilize a wide range of forest structural conditions, often hunting prey in more open stands, yet relying on mature to old-growth structure for nesting and fledging. Nests are commonly on north aspects in drainages with dense canopy (60 to 80%), in large trees, and near water or other forest "edges" (Reynolds et al. 1992 and Marshal 1992). Habitat trend information derived from Interior Columbia Basin studies indicated that about 50% of the watersheds in the Blue Mountains showed a decreasing trend in goshawk habitat and 35% showed an increasing trend. Breeding Bird Survey (BBS) data suggests stable populations in western North America from 1966 through 1995; trend information derived from a study in the southwest indicated a 4% annual decline in populations (Wisdom et al. 2000). On the southern portion of the Blue Mountain Ranger District, known goshawks nest sites are monitored annually. The northern portion receives monitoring sporadically as funds, personnel and projects direct.

Potential nesting habitat, classified as old-growth, covers 13% of the analysis area. Overall 90% of the analysis area is forested. One known goshawk territory existed within the project area. The nest tree died and the nest eventually deteriorated. The original nest site and adjacent nesting habitat were surveyed for goshawks from 1999 to 2003 and again in 2005. No nesting goshawks were identified within or immediately adjacent to that site. No new nests have been located by surveyors. Foraging goshawks have been regularly sighted in the project area. There will be provisions to protect and create a 30-acre nest site and 400-acre post-fledging area (PFA) if a nest is located, as per Forest Plan direction, as amended.

Environmental Consequences – Northern Goshawk

See the Old-Growth Section of this chapter for additional effects on goshawks and their preferred nesting habitat.

Alternative 1 – No Action

Direct and Indirect Effects

There would be no direct adverse effects to goshawks from Alternative 1 since no logging or fuels reduction activities would occur. Overstocking may delay development of mature and old-growth forests. See Old-Growth section for the time it would take to reestablish old-growth. Under Alternative 1, the elevated fuel loads increase the risk of an intense burn; stand replacement fire could delay development of nesting habitat.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Under Alternatives 2, 3, and 4, treatment would occur in mature or old-growth stands suitable for nesting. See the Vegetation Section or the Glossary for OFSS, OFMS, and YFMS definitions.

Table WL – 19 displays the acres of mature and old-growth habitat treated and the treatment acres as a percentage of total potential nesting habitat.

Table WL – 19. Treatment Acres in Mature and Old-Growth Habitat. Treatment Acres as a Percentage of Total Potential Nesting Habitats.

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Treatment (Commercial Harvest and Precommercial thinning) acres in Mature and Old-Growth Habitat (OFSS, OFMS, and YFMS structure)	0	451	247	173
% of Potential Nesting Habitat Treated	0%	10%	5%	4%

The action alternatives do not propose any activities adjacent or within the original goshawk nest stand; there would be no direct adverse effects. Treatment would occur in stands suitable for nesting, although as a percentage of total potential nesting habitat, the amount of habitat affected is relatively small, less than 10%. Following treatment, stands are less likely to support nesting goshawks. Construction of temporary roads would fragment mature and old-growth habitat.

Potential nesting habitat would be monitored annually for goshawk activity if funding becomes available. If active nest sites are identified within or immediately adjacent to the project area, management activities would be prohibited within ½ mile of the nest sites from April 1st to September 30th to avoid disturbing goshawks during the breeding season.

Harvest would alter foraging habitat by reducing canopy and possibly shifting prey assemblages from canopy gleaners to open forest type birds. Since goshawks will prey on primary cavity excavators, retention of dead wood habits will help improve goshawk foraging habitat. Goshawks prey on a variety of small mammal species as well. Adult goshawks foraging in the area are not likely to be disturbed by project activities.

Research varies on conclusions as to the effects of harvest in and adjacent to nest stands and whether or not goshawks will use these stands following harvest. Several studies (Marshal 1992) have suggested that selection harvest of trees can reduce nesting; however, goshawk management recommendations by Reynolds et al. (1992) do not exclude timber harvest.

Four studies comparing prey abundance at goshawk locations and random points suggested that goshawks did not select stands on the basis of prey abundance but rather on forest structure. (Fischer 1986, Beier and Drennan 1997, Goode 1998, Drennan and Beier 2003).

Greenwald et al. (2005) states that current goshawk management plans in the western United States may be inadequate. Most studies found that goshawks avoided open areas and logged early seral stands. Three studies demonstrated avoidance of clear cuts and seedlings, sapling and young stands. (Austin 1993, Titus et al. 1996, Bloxton 2002). Austin (1993), and Beier and Drennan (1997)) documented avoidance of stands with <40% canopy closure. (Bright-Smith and Mannan (1994) documented avoidance of more open, partially logged old-growth forest.

Prescribed burning could also reduce cover, but generally burning kills smaller trees and would have minimal effect on canopy cover. As with timber harvest, seasonal restriction would be applied to burning activities if nesting goshawks are identified.

The action alternatives close or decommission roads. Generally, road closures reduce the potential for disturbance of nesting birds.

All Alternatives

Cumulative Effects

All of the activities in Appendix D have been considered for their cumulative effects on northern goshawk. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the species or its habitat.

Nesting habitat is typically the limiting factor for goshawks. Past timber harvest reduced mature and old-growth habitat preferred for nesting and fledging. Since 1993, the Forest Plan as amended has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages, and timber sales planned since that time should not have contributed to loss of mature and old-growth forests.

Adjacent private lands have been logged. In the past these timber stands have generally not provided nesting habitat for goshawks. These stands are not being managed for old-growth conditions, and therefore are not expected to provide nesting habitat in the future. No northern goshawk or other raptor nests have been identified in the immediate vicinity of Wrac Lodgepole Thinning Project. Thinning from below would create openings in the understory canopies, thereby enhancing foraging opportunities for goshawks and other raptors.

Overall, forage is not considered a factor limiting goshawk population viability, and consequently cumulative changes to foraging habitat, whether positive or negative, may not contribute to a measurable change in goshawk populations.

Goshawks are highly sensitive to disturbance during the breeding season. When seasonal restrictions on management activities were disregarded in the past, breeding success may have been reduced. Since 1990, seasonal restrictions on activities have been regularly used in the vicinity of occupied nests. Suitable nesting habitat is to be monitored annually; if monitoring identifies occupied nesting habitat, seasonal restrictions would be applied to all management activities.

In the short-term, the three action alternatives would not contribute to cumulative losses of mature and old-growth habitat because stands treated would still function as old-growth though canopy cover would be reduced. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of old-growth, i.e. goshawk nesting habitat. Cumulatively, management actions are not expected to reduce population viability.

Summary

Neither the No Action Alternative nor the action alternatives are expected to affect populations or viability of northern goshawks. Past harvest already reduced or eliminated nesting habitat in the Crawford Project Area. Harvest would treat less than 10% of the potential nesting habitat in the subwatershed. Mature and old-growth stands suitable for nesting would be surveyed annually for goshawk nesting activity if funding becomes available. If new nest sites are identified within or immediately adjacent to the project area, silvicultural prescriptions would be modified as needed and seasonal restrictions would be applied to management activities to avoid disturbing goshawks during the breeding season.

Affected Environment – Featured Species – Blue Grouse

Blue grouse inhabit coniferous forests intermixed with grassy or scabby openings. They prefer coniferous forest edges and aspen groves in the breeding season and coniferous forests in the winter (Aldridge 1963). Various reports indicate that blue grouse prefer habitats with a total tree canopy cover ranging from 20 to 50%. Habitat suitability decreases rapidly as tree canopy closures exceed 75%. The food habits of the blue grouse vary from a simple diet consisting of a variety of green leaves, fruits, seeds, flowers, animal matter, and conifer needles (Stewart 1944). The yearly diet of blue grouse in Washington and northern Idaho consisted of 98% plant food and 2% animal matter (Beer 1943). Sixty four percent of the plant material was conifer needles, mostly from firs and Douglas-fir; 17% was berries, primarily from currents, service berries, blackberries, huckleberries and bearberry; and 17% miscellaneous plant materials. The youngest birds fed almost exclusively on insects, and the availability of an adequate supply of insects is important during the first month of growth of blue grouse chicks. As grouse in Idaho moved from their winter range to lower elevation Douglas-fir forests during May and June, their diet consisted primarily of the flowering parts of various plants (Marshall 1946). These grouse moved to lower elevations along streams during July and August, and their diets shifter to the fruits and leaves of various shrubs. Forest habitats that are in early stages of second growth vegetation provide important summer foods for adults and chicks (Fowle 1960). The winter diet (from October through April) consists almost entirely of conifer needles (Beer 1943). The needles and buds of Douglas-fir provided 99% of the winter grouse in Idaho (Marshall 1946).

Blue grouse in Idaho relied almost entirely on conifers for escape cover (Marshall 1946). Male blue grouse in British Columbia utilized conifer thickets, log tangles, and spaces under logs and stumps for rest and concealment during the breeding season (Bendell and Elliott 1967). In the spring, hens concealed themselves under logs, stumps and small conifers for cover in locations similar to those used for nest sites. Winter range is provided primarily by montane forests (Bendell and Elliott 1966) and blue grouse spend most of the winter in coniferous trees, until the snow melt allows ground feeding (Hoffman 1956). Blue grouse also use spruce-fir and lodgepole pine forests during the winter where Douglas-fir was absent or scarce. Intensively used conifer stands were structurally similar to less used stands, and within all occupied stands blue grouse tended to be found in the largest conifers available.

Blue grouse breed and nest in a variety of forest and shrub vegetation types from the foothills to timberline. Broods in Montana and Colorado utilized areas where the interspersion of plants of various life forms provided a high degree of cover (Mussehl 1963; Hoffman 1981). Nesting and brood rearing habitats of blue grouse are often intensively used for spring and early summer grazing by domestic livestock (Marshall 1946). The types, time and intensity of grazing can have a significant effect on the structures and species composition of the vegetation during brood rearing season (Mussehl 1963). Ground cover that was ungrazed provided better brood cover than ground cover that was grazed.

Habitat trend information derived from Interior Columbia Basin studies indicated that about 80% of the watersheds in the Blue Mountains showed a decreasing trend in blue grouse habitat and 10% showed an increasing trend. Declines in source habitat are primarily attributed to a reduction in late seral forest. No population data is available; however, populations are likely lower than they were historically (Wisdom et al. 2000).

Environmental Consequences – Featured Species – Blue Grouse

Alternative 1 –No Action

Direct, Indirect, and Cumulative Effects

Under the No Action Alternative, there would be no direct or indirect effects to winter roost habitat. Habitat conditions would remain the same in the short-to mid-term. Over the long-term, increased stand densities and related stress could result in increased mistletoe and therefore increased winter roost habitat. Populations of blue grouse would be maintained.

Past harvest has reduced the mixed conifer old-growth that provide grouse habitat. There would be no harvest that would be cumulative to past actions. Refer to Appendix D for a description of past, present, and reasonably foreseeable future activities.

Alternatives 2, 3, and 4

Direct, Indirect, and Cumulative Effects

Under the action alternatives, harvest of trees potentially providing winter roost habitat could occur. As directed by the Forest Plan, design features would be incorporated into harvest prescriptions to maintain winter roost habitat. Populations of blue grouse would be maintained.

To provide blue grouse winter roosts, large mistletoe infected or "wolfy" Douglas-fir trees along ridge tops and large scab openings will be retained. This objective would apply to Wrac Lodge-pole Thinning Project as well.

All of the past, ongoing, and foreseeable future projects in Appendix D have been considered for their cumulative effects to blue grouse and their habitat. Past harvest and thinning, fire suppression, and personal use firewood cutting have affected the quality and quantity of winter roost habitat in the project area. Past harvest and thinning reduced stand densities and in some cases selectively removed infected trees that would have otherwise provided potential winter roosting habitat.

Because design features would be included in all harvest and prescribed burning projects on Forest Service lands to help protect winter roost habitat, cumulative adverse effects would not be expected to reduce population viability of blue grouse.

Affected Environment –Threatened, Endangered and Sensitive

Table WL – 20 (on the following page) summarizes habitat and species information for threatened, endangered and sensitive (TES) species that are suspected on the Malheur National Forest. Habitat/species presence calls focus on the Mill Creek Subwatershed and surrounding area as appropriate. Effects determinations are summarized for the No Action and action alternatives. More detailed discussions of habitat and effects follow the table. The discussion summarizes information in the Wildlife Biological Evaluation located in the project record.

Table WL – 20. Threatened, Endangered, and Sensitive Wildlife Species Summary.

Terrestrial Species	Status	Species Occurrence	Alt 1	Alt 2	Alt 3	Alt 4	Delisted
Gray Wolf *Canis lupus*	S	HD/N	NI	NI	NI	NI	March 28, 2008
Northern Bald Eagle *Hailaeetus leucocephalus*	S	HN/N	NI	NI	NI	NI	July, 2007
North American Lynx *Lynx canadensis*	T	HN/N	NE	NI	NE	NE	
American Peregrine Falcon *Falco perigrinus anatum*	S	HN/N	NI	NI	NI	NI	August, 1999
California Wolverine *Gulo gulo luteus*	S	HD/S	NI	NI	NI	NI	
Pygmy Rabbit *Brachylagus idahoensis*	S	HN/N	NI	NI	NI	NI	
Pacific Fisher *Martes pennanti*	S	HD/N	NI	NI	NI	NI	
Western Sage Grouse *Centrocercus urophasianus phaios*	S	HN/N	NI	NI	NI	NI	
Gray Flycatcher *Empidonax wrightii*	S	HN/N	NI	NI	NI	NI	
Bobolink *Dolichonyx oryzivorus*	S	HN/N	NI	NI	NI	NI	
Upland Sandpiper *Bartramia longicauda*	S	HN/N	NI	NI	NI	NI	
Tricolored Blackbird *Agelaius tricolor*	S	HN/N	NI	NI	NI	NI	
Bufflehead *Bucephala albeola*	S	HN/N	NI	NI	NI	NI	

Status: E = Endangered, T = Threatened, S = Sensitive. **Species Occurrence:** HD = Habitat Documented; HN = Habitat not within the project area or affected by its activities, D = Species documented in general vicinity of project activities, S= Species suspected in general vicinity of the project activities, N = Species not documented and not suspected in general vicinity of project activities.

Effect: NE =No Effect, NLAA =May Effect, Not Likely to Adversely Affect, LAA =May Effect, Likely to Adversely Affect, BE =Beneficial Effect, BI=Beneficial Impact, NI =No Impact, MIIH =May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species (Effects in parentheses are long-term effects).

Existing Condition – Bald Eagle (Sensitive)

The bald eagle was removed from Federal List of Endangered and Threatened wildlife in July of 2007. However, the bald eagle is still protected under the Migratory Bird Treaty Act (MBTA), The Lacey Act and The Bald and Golden Eagle Protection Act.

Bald eagle (*Haliaeetus leucocephalus*) nests are usually in multistoried, predominantly coniferous stands with old-growth components near water bodies which support adequate food supply. The nearest suspected nest site is 19 miles from the project area. Potential nesting habitat occurs along the Middle Fork of John Day River.

On the Malheur National Forest, bald eagles congregate at winter roost sites in mature forest stands. There are no defined winter roosts in or adjacent to the project area. Winter roost occurs about eight miles southeast of the project area.

Effects Determination – Bald Eagle

Direct, Indirect, Cumulative Effects

Alternative 1 –No Action

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct, indirect or cumulative effects to bald eagles or their habitat.

Alternative 2, 3, and 4

No action alternatives proposed would affect bald eagle habitat along the Middle Fork of the John Day River, since the proposed activities are not planned in riparian areas. No large trees would be harvested with the exception of incidental snags that pose hazards along roads and landings. There should be no director indirect effects to bald eagles or their habitat. Since there are no direct or indirect impacts to bald eagle or bald eagle habitat in the project area, there would be no cumulative impacts.
A ***no effect*** determination was given.

Existing Condition – Canada Lynx (Threatened)

Potential lynx (*Lynx canadensis*) habitat on the Malheur National Forest is defined as stands above 5,000 feet that are sub-alpine fir, lodgepole pine, Engelmann spruce, or moist grand fir types. Lynx require a mix of early and late seral habitats to meet their food and cover needs. Research indicates that lynx need approximately 10 to 15 square miles of high quality habitat to support a functional home range (Ruggiero et al. 1994). Lynx require a mix of early and late seral habitats to meet their food and cover needs. Early seral habitats provide the lynx with a prey base, primarily snowshoe hares, while mature forests provide denning space and hiding cover (Koehler 1990). Pockets of dense forest must be interspersed with prey. Lynx den sites are in forests with a high density of downfall (Koehler 1990). Favored travel ways within and between habitat areas include riparian corridors, forested ridges, and saddles.

The Mill Creek Subwatershed contains very little lynx habitat. There is no primary lynx habitat within the project area and only approximately 950 acres of secondary lodgepole habitat exists. It was concluded the Crawford Project Area would function as dispersal habitat for lynx.

There are several unconfirmed sightings of lynx in Grant County. In the late 1990s, Pat Sweeney, former wildlife biologist for the Blue Mountain Ranger District, observed a lynx in the Crawford Timber Sale area (Personal Communication, 2001).

Effects Determination – Canada Lynx

Direct, Indirect, Cumulative Effects

All Alternatives

According to the *Canada Lynx Conservation Assessment and Strategy*, August 2000, Lynx have been documented in the Blue Mountains and Wallowa Mountains. About half of the verified records are from the northeastern corner of Oregon. This area may be important in providing connectivity between Idaho and the Cascade Mountains Geographic area, although the Snake River and Hells Canyon likely would impede lynx movements.

Because lynx habitat is so limited in the project area, both now and historically, there would be no direct, indirect or cumulative effects expected from any of the alternatives. There is potential that the project area provides connectivity between the two lynx analysis units (LAUs). Use would be incidental and not prolonged due to the lack of prey species. Vegetation treatments are planned to allow connectivity of dispersal habitat and would not impede movement by lynx and other carnivores. Connectivity corridors would be maintained which could provide travel and foraging corridors. Since 1993, the Forest Plan as amended has directed the Malheur National Forest to protect connectivity habitat between LOS stands. In the short-term, the action alternatives would not contribute to cumulative losses of mature and old-growth habitat because stands would not be treated except to enhance old-growth attributes. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of OFSS and maintaining connectivity habitat between LOS stands. Clumpy patches ranging in size from 5-15 acres would be maintained which could provide hiding cover. The Lynx Conservation Agreement (CA) between the U.S. Fish and Wildlife Service was revised and amended in 2005 and 2006; the FWS Recovery Outline was issued in September 2006. The 2006 amendment to the CA identified the Malheur N.F. as not occupied based on the results of the surveys conducted in 1999, 2000 and 2001 as part of the National Lynx Survey. The project area was not surveyed due to the fact that the habitat was not considered suitable. The revision to the CA concluded that the Lynx Conservation Assessment and Strategy (LCAS) (under which Lynx Analysis Units (LAU) were delineated) did not apply to habitat that was unoccupied by lynx. However, the CA amendment also states that the LCAS may provide useful information for FS managers to consider when making decisions regarding unoccupied, mapped lynx habitat.

The Forest is included in "Peripheral Habitat" in the FWS Recovery Outline (pg 4): "In "peripheral areas" the majority of historical lynx records is sporadic and generally corresponds to period following cyclic lynx populations high in Canada. There is no evidence of long-term presence or reproduction that might indicate colonization or sustained use of these areas by lynx. However, some of these peripheral areas may provide habitat enabling the successful dispersal of lynx between populations or subpopulations…"

Research indicates that lynx need approximately 10 to 15 square miles of high quality habitat to support a functional home range (Ruggiero et al. 1994). Forest managers have conducted several mapping analyses of lynx habitat on the Malheur National Forest; none of these analyses classified the Crawford Project Area as a LAU. The number of acres is considered insufficient for lynx and what does exist is noncontiguous; therefore, this area is not considered suitable habitat for lynx to occupy. The nearest area that approximates lynx source habitat is located in the Strawberry Mountains, about 25 miles to the east. Since there are no direct or indirect impacts to Canada lynx or lynx habitat in the project area, there would be no cumulative impacts.

A ***no effect*** determination was stated for all action and No Action Alternatives.

Existing Condition –Wolverine (Sensitive)

Wolverines (*Gulo gulo*) were always rare in Oregon, although recent sightings, tracks, and collected remains document their continued presence at low densities in the state. Current distribution appears to be restricted to isolated wilderness areas. There is no source habitat for wolverine in the project area. There are no sub-alpine forest types with or without talus surrounded by trees in or adjacent to this area. The closest source habitat is approximately 10 miles from the proposed project site.

The likelihood of wolverine using or frequenting the area is expected to be very low. The Crawford Project Area may be used as dispersal habitat for wolverine.

Effects Determination – Wolverine

Direct, Indirect, Cumulative Effects

All Alternatives

There are no confirmed records of wolverine occurring in the project area. Periodically throughout the 1990s, wolverine surveys were conducted across the District including the Summit Creek/Idaho Creek area just east of the project area. No wolverine tracks or individuals were found. A wolverine was confirmed from bones and fur found in the Strawberry Mountain Wilderness in 1992. Unconfirmed sightings of wolverine were reported near Dixie Mountain and to the northeast near Big Boulder Creek. Additional sightings of animals and tracks have occurred on the District, but none have been confirmed. In 1994, bait and camera stations were set up in the vicinity of Tipton Summit, since two sightings had occurred there just across the Long Creek Ranger District border. No wolverines or sign were found.

The Crawford Vegetation Management Project is projected to have both positive and negative effects to wolverine and its prey. Positive effects include reducing canopy cover and increasing forage for deer and elk as well as ground cover for smaller wolverine prey species. Connectivity corridors would be maintained which could provide travel and foraging corridors. Since 1993, the Forest Plan as amended has directed the Malheur National Forest to protect connectivity habitat between LOS stands. In the short-term, the action alternatives would not contribute to cumulative losses of mature and old-growth habitat because stands would not be treated except to enhance old-growth attributes. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of OFSS and maintaining connectivity habitat between LOS stands. Clumpy patches ranging in size from 5 to 15 acres would be maintained which could provide hiding cover. Negative effects could include the reduction of hiding cover from timber harvest, but can increase forage for deer and elk.

Therefore, there would be no direct or indirect effect to this species. Since there are no direct or indirect impacts to wolverine or wolverine habitat in the project area, there would be no cumulative impacts to wolverine.

Dispersal habitat for wolverine would be maintained with application of the Regional Forester's Eastside Forest Plan Amendment 2 connectivity requirements for late old structure stands. Potential prey species and associated habitat would be maintained including decayed components such as snags and downed logs. Temporary roads would not be constructed in roadless areas and the recreation activities were not anticipated to increase from any of the proposed alternatives, therefore a ***no impact*** determination was stated.

Existing Condition Pacific Fisher (Sensitive)

Fisher (*Martes pennanti*) prefer habitat in later successional stages in the mesic conifer with greater than 40% canopy. Historically fisher occupied most coniferous forests in Oregon of low to mid-elevations with large snags, logs, and decadent trees. This species is not known to occur in the project area. Surveys show that fishers are limited to two small and disjunctive populations in southwestern Oregon. Habitat within the project area is present in conifer stands in the northeastern portion and consists of approximately 400 acres of suitable habitat.

Effects Determination – Pacific Fisher

Direct, Indirect, Cumulative Effects

All Alternatives

The project area does not contain adequate habitat type and structure for fisher. Fisher may disperse through the Crawford Area in search for suitable habitat. Connectivity throughout the project area would be maintained following guidelines in the Regional Forester's Eastside Forest Plan Amendment 2. Prescribed fire prescriptions would maintain downed logs and snags that fisher may use. The most probable dispersal habitat in the northern portion of Crawford Project Area would not receive prescribed fire and most of the treatment area is in the drier plant association groups not suitable for fisher. There would be no direct or indirect effects to fisher; therefore, there will be no cumulative effects on fisher or its habitat.

No ***impact*** determination was stated for all alternatives.

Existing Condition – Gray Wolf (Sensitive)

Historically, wolves (*Canis lupus*) occupied all habitats on this Forest, but are currently considered extirpated. The Blue Mountains provide suitable habitats for wolves based on evidence of a wolf captured in 1999 on the Malheur Forest and returned to Idaho. Current flights to locate radio-collared wolves have not confirmed any evidence of wolves in Oregon. Flights occurred over the Malheur National Forest in April 2006 (Miller, personal communication. 2006).

Effective March 28, 2008, the Northern Rocky Mountain population of the Gray Wolf (as a Distinct Population Segment) was removed from the federal list of Endangered and Threatened Species under the Endangered Species Act (ESA). The boundary of the Northern Rocky Mountain Distinct Population Segment, as established in the Federal Register Notice, includes lands within eastern Oregon and Washington that encompass the Malheur National Forest.

In 1999, Region 6 established a policy concerning species delisting. The policy states that after de-listing, the species is placed on the Region 6 Regional Forester's Sensitive Species List and will be managed as a Sensitive Species according to Forest Service Manual 2670 direction**.**

Effects Determination – Gray Wolf

Direct, Indirect, Cumulative Effects

All Alternatives

Wolves are limited by prey availability and are threatened by negative interactions with humans. Generally, land management activities are compatible with wolf protection and recovery, especially actions that maintain ungulate populations. Despite good populations of ungulates on the Malheur National Forest, no wolf populations currently exist and no denning habitat has been located. However, in the past 6 years large canid tracks have been seen and scat collected for analysis on the Malheur NF. It is postulated that while no denning habitat or packs of wolves have been located to present, individual wolves may be traveling through the Blue Mountains. No gray wolf populations currently occupy the Malheur National Forest. There will be no direct or indirect effects to gray wolf; therefore, there will be no cumulative effects.

Therefore, a ***no impact*** determination was stated in the BE (Biological Evaluation).

Affected Environment – Species of Concern – Landbirds Including Neotropical Migratory Birds (NTMB)

Neotropical migratory birds breed in temperate North America and spend the winter primarily south of the United States-Mexico border. Of the 225 migratory birds that are known to occur in the western hemisphere, about 102 are known to breed in Oregon and about 82 are known to breed on the Malheur National Forest. They include a large group of species, including many raptors, cavity excavators, warblers and other songbirds, with diverse habitat needs spanning nearly all plant community types and successional stages. Long-term population data on many of these birds indicate downward population trends although not all species populations are declining (Sharp 1996, Saab and Rich 1997, Altman 2000, USFWS 2002). Habitat loss is considered the primary factor in decline of neotropical migratory birds.

In 2000, the Oregon-Washington Chapter of Partners in Flight published its Northern Rocky Mountains Bird Conservation Plan (Altman 2000). The Plan provides conservation recommendations for the various species of landbirds that occupy the Oregon and Washington portions of the Interior Columbia Basin. The Plan identified the following priority habitats for landbird conservation: old-growth dry forest, old-growth moist forest, riparian woodland and shrubland, and unique habitats including alpine and sub-alpine forests, shrub-steppe, montane meadow and aspen habitats. The Conservation Plan also identified burned old forest as a limited habitat due to fire suppression. Many of the avian species/habitats identified in the Northern Rocky Mountains Bird Conservation Plan (Altman 2000), are also addressed in the USFWS's Birds of Conservation Concern (USFWS 2002).

Table WL – 21 lists those priority habitats and associated focal species that would be expected in the project area. Existing condition and effects discussions will focus on changes to priority habitats, and less on the individual species that use these habitats. No alpine or sub-alpine habitats are present. The analysis area contains only 180 acres of moist forest and no treatment is proposed; therefore, effects to old-growth, moist forests will not be discussed.

Table WL – 21. Neotropical Migratory Birds – Focal Species Found in the Project Area by Habitat Type and Acres of Habitat.

Habitat Type	Habitat Feature/Conservation Focus	Focal Species
Dry Forest Types	Large patches of old forest with large trees and snags – i.e. OFSS	White-headed woodpecker
	OFSS with interspersions grassy openings and dense thickets	Flammulated owl
	OFSS – open understory with regenerating pines	Chipping sparrow
	Patches of burned old forest	Lewis' woodpecker
Riparian Woodland	Large snags	Lewis' woodpecker
	Canopy foliage cover	Red-eyed vireo
	Understory foliage and structure	Veery
Riparian Shrubland	Dense willow/alder shrub patches	Willow flycatcher
Montane Meadow	Wet/dry meadows	Upland sandpiper
Aspen	Aspen large trees/snags with regeneration	Red-naped sapsucker
Steppe Shrublands	Steppe shrublands	Vesper sparrow

Table WL – 22. List of Species of BCR 10, Northern Rockies Region, Species Status as Present or Absent From the Project Area, and How Each Species is Addressed in This Report.

Species	Presence /Absence	Reason for Absence/Where Addressed If Present
Swainson's Hawk	Absent	Habitat Not Affected by Proposed Activities
Ferruginous Hawk	Absent	Habitat Not Affected by Proposed Activities
Golden Eagle	Present	Habitat Not Affected by Proposed Activities
Peregrine Falcon	Absent	No Suitable Habitat
Prairie Falcon	Absent	No Suitable Habitat
Yellow Rail	Absent	No Suitable Habitat
American Golden-Plover	Absent	Outside Range
Snowy Plover	Absent	Outside Range
Mountain Plover	Absent	Outside Range
Solitary Sandpiper	Absent	Outside Range
Upland Sandpiper	Absent	No Suitable Habitat
Whimbrel	Absent	Outside Range
Long-Billed Curlew	Present	Habitat Not Affected by Proposed Activities
Marbled Godwit	Absent	Outside Range
Sanderling	Absent	Outside Range
Wilson's Phalarope	Absent	No Suitable Habitat
Yellow-Billed Cuckoo	Absent	Outside Range
Flammulated Owl	Present	Landbird Discussion
Black Swift	Absent	Outside Range
Lewis' Woodpecker	Absent	No Suitable Habitat
Williamson's Sapsucker	Present	MIS – Primary Cavity Excavator Discussion
Red-Naped Sapsucker	Present	MIS – Primary Cavity Excavator Discussion
White-Headed Woodpecker	Present	MIS – Primary Cavity Excavator Discussion
Loggerhead Shrike	Absent	No Suitable Habitat
Pygmy Nuthatch	Present	Landbird Discussion
Virginia's Warbler	Absent	Outside Range
Brewer's Sparrow	Present	Habitat Not Affected by Proposed Activities
McCown's Longspur	Absent	Outside Range

Table WL – 22 lists species identified in the USFWS's Birds of Conservation Concern (USFWS 2002), Bird Conservation Regions (BCR) 10. The Crawford Project Area is best characterized by BCR 10, the Northern Rockies Region. Effects on species listed in Table WL – 22 will be analyzed in the context of changes in high priority habitats/focal species listed in Table WL – 21.

Some neotropical migratory birds respond positively to logging, thinning and prescribed burning, while others respond negatively. Existing habitat conditions are described for the Mill Creek Subwatershed. The following sections summarize the effects of the project on the high priority habitats listed in Table WL – 21.

Dry Forests

The hot-dry and warm-dry biophysical environments refer to the dry ponderosa pine dominated habitats and the dry mixed conifer habitats, i.e., conifer stands of ponderosa pine, Douglas-fir, and/or grand fir. Over 70% of the analysis area is in the hot-dry and warm-dry biophysical environments. In addition, some cold dry biophysical environments, particularly those in grand fir/grouse huckleberry plant associations, are currently overstocked, multi-strata stands; historically many of these sites were also dominated by OFSS stands.

The Conservation Strategy identifies four habitat components of the dry forest types that are important to landbirds: OFSS, OFSS with patches of regenerating pines, OFSS with grassy openings, and burned habitats (see Table WL – 21). Large-scale declines in OFSS have raised concern for such species as the white-headed woodpecker, flammulated owl, chipping sparrow, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis' woodpecker. These bird species have likely suffered some of the greatest population declines and range retractions (Altman 2000).

OFSS habitat is quite deficit in the Mill Creek Subwatershed, particularly in the warm-dry and hot-dry biophysical environments. In the analysis area, OFSS occurs on 3% (289 acres) and 0% (0 acres) of the warm-dry and hot-dry biophysical environments, respectively. Historically, this habitat type occurred on 5 to 55% and 20 to 70% of the warm-dry and hot-dry biophysical environments, respectively. Young forest multi-strata (YFMS) and understory reinitiation (UR) habitats with low canopy coverage (less than 30% canopy closure) likely provide the opening/ thicket/ regeneration conditions used by flammulated owl or chipping sparrow. A query of habitat data in the Forest GIS database identified about 1,750 acres of potential habitat for these species. Burned old forest is lacking, as fire suppression has all but eliminated the influence of this disturbance factor in the analysis area; therefore, post-fire habitats for species such as the Lewis' woodpecker are absent.

Riparian Woodlands and Shrublands

Riparian woodlands and shrub habitats are typified by the presence of hardwood tree and shrub species, along with associated wetland herbaceous species. Water is obviously an important component of these habitats, whether it is in the form of standing wetlands, spring and seeps, or flowing water (rivers and streams). Although these habitats generally comprise only a small portion of the landscape, they usually have a disproportionately high level of avian diversity and density when compared to surrounding upland habitats.

The Conservation Strategy (Altman 2000) identifies three habitat components within the riparian woodlands and one within the riparian shrub habitats that are important to many landbirds. They include large snags, canopy foliage cover, understory shrub cover, and dense shrub patches (see Table WL – 21). In addition, the Conservation Strategy identifies aspen and montane grasslands as unique habitats important to landbirds. In the Crawford Project Area, many of these habitats are associated with riparian areas or ephemeral draws, so they are included in this section.

Within the project area, riparian woodlands and shrublands are generally associated with Category 1 streams (.09 miles) and Category 2 streams (6.29 miles), and include segments of the Middle Fork John Day River, Mill and Crawford Creeks. Priority hardwood habitats include cottonwood, aspen, willow and alder. All four of these components are generally deficient in the project area due to past management activities, including timber harvest, livestock grazing and fire suppression.

Few cottonwood trees exist in the area; there is little historical data to indicate whether this species was ever present here. Due to the limited extent of cottonwood, this discussion will not focus on Lewis' woodpecker/cottonwood snag habitats in the riparian discussion. Effects to Lewis' woodpecker are discussed in the Primary Cavity Excavator and Landbird sections – Dry Forest Habitats.

Dense willow canopies historically dominated riparian shrublands; today, shrubs are generally degraded or absent. Because riparian habitats are in generally poor condition, landbird species diversity and population densities are likely reduced. Red-eyed vireo veery, and willow flycatcher habitat is likely reduced from historic conditions.

Small, remnant aspen stands are scattered over approximately 40 acres and are found in Category 1, 2 and 4 streams and ephemeral draws; most aspen stands are old and decadent, exhibit poor vigor, and lack regeneration. Of the 22 aspen stands in Mill Creek Subwatershed, two stands (2.54 acres) are considered to be in "fair" condition. Eleven stands (30.2 acres) are in "poor" condition and nine stands (7.43 acres) are in "very poor" condition. Heavy grazing by domestic livestock and browsing by deer and elk often inhibit hardwood regeneration.

Degraded riparian habitats have likely affected such landbird species as Lewis' woodpecker, red-naped sapsucker, downy woodpecker, red-eyed vireo, willow flycatcher, veery, ash-throated flycatcher, tree swallow, house wren, Swainson's thrush, calliope hummingbird, song sparrow, spotted towhee, western wood pewee, warbling vireo, American redstart, orange-crowned warbler, and mountain chickadee. Landbird species that could benefit from improvements in riparian habitat include almost every bird species residing or migrating through Oregon.

Shrub-Steppe Habitats

Shrub-steppe habitats are comprised primarily of dry woodlands, shrublands and grasslands. Dry shrublands/grasslands comprise approximately 12% of the analysis area. Size ranges from 1 acre to 254 acres with the largest expanses occurring primarily on private land. These shrub-steppe habitats are relatively small with the average size less than 10 acres. The larger grass-lands and shrublands are on private lands. Grasslands and shrublands on public lands are smaller and do not meet the habitat needs of upland sandpipers, the focal species for this habitat type. Livestock grazing, fire and road construction have impacted habitat quality. Conifer encroach-ment along the edge of openings may have reduced the extent of these habitats.

Small openings are also scattered throughout the forested areas, and can include both grasslands and shrublands. Shrub species include sagebrush as well as mountain mahogany and bitterbrush; these areas provide additional habitat for landbird species that use dry shrub-steppe habitats.

Species that use these habitats include vesper sparrow, Brewer's sparrow, lark sparrow, and long-billed curlew.

Environmental Consequences– Species of Concern – Landbirds Including Neotropical Migratory Birds (NTMB)

Alternative 1 – No Action

Direct and Indirect Effects

Dry Forests

With the implementation of Alternative 1, there would be no direct effects to the various neotropical migratory/landbird species inhabiting the project area. Habitat modifications would not occur, nor would individuals be directly affected, as no activities are proposed under this alternative. Habitat conditions would remain unchanged in the short- and mid-term, as described in the existing condition section. Species distributions, densities, and overall population levels would remain relatively unchanged in the short- and mid-term.

Indirectly, implementation of the No Action Alternative would affect some neotropical migratory bird species in the long-term. By selecting this alternative, options and opportunities to create and enhance OFSS habitats for adapted species would be foregone, and thus affect these species indirectly. These open, mature ponderosa pine habitats were once abundant in the warm-dry and hot-dry biophysical environments in the Mill Creek Subwatershed. As described in the existing condition section, habitat for the white-headed woodpecker, flammulated owl, chipping sparrow, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis' woodpecker is lacking throughout the analysis area. This alternative would fail to restore habitat for these species in the short-, mid-, and long-term.

Riparian Woodlands and Shrublands

With the implementation of Alternative 1, there would be no direct effects to the various neotropical migratory/landbird species that utilize riparian areas. Riparian conditions would be as described in the existing condition section. Shrub condition would likely remain static or improve. Mature aspen trees would continue to decline and regeneration would be low or nonexistent. By selecting this alternative, options and opportunities to close or decommission roads in riparian areas would be forgone, and thus affect these species indirectly. By forgoing prescribed burning, riparian areas would remain at high risk to stand replacing fire that could eliminate habitat.

Degraded riparian habitats would continue to affect use by riparian landbird species such as Lewis' woodpecker, red-naped sapsucker, downy woodpecker, red-eyed vireo, willow flycatcher, veery, ash-throated flycatcher, tree swallow, house wren, Swainson's thrush, calliope hummingbird, song sparrow, spotted towhee, western wood pewee, warbling vireo, American redstart, orange-crowned warbler, and mountain chickadee.

Shrub-Steppe Habitats

With the implementation of Alternative 1, there would be no direct effects to shrub-steppe habitats or to the landbird species that use them. Habitat conditions would be as described in the existing condition section. Species such as vesper sparrow, Brewer's sparrow, lark sparrow and long-billed curlew would be expected to continue to use the area.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Dry Forests

Chapter 1 identified a need to develop historic levels of OFSS structure habitat in the project area. In the Mill Creek Subwatershed, OFSS occurs on 3% and 0% of the warm-dry and hot-dry biophysical environments, respectively. Historically, this habitat type occurred on 5 to 55% and 20 to 70% of the warm-dry and hot-dry biophysical environments, respectively. In addition, some cold-dry biophysical environments, particularly those in grand fir/grouse huckleberry plant associations, are currently overstocked, multi-strata stands; historically many of these sites were also dominated by OFSS stands.

Table WL – 23 displays acres of OFMS conversion, OFSS maintenance and OFSS development. Descriptions are described in the table below. OFSS treatments would benefit species that utilize these habitats including the white-headed woodpecker and flammulated owl. Table WL – 23 also displays the percentage of the Mill Creek Subwatershed that would classify as OFSS in 50 years; the Forest Vegetation Simulator (FVS) model and fire behavior extension was used to make these projections and are intended to be used as a comparison tool between alternatives.

A negligible number of acres of OFMS to OFSS conversion treatments are proposed in the hot-dry biophysical environment in Alternatives 2 and 3. In the warm-dry biophysical environment, a small number of acres in OFSS stands would be treated to maintain the current structure in Alternatives 2, 3, and 4. The warm-dry OFMS structural stage is currently below HRV, so treatment would not occur in that structure. Following treatment, stands would be more open and better mimic historic conditions. Table WL – 7 displays acres treated; acres do not vary significantly between alternatives and treat only a small percentage of the total OFMS/OFSS acres in the subwatershed. Locally, treatments at such levels would improve habitat for species such as the white-headed woodpecker, flammulated owl and chipping sparrow; at the landscape level, treatment levels would be insignificant.

Proposed OFSS development treatments would have a much greater influence on these species. The three action alternatives prescribe commercial and/or precommercial thinning of mid-successional stands (YFMS, UR, SECC, and SEOC) to help develop OFSS habitat over the mid- to long-term. The majority of the proposed thinning units are in the warm-dry biophysical environment. OFSS development in treated stands would depend upon the current availability of large diameter trees (21 inch and greater dbh), the thinning intensity, and the resultant time it takes for small diameter trees to grow into large diameter trees. Shelterwood harvest would also be used to shift multi-strata stands back towards single-stratum stands. Thinning from below designed to emulate understory fire in reducing fuels in an old-growth forest in Oregon, did not alter use of the site by pileated woodpeckers or Vaux's swifts, another bird that uses the tree canopy in old-growth forests (Bull et al. 1995).

Table WL–23. OFSS Treatments. Acres of OFSS Development by Alternative. Projected OFSS at 50 years by Alternative. Existing OFSS comprises 3% of the Mill Creek Subwatershed.

	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Treatment Acres in OFMS – OFMS to OFSS conversion	0	6	1	1
Treatment Acres in OFSS – OFSS Maintenance	0	17	14	6
Treatment Acres – OFSS Development[1]	0	2,130	1,452	750
% of Mill Creek Subwatershed in OFSS in 50 years	15%	27%	24%	15%

[1]Thinning acres in YFMS, UR, SECC, and SEOC stands.

* OFSS conversion acres are located in the hot-dry biophysical environment. These consist of several small pieces within harvest units that are primarily younger forest structures.

Table WL – 23 indicates that Alternative 2, followed by Alternative 3, would implement the most OFSS development treatments. Although proposed thinning would be intended to benefit OFSS-dependent species in the mid- to long-term, some habitats may actually be used soon after treatment. In the short-term, canopy cover would be reduced and herbaceous vegetation and shrub growth would be stimulated. Populations of OFSS-dependent species would be expected to increase. Alternative 4 is restricted to precommercial thinning of small diameter trees, and therefore, does little to accelerate growth of residual trees; although treatment would open understories and improve habitat for white-headed woodpeckers, development of OFSS would likely take longer than under Alternatives 2 and 3. Under all action alternatives, prescribed burning would be utilized in many of these stands to maintain open conditions.

Prescribed fire has the potential to impact landbirds species both directly and indirectly. Of greatest concern would be implementation of spring burning actions where the effects of direct mortality as well as the loss of and or disturbance to nests and nesting activities could result in adverse effects to individuals or numbers, depending on the scale of the activities, as well as the timing. Bird populations respond to changes in food, cover and nesting habitat caused by fire. The season of burning is important to birds in two ways: Fires during the nesting season may reduce populations more than fires in other seasons; and migratory populations may be affected only indirectly, or not at all, by burns that occur before their arrival in spring or after their departure in fall. Bird nest site selection, territory establishment, and nesting success can be affected by season of fire. Spring burns may destroy active nests (Ward 1968). Nesting success also depends on the quality of the habitat before fire. Most birds nesting in areas burned by stand-replacing fire in the northern Rocky Mountains used broken-topped snags that were present before the fire (Hutto 1995). Many species of woodpeckers show substantial population increases and disperse into areas burned by stand-replacing fire (Hejl and McFadzen 1998; Hutto 1995; Saab and Dudley 1998). Ground-dwelling bird populations are likely to be affected by fires of any severity; whereas canopy-dwelling populations may not be affected by understory fire.

Neotropical migratory birds tend to nest on the ground, in shrub layers or within the lower or mid-canopies of trees. Generally, breeding season on the Malheur National Forest extends from mid-April to mid-July, with nesting occurring from mid-May through mid-July (Adamus et al. 2001). Birds that nest on the ground, on shrubs, or within lower tree canopies would be vulnerable to loss of nest productivity from prescribed burning if the activities occur during the nesting season. Although breeding adults could be killed during burning operations, most adult birds regularly escape the direct effects of the burn by simply leaving. However, disturbance from burning activities could lead to nest abandonment and subsequent loss of nestlings.

Nests, eggs and nestlings could be directly destroyed. Turner (2001) found a 20% loss of human-installed ground nests during low-intensity spring prescribed fires, results of local burns are expected to be less because human-installed nests were distributed at greater densities than natural nests would be. Spring prescribed fire may cause some mortality of young in early nests, in shrub nesters from smoke and heat and could be detrimental to local populations; however, it would not likely have a negative effect on bird populations. If a nest burns, in most cases, breeding opportunities would still be available. Neotropical migratory birds appear to be fairly resilient to spring prescribed burning, with re-nesting in remaining habitat common among birds that suffer early-season nest failure (R. Sallabanks, personal communication 2003).

Although spring wildfires occurred infrequently, spring burning is being considered for several reasons. In some areas, unnaturally high fuel loads preclude initial fall burns; high intensity fires could result in the undesirable loss of large trees and snags, canopy cover and other key habitat components. In the spring, moisture levels are typically higher; therefore, reducing fire intensity and providing easier, safer and less costly and potentially damaging control options. Under existing conditions, spring burning can be implemented in a way that mimics historic conditions. Low intensity fires create a mosaic of burned areas with non-burn areas that may function as refugia for breeding birds. If burning is conducted early enough in the spring, the degree of impact is minimized for migratory birds that have not initiated nesting activities.

Once spring burning reduces fuel loads, fall burns can then be safely implemented during future entries to better mimic what is believed to be the natural fire history of the area. Fall burning would have little direct effect on bird mortality, because even young birds would be developed enough to fly and escape a fire.

In any one year, burning would be limited to 3,000 acres or 19% of the forested area within the analysis area, and some of the burning may occur in the fall. Because prescribed fire would be expected to burn in a mosaic, even within the burn units, ground vegetation would be reduced but not entirely eliminated. Burning objectives are targeted to burn as much as 60 to 80% of a burn unit; the 60% level is expected in the spring and the 80% level in the fall due to the differing moisture conditions. By adjusting acres to account for untreated acres, spring burning would affect only 1,800 acres or 11% of the forested acres in any one year. Tree mortality levels would be even lower; for trees less than 5 inches dbh, tree mortality could be as much as 35%, but in most burning operations would be expected to range from 5 to 15%. In areas where no overstory exists, mortality of natural regeneration would be restricted to 10% in areas one acre or greater. Consequently, direct impacts to breeding birds in any single year would be fairly limited.

Although some large diameter trees would be killed, it is not the objective of this prescribed burn to kill dominant and codominant trees; killing of trees 10 inches dbh and greater would be expected to range from 1 to 2%. Creation of additional large diameter snags would provide habitat for Lewis' woodpecker and other primary and secondary cavity excavators. Prescribed fire would reduce the number of soft snags; however, there would be an "exchange of dead trees" with some overstory trees being killed and new snags being created. This effect is described to a greater extent in the Primary Cavity Excavator section.

The direct loss of adult birds and young from prescribed burning would likely be less of an effect to bird populations than the loss of habitat (R. Sallabanks, personal communication 2003). In the first few years after burning, understory trees, shrubs and forbs would be reduced or removed, reducing nesting and feeding habitat for species that use the lower forest layers. Because of changes to habitat, effects to birds could continue into the following seasons with reduced or improved recruitment throughout the area (Altman 2000). Ground vegetation tends to sprout vigorously from the roots if the above ground portions are killed by fire, although it might take 2 to 5 years for grasses, sedges and forbs to return to their pre-fire abundance and volume (USDA 2000). Shrub recovery may take 2 to 15 years. Species that respond favorably to fire include pinegrass, elk sedge, rose, snowberry, ceanothus, serviceberry, chokecherry and currant. Effects to larger shrublands, i.e., that are ¼ acre in size or greater, would be minimized by only allowing fire with low flame lengths through these areas; shrublands would burn in a mosaic.

As stated previously, prescribed burning would burn a maximum of 3,000 acres per year. Previous calculations discussed direct effects to nesting birds in a single year. To discuss indirect loss of habitat, one needs to look at effects over multiple years. Assuming 80% of the ground is burned, consecutive years of burning, and recovery of herbaceous vegetation in 3 years, burning could affect understory habitats on as much as 38 to 50% of the forested acres at any one time. These calculations only estimate the portion of the landscape that could be affected at any time. It does not mean that all understory trees would be lost on these acres; as stated previously, most burning operations would be expected to kill 5 to 15% of the trees less than 5 inch dbh.

The action alternatives would be expected to shift stands from OFMS and YFMS stands towards OFSS increasing habitat for species such as the white-headed woodpecker. The flammulated owl is a focal species for OFSS with a mosaic of grassy openings and dense thickets habitat. This habitat would increase with this alternative. Understory burning would reduce the amount of roost and hiding cover thickets, but increase the amount of open areas in which these owls hunt. Untreated patches at least 2 acres in size would be retained on 5 to 15% of the acres, where available. This design feature would maintain small, dense thickets and regenerating pine to the benefit of flammulated owls. In addition, prescribed burning and thinning would open up canopies and promote new conifer regeneration over the next 30 years. Chipping sparrow habitat would increase. They are a focal species for OFSS with a mosaic of open understory and regenerating pines. Burned old forest habitat for Lewis' woodpecker may increase, although there may be an exchange of snags with some existing snags being burned while new ones are being created (see primary Cavity Excavators – Snags and Down Wood). Lewis' woodpecker is most often associated with stand replacement burns with soft snags and a shrub component of greater than 13% cover. Lewis' woodpecker habitat would stay the same or improve.

Reductions in understory vegetation are likely to adversely affect species that prefer dense canopies such as the red-breasted nuthatch, American robin, and spotted towhee, referred to as non-target species. The Northern Rocky Mountains Bird Conservation Plan (Altman 2000) considers the alteration/loss of habitat for non-target species to be of low concern because:

- Non-target species are opportunistically present in dry forest sites, and generally not of conservation concern in this habitat due to their primary association with other forest types,
- The long-term benefit of habitat enhancement for target dry forest species outweighs the impacts of habitat loss for non-target species, and
- Restoration of dry forest habitats is among the highest priorities for bird conservation in western North America.

Treatments proposed represent a positive attempt to manage stands for dry forest restoration. Prescribed burning and timber harvest would be expected to improve habitats for those species of landbirds, including neotropical migratory species that are at highest risk.

Temporary road construction would reduce habitat in the short-term. Alternative 2 would construct 8.6 miles of road; Alternative 3 would construct 1.5 miles; Alternative 4 would construct 0 miles. Roads would be ripped and seeded when work is completed. Conifers would likely seed in on most sites but may take 10 to 30 years to become reestablished. Acres of habitat affected would be considered incidental compared to habitat acres being treated by harvest and prescribed burning. All alternatives would decommission 18.0 (17.8 miles in the Mill Creek subwatershed) miles of road also restoring habitat in the mid-term.

Table WL – 23 displays the percentage of the Mill Creek Subwatershed that would classify as OFSS in 50 years. Currently, about 3% of the subwatershed classifies as OFSS. Under Alternatives 2 and 3, 27 and 24% (combination of all biophysical environments) of the subwatershed would be expected to classify as OFSS in 50 years compared to 15% under the No Action Alternative. Alternative 4 does little to accelerate growth of residual trees; development of OFSS over time would be similar to levels expected under the No Action Alternative. Populations of species that use OFSS, including habitat for the white-headed woodpecker, flammulated owl, chipping sparrow, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis' woodpecker, would be expected to increase under all alternatives, but available habitat would be substantially higher under Alternatives 2 and 3.

Riparian Woodlands and Shrublands

Timber harvest units, landings, and temporary roads would not be located in Riparian Habitat Conservation Areas (RHCAs) under any of the action alternatives. Restricting these activities to areas outside of RHCAs would prevent adverse impacts to riparian habitats.

Haul routes would occur in RHCAs. There would be about 5.6 miles and 5.5 miles of haul route along RHCA roads in Alternatives 2 and 3, respectively. Felling of danger trees for human safety along haul routes in RHCAs has the potential to reduce wildlife snags. All trees felled for safety reasons would be kept on site. Road maintenance / reconstruction activities would occur along haul routes in RHCAs. Road maintenance/re-construction activities would not result in removal of trees because existing road prisms would not be widened. Where danger trees need to be felled for safety reasons they would be kept on site to meet woody debris objectives. Felling of danger trees could reduce habitat for Lewis' woodpecker and other species that depend on snags, but losses would be considered incidental (see Primary Cavity Excavator Section for additional effects of snag reduction on woodpecker species).

Prescribed fire activities would occur in RHCAs. Burning activities would mimic low intensity fires that are characteristic of natural burning patterns that tend to occur in riparian areas. This would be accomplished by not actively lighting fires in RHCAs while allowing fires to back into RHCAs from adjacent upslope areas. This technique would result in a patchy distribution of burned and unburned areas in RHCAs based on the Forest's experience with past prescribe burning activities in RHCAs using the same technique. Using these techniques, mortality of understory trees would occur in burned patches but few overstory trees would be killed. Fire intensities will not be high enough to consume trees or large downed wood. The reduction in stocking densities following burning activities would increase the vigor of larger trees in the overstory. Small openings in canopy cover may induce establishment of shrubs, grass and forbs species to the benefits of riparian landbirds. Adverse effects of prescribed burning on nesting and foraging habitat would be as described in the dry forest section; effects would likely be reduced because fire intensities would be reduced.

Road decommissioning activities would occur under all action alternatives. About 5.8 miles of road would be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek. Proposed decommissioning activities would consist of removal of one culvert on FSR 2620156, ripping and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use and ensure proper drainage occurs over time. Conifers would be planted in decommissioned road segments in RHCAs as part of the decommissioning process. Road closure/decommissioning activities would not result in removal of trees. Road closures in RHCAs would also reduce potential disturbance to landbirds.

This project does not treat any aspen stands. Aspen habitat would continue to decline as described in the existing condition section. A variety of landbird species use aspen habitats, including red-naped sapsucker, Williamson's sapsucker, Lewis' woodpecker, downy woodpecker, northern flicker, tree swallow, house wren, mountain bluebird, northern pygmy owl, white-breasted nuthatch, flammulated owl, Hammond's flycatcher, chestnut-backed chickadee, great gray owl, blue grouse, long-eared owl, rufous hummingbird, and broad-tail hummingbird. Effects to species would be low, given the limited amount of habitat in this area. Adverse effects are not a result of management activities proposed under this project.

Given the low level or management activity in RHCAs, the action alternatives would have negligible effects on riparian landbirds.

Shrub-Steppe Habitats

Prescribed fire is not proposed in any larger expanses of open shrublands or grasslands, although a small amount of light burning may occur along the fringes of these habitats and in small inclusions scattered throughout the forested areas. Smaller openings in forested environments, ½ acre or greater, project design would limit burn intensity to flame lengths one foot or less in height. At this burn intensity, any shrubland areas burned would do so in a mosaic of burned and unburned patches. Unburned islands of sagebrush can retain habitat features vital to associated species, such as vesper sparrow. In studies in Idaho, (Peterson and Best 1987), prescribed burns killed bout 50% of the shrubs; total bird abundance declined significantly in the first year after fire, and then rebounded in years two and three to levels similar to those in unburned areas. Scattered loss of shrubs is not expected to have significant impacts on shrub-steppe habitats or the landbird species that use them.

Neotropical migratory species that utilize these habitats would not be adversely affected. Effects would be as described for the No Action Alternative.

All Alternatives

Cumulative Effects

All of the activities in Appendix D have been considered for their cumulative effects on neotropical migratory birds. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the landbirds or their habitat.

Every management action within the scope of control of the Forest Service has tradeoffs. Every action (including no action) would affect populations of landbirds, including NTMB species, differently: some species positively, others negatively and perhaps others neutrally. The decision on which forest practices to use may depend on the species targeted for management.

Habitat loss is considered the primary factor in decline of neotropical migratory birds. Previous sections identified high priority habitats for conservation of neotropical migratory birds: old-growth dry forest including burn habitats, riparian woodland and shrubland, montane meadow, aspen habitats, and shrub-steppe habitats. For the Crawford Project, the Northern Rocky Mountains Bird Conservation Plan (Altman 2000) was the primary source used to determine target species for management. Restoring historic habitats is assumed to be the best strategy for assuring local viability of landbird species.

In the Crawford Project Area, bird species that historically preferred open, park-like ponderosa pine forests and open, mixed conifer stands have been negatively affected by forest management practices that emphasized extensive even-aged management, fire exclusion or suppression, and continuous or long-term grazing (Altman 2000). These practices produced a closed forest of dense, young to mid-aged trees with limited understory diversity, fragmented landscapes and, removed much of the structure that provided diversity at the stand-level and at the landscape-level.

Cumulatively, this project combined with other recent and ongoing prescribed burning and understory thinning would help restore dry forest habitats, benefiting the landbird species that use them. All ongoing projects have considered design features in the Northern Rocky Mountains Bird Conservation Plan (low intensity and severity burns, retention of snags and large trees, and mosaic patterns with refuge areas of untreated habitat among others), which should allow for restoration while reducing short-term impacts on nesting birds. The Northern Rocky Mountains Bird Conservation Plan (Altman 2000) does not identify lodgepole pine habitats as a priority habitat for landbirds conservation. Little to no effects to landbird species, including neo-tropical migrants, would be expected as a result of proper implementation.

Cumulative effects on mature and old-growth coniferous forest, particularly OFSS habitats, are discussed in the Old-Growth section, and conclude that the action alternatives would have varying positive effects for mature and old-growth habitat and for the species that use those habitats. Cumulative effects to snags and down logs are discussed in the Primary Cavity Excavator Species section. This project includes design features to protect snags and down logs; overall, changes in deadwood habitats would be considered incidental.

Riparian vegetation within and adjacent to the project area has been altered by a variety of management activities, including timber harvest, railway and road construction, and mining and livestock. Many years of livestock grazing, primarily earlier in this century, concentrated use in riparian areas. Livestock grazing also negatively affected grasslands by reducing native species' abundance and diversity. Fire suppression allowed encroachment of conifers, which shaded out hardwoods such as aspen. The condition of some riparian areas and grasslands has been improved by new management practices and restoration activities in more recent years, but many are still not fully restored to conditions that are most suitable for associated native wildlife species. In the last 15 years, stream restoration work in the analysis area has helped to improve riparian conditions. Course wood placement in Crawford Creek, 16 Gulch and their tributaries, and culvert/bridge replacement and planting on creeks along Highway 26 have all been beneficial to riparian areas and the species they support. Cumulatively, these actions will help improve riparian health to the benefit of neotropical migratory birds. Prescribed burning and road decommissioning in the Crawford Project is expected contribute positively to riparian areas.

Shrub-steppe habitats have probably changed due to 100 years of fire suppression. Other conifer species have encroached on these habitats, reducing their size. On residual acres, juniper density probably has increased. Livestock grazing, primarily early in the century, may have caused changes in shrub, grass and forb composition or abundance. Under the Crawford Project, prescribed burning avoids most of these habitats; design features have been included in the action alternatives to minimize effects in forest openings.

Current levels of invasive/noxious weeds in the project area are below threshold levels that can cause measurable changes in terrestrial habitat. Over the long-term, habitat may be degraded by encroaching invasive/noxious weeds if they are not controlled.

Future projects would have to abide by existing management direction to maintain or enhance mature and old-growth habitat, maintain snags and down log standards, and protect or enhance riparian areas, grassland and woodland communities. Future planning will consider potential effects to neotropical migratory birds.

Action alternatives propose few to no activities within riparian areas, aspen stands, shrublands and grasslands, habitats considered a high priority for landbird conservation. Restoration of dry forest habitats, particularly OFSS habitats, would improve conditions for landbirds that rely on these habitats. Cumulatively, this project when combined with current management practices would not be expected to reduce viability of any landbird species including neotropical migratory species; rather, proposed management would likely improves species richness.

Consistency with Direction and Regulations

Old-Growth

Forest Plan, Management Area 13 (MA–13) provides for the management of old-growth through a network of DOG/ROG areas. Each DOG/ROG is specifically managed for one of two Management Indicator Species (MIS) for OFMS: pileated woodpecker or American marten. ROGs are established to counter possible catastrophic damage or deterioration of the DOGs. The Forest Plan directs continued review of DOG/ROG areas, with adjustments to boundaries as appropriate to ensure suitable levels of old-growth habitat are provided for species dependent upon them and to ensure those units meet Forest Plan Standards and Guidelines. Under all action alternatives, the Forest Plan would be amended to allow changes in Forest Plan management allocations to adjust Dedicated Old-Growth areas (DOGs) and designate Replacement Old-Growth areas (ROGs). This amendment is permanent until the Forest Plan is amended or revised. Management activities proposed in action alternatives within ROGs and PWFAs meet Forest Plan direction.

Regional Forester's Eastside Forest Plans Amendment 2 (Eastside Screens)

Late and Old Structure - Regional Forester's Eastside Forest Plan Amendment 2 (USDA 1995) amended the Forest Plan to manage late and old structure (LOS) stands within the Historic Range of Variability (HRV). HRV is a landscape level assessment of structural stage; Forest Plan Amendment 2 applies to LOS stands both inside and outside of the DOG/ROG network. Under the Crawford Project, harvest and prescribed burning projects were designed to move the project area towards the historic balance of OFSS and OFMS. Only Alternatives 2 and 3 propose timber harvest, and are subject to the Eastside Screens. Proposed activities in Alternatives 2 and 3 would meet Regional Forester's Eastside Forest Plans Amendment 2 by:

- Maintaining all live trees greater than or equal to 21 inches in dbh that currently exist in all harvest units.
- Proposed treatments are designed to develop OFSS structure where it historically occurred. The majority of harvest activities are located outside of LOS structures with an objective to enhance the large tree component and develop future LOS. Especially the OFSS component which is lacking in Mill Creek Subwatershed.
- There will be no net loss of LOS structure. A small amount of harvest is proposed in existing LOS structures. No activities occur in LOS stages that are below HRV, unless the treatment would maintain or enhance the existing stand structure.
- Harvest is proposed in LOS stages that are within or above HRV to increase a deficit LOS structure. Specifically conversion of OFMS to OFSS would occur on a few acres. The OFMS structure is within HRV for all biophysical environments, with the exception of the warm-dry forest type. No harvest treatments are proposed that would result in a net loss of the OFMS structure in the warm-dry biophysical environment.

Connectivity – Regional Forester's Eastside Forest Plan Amendment 2 requires that connectivity corridors be established between LOS stands. Stands should commonly have medium diameter or larger trees, and canopy closure should be within the top 1/3 of site potential. Corridors should be at least 400 feet wide.

All alternatives establish connectivity corridors between LOS within the Mill Creek Subwatershed and to LOS in adjacent subwatersheds. Commercial timber harvest is proposed in connectivity corridors in Alternatives 2 and 3. Harvest will maintain treated areas within the top one-third of site potential and maintain patches of understory. All alternatives meet the connectivity requirements of Forest Plan Amendment 2,

Big Game

HEI for all alternatives would remain at .57, which exceeds the Forest Plan standard of .40. Cover reduction with proposed activities is not great enough to change HEI from the existing condition.

Total and marginal cover would greatly exceed the Forest Plan standard of 5% and 20%, respectively. Alternative 2 would retain the least amount of total cover at 44.4%. Existing satisfactory cover in the subwatershed is 2.5%, which is well below the Forest Plan standard of 12%. Alternative 2 is the only alternative that would reduce satisfactory cover. Alternative 2 proposes harvest in 27 acres which would reduce the cover percentage to 2.4%, requiring a non-significant Forest Plan Amendment. This amendment would apply only for the duration of, and to those actions proposed for the site-specific project called Crawford Project.

Open road densities would remain low (1.8 miles per sq. mile), meeting Forest Plan standard in all alternatives.

Primary Cavity Excavators

Snags and large down logs do not meet Forest Plan Standards as a result of past management. In the action alternatives, design measures have been incorporated to protect existing snags and large down logs that contribute to the Forest Plan Standards. Only incidental losses of addition deadwood habitats would be expected from the action alternatives. Project design measures, such as retaining clumps of live trees around snags and locating landings where there are few or no snags, would help minimize losses. Retention of untreated patches of trees (tree clumps) would provide areas for future snag recruitment. Prescribed fire would result in a snag exchange with some being lost and some snags being created. Stand treatments would accelerate growth of large diameter trees that would provide opportunities for snag replacements in the future.

Threatened, Endangered and Sensitive Species

All alternatives are consistent with the Endangered Species Act (see Biological Evaluation available in the project record). Alternatives are expected to have **No Effect** on threatened and endangered species. Based on these effects calls, consultation with the US Fish and Wildlife Service was not considered necessary.

Featured Species

For northern goshawks, all alternatives are consistent with the Forest Plan and the Regional Forester's Eastside Forest Plan Amendment 2. Mature and old-growth stands suitable for nesting, would be monitored annually for nesting activity. If new nest sites are identified within or immediately adjacent to the project area, management activities would be prohibited within ½ mile of the nest sites from April 1st to September 30th to avoid disturbing goshawks during the breeding season.

Landbirds

All alternatives are consistent with the 1918 Migratory Bird Treaty Act (MBTA) and the Migratory Bird Executive Order 13186. Alternatives were designed under current Forest Service policy for landbirds. The Northern Rocky Mountains Bird Conservation Plan (Altman 2000) and the U.S. Fish and Wildlife Service's Birds of Conservation Concern (USFWS 2002) were reviewed for effects disclosure. Vegetation management cannot completely avoid unintentional take of birds, no matter what design measures are imposed on the activities. Measures, such as retention of snags and down logs, retention of live trees, and avoidance of riparian areas, grasslands and juniper woodlands proposed in this project will minimize take of migratory birds

Irreversible and Irretrievable Commitments of Resources

There are no irreversible or irretrievable commitments of resources associated with wildlife or wildlife habitat that may result from the implementation of alternatives.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on wildlife species can be found in the Wildlife Specialist Report located in the project record.

Sensitive Plants

Introduction

A Biological Evaluation (BE) describes and displays effects to proposed, endangered, threatened, and sensitive floral species associated with the Crawford Project on the Blue Mountain Ranger District (BMRD) of the Malheur National Forest (see project record).

This section summarizes the existing condition and effects described in the BE and are contingent upon implementation of design measures, identified below. No sensitive plants were located during surveys. Potential effects are based on potential habitat. For additional detail see the Sensitive Plant BE located in the project record.

Design Measures

- To protect *Achnatherum* species habitat, vehicles and off-road equipment should avoid scabland areas. Rock outcrops are generally avoided during harvest activity, but piling of harvest generated fuels in near vicinity of these specific areas should be avoided to protect *Pellaea bridgesii* habitat**.**
- To protect *Botrychium* species, *Listera borealis, Cypripedium fasiculatum* habitat and *Carex interior* habitat, vehicles and off-road equipment should avoid seeps, springs, wet meadows, and riparian areas.
- To protect *Phacelia minutissima* habitat, areas supporting false hellebore (*Veratrum californicum*) and vernally moist meadows should be avoided by vehicles and heavy equipment, even if these areas dry out late in the season.
- To protect *Carex idahoa and Carex backii* habitat, prescribed burning should produce only low to moderate fire severity so rhizomes of any existing plants will survive and sprout after the burn.
- To avoid additional introduction of non-native species within the project area, local native seed mixes or non-persistent weed-free certified seed will be used for areas requiring erosion control or rehabilitation measures.

Status of Species, Habitat, and Effects Summary

Table 1 – Effect Determinations displays the status of species and habitat within the project area, and effect findings for species suspected or documented on the Blue Mountain Ranger District and are contingent upon implementation of design measures, identified below.

Table SP – 1. Sensitive Plant Biological Evaluation Effects Summary.

Sensitive Species	Occurrence in Project Area	Habitat Status Within Project Area	Alt 1 (No Action)	Alternatives 2, 3, and 4
Achnatherum hendersonii **Henderson's ricegrass**	**Not Found**	**Present**	**NI**	**MIIH**
Achnatherum wallowensis **Wallowa ricegrass**	**Not Found**	**Present**	**NI**	**MIIH**
Astragalus diaphanus var. diurnus South Fork John Day milkvetch	Not Found	Not Present	NI	NI
Astragalus tegetarioides Deschutes milkvetch	Not Found	Not Present	NI	NI

Sensitive Species	Occurrence in Project Area	Habitat Status Within Project Area	Alt 1 (No Action)	Alternatives 2, 3, and 4
Botrychium ascendens **upswept moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium crenulatum **crenulate moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium lanceolatum **lance-leaf moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium minganense **Mingan moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium montanum **mountain moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Botrychium pinnatum **pinnate moonwort**	**Not Found**	**Present**	**MIIH**	**MIIH**
Calochortus longebarbatus var. peckii long-bearded sego lily	Not Found	Not Present	NI	NI
Camissonia pygmaea dwarf evening primrose	Not Found	Not Present	NI	NI
Carex backii **Back's or Cordilleran sedge**	**Not Found**	**Present**	**NI**	**MIIH**
Carex idahoa **Idaho sedge (formerly C. parryana)**	**Not Found**	**Present**	**NI**	**MIIH**
Carex interior **inland sedge**	**Suspected**	**Present**	**NI**	**MIIH**
Cypripedium fasciculatum **clustered lady's- slipper**	**Suspected**	**Present**	**MIIH**	**MIIH**
Dermatocarpon luridum silverskin lichen	Not Found	Not Present	NI	NI
Leptogium burnetiae var. hirsutum hairy skin lichen	Not Found	Not Present	NI	NI
Listera borealis **northern twayblade**	**Not Found**	**Present**	**MIIH**	**MIIH**
Lomatium erythrocarpum redfruit desert parsley	Not Found	Not Present	NI	NI
Lomatium ravenii Raven's lomatium	Not Found	Not Present	NI	NI
Luina serpentina colonial luina	Not Found	Not Present	NI	NI
Mimulus evanescens vanishing monkeyflower	Not Found	Not Present	NI	NI
Pellaea bridgesii **Bridge's cliff-brake**	**Not Found**	**Present**	**NI**	**NI**
Phacelia minutissima **least phacelia**	**Not Found**	**Suspected**	**NI**	**MIIH**
Pleuropogon oreganus Oregon semaphore grass	Not Found	Not Present	NI	NI
Thelypodium eucosmum arrow-leaved thelypody	Not Found	Not Present	NI	NI
NI = No Impact. MIIH = May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal Listing or cause a loss of viability to the population or species.				

Regulatory Framework

The National Forest Management Act states that federal agencies need to maintain viable populations of all desired native plant species. Consequently, Forest Service Manual direction requires that the Regional Forester maintain a list of sensitive plants which includes species listed as threatened, endangered, sensitive, and those species proposed for listing under the Endangered Species Act. As a result, the Forest Plan requires all proposed projects assess the potential impact of activities on the habitat of sensitive plant species, and perform a biological field evaluation when sensitive species are present.

Analysis Methods

To determine which sensitive plant species may be affected by the proposed action, two steps are taken. First, the Forest GIS and sensitive plant database is searched to locate known sensitive plant populations that occur in or near the project area. Second, to identify habitats that may harbor sensitive plants and the physical and biological features, in the project area, that is correlated with those in which sensitive plants are known or suspected to occur (Nelson 1985).

Specific habitat features for the Malheur National Forest sensitive plants are described in an unpublished, draft document, Sensitive Plants of the Umatilla, and Malheur National Forests, (Umatilla National Forest Botanical Group), and in site reports of documented species.

Areas of suspected habitat for sensitive plants are identified in pre-field analysis based on aspect, elevation, and ecoclass. A large proportion of potential habitats were surveyed by the controlled intuitive meander method, a survey of the most likely areas and the travel routes walked between high priority sites. Field surveyors also surveyed specific areas since temporary roads and log landings are proposed. All surveys were completed during periods when individual plants could be identified, during the 1998, 2000, 2002, and 2005 field seasons. No sensitive species were found in the project area, although more habitats exist than was surveyed, mainly for *Achnatherum*, *Botrychium*, and *Carex* species.

Potential sensitive species habitat was surveyed during June and July of 1999, and again in June, July, and August of 2005, after the Region 6 Regional Forester's Sensitive Species List was updated in July, 2004. No sensitive plants were documented with the project area, but potential habitat was noted for 15 species (Table SP – 1 - Effect Determinations).

Cumulative effects are addressed at the Crawford Project Area scale. Effects to habitat or individuals or populations are addressed under the No Action and action alternatives.

Affected Environment

There are three, general habitat groups capable of supporting BMRD sensitive species: harsh, rocky habitats, seasonally moist areas, and riparian areas. Most have few if any trees, but the clustered lady slipper orchid has been found in forested areas that provide needed shade.

Habitat for most of these plants is not abundant due to their special habitat requirements. The 1998, Upper Middle Fork John Day Watershed Analysis documented only incidental amounts of non-forested plant associations. These habitats include seasonally moist meadow grasslands, dry land bunchgrasses, sagebrush and mountain mahogany shrublands, and sparsely vegetated sites with a high percentage of rock.

Riparian area habitats are the most numerous. There are three major drainages in the project area: Middle Fork John Day River, Crawford Creek, and Mill Creek. The Middle Fork John Day River is the only true perennial stream in the analysis area. Both Crawford and Mill Creeks are generally dry later in the mid to late summer.

Riparian habitats are also present as wet and seasonally moist meadows, and seeps and springs. The northeast portion of the analysis area contains Crawford, Lobelia, Pie, and Japanese Meadows, where native species still dominate. Phipps Meadow, at a lower elevation, has significant amounts of *Poa pratensis*, and various levels of native sedges and rushes. While long-term range plots and field observations show meadow conditions are generally improving, lodgepole pine has become denser around these habitats and has grown into meadows and other riparian habitats.

Potential Plant Habitats

The potential for occurrence of any given plant species is based on combinations of habitat, elevation, aspect, and micro sites known to occur within or adjacent to the analysis area. The following table presents the Regional Forester's listing of plants designated as sensitive (USDA, July 2004) that are considered as potentially having habitat on the Blue Mountain Ranger District.

Table SP – 2. Sensitive Plant Species List for the Blue Mountain Ranger District

Scientific Name	Common Name
Achnatherum hendersonii	Henderson's ricegrass
Achnatherum wallowaensis	Wallowa ricegrass
Astragalus diaphanus var. diurnus	South Fork John Day milkvetch
Astragalus tegetarioides	Deschutes milkvetch
Botrychium ascendens	upswept moonwort
Botrychium crenulatum	dainty moonwort
Botrychium lanceolatum	triangle moonwort
Botrychium minganense	mingan moonwort
Botrychium montanum	mountain moonwort
Botrychium pinnatum	northwestern moonwort
Calochortus longebarbatus var. peckii	long-bearded sego lily
Camissonia pygmaea	dwarf evening-primrose
Carex backii	Cordilleran sedge
Carex idahoa	Idaho sedge
Carex interior	inland Sedge
Cypripedium fasciculatum	clustered lady slipper
Dermatocarpon luridum	silverskin lichen
Leptogium burnetiae var. hirsutum	hairy skin lichen
Listera borealis	northern twayblade
Lomatium erythrocarpum	red-fruited lomatium
Lomatium ravenii	Raven's lomatium
Luina serpentina	colonial luina
Mimulus evanescens	fleeting monkeyflower
Pellaea bridgesii	Bridge's cliff-brake
Phacelia minutissima	least phacelia
Pleuropogon oregonus	Oregon semaphore grass
Thelypodium eucosmum	arrow-leaved thelypody

***Regional Forester's Sensitive Species List (Update):** On January 31, 2008, Regional Forester Linda Goodman released an updated Sensitive Species List which includes federally listed, federally proposed and sensitive species lists.

In the cover letter for the updated species list the Regional Forester states that projects initiated prior to January 31, 2008 may use the updated sensitive species list or the list that was in effect when the project was initiated. The Responsible Official for the project has authority to decide which list to use. "Initiated" means that a signed and dated document such as a project initiation letter, scoping letter, or Federal Register Notice for the project exists.

The Crawford Project field surveys were conducted in 1999 and 2005 and the Draft Environmental Impact Statement was issued in November 2006. Consequently, the 2004 Regional Forester Sensitive Species list in effect at that time was used for field reconnaissance and this Biological Evaluation.

Environmental Consequences

In this section, the Biological Evaluation effects determination is given for the group of species with similar habitats, and the individual species descriptions and more detailed project effects follow.

Plant Species Associated with Dry Habitat

These species are found in rock outcrops, talus slopes, rocky scabs in ponderosa pine stands, or grass steppe habitat.

Achnatherum hendersonii
(Henderson's ricegrass)
Status Federal: none
State: Candidate
Region 6: Sensitive

Achnatherum wallowensis
(Henderson's ricegrass)
Status Federal: none
State: Candidate
Region 6: Sensitive

Pellaea bridgesii
(Bridge's cliff-brake)
Status Federal: none
State: none
Region 6: Sensitive

Carex backii
(Back's sedge)
Status Federal: none
State: Candidate
Region 6: Sensitive

Effects Determination for Plant Species Associated with Dry Habitats

No Action

With Alternative 1, no actions would occur in the Crawford Project Area. The project would therefore have no impact to the plants listed above that are associated with dry habitats.

Action Alternatives

Project impact to this habitat group is low or limited since these plants inhabit non-forested or sparsely forested habitat. Action alternatives may impact individuals or habitat, but should not contribute to a trend towards federal listing or cause a loss of viability to the species.

Achnatherum hendersonii, A. wallowensis (Henderson's ricegrass)

Environmental Baseline

Since both species occupy similar habitat, they are treated together in this document under the common name of Henderson's ricegrass. Potential habitat was found at several sites within the project area in the summer of 1999. However no plants either *Achnatherum hendersonii* or *A. wallowensis* were located during field surveys.

Henderson's ricegrass is a strongly tufted perennial that has been found on the Ochoco National Forest at elevations from 4100 to 5400 ft. It reproduces from seed, and known populations contain few plants. Its range is east of the Cascades from central Washington to the Wallowa Mountains of northeast Oregon.

This grass is found in dry, rocky, shallow soil, in association with sagebrush or ponderosa pine, although some sites have been found in scablands with no overstory. It has been found in *Artemisia rigida - Poa secunda* plant associations, as well as *Eriogonum strictum - Poa secunda* plant communities. Other associated plants include *Lomatium spp.*, *Elymus elymoides*, *Trifolium spp*., and *Zigadenus spp.*

Direct and Indirect Effects

It is unlikely that potential habitat will be affected by burning as scablands support too little vegetation to carry a fire.

Use of scabland areas by vehicles and heavy equipment during management activities could damage potential habitat by soil compaction and ground surface disturbance. Design measures to designate and approve skid trails and landings prior to logging would limit soil disturbance and minimize direct and indirect effects to potential habitat.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on potential habitat and associated species. Historic use of scablands for yarding and log landings has removed and reduced native vegetation, compacted soils, and altered runoff and moisture retention patterns on some potential habitat. Grazing, which is likely to remove the seed crop as well as impact individual clumps, is the greatest threat to these species' survival. There is ample evidence that another ricegrass, *Achnatherum hymenoides*, a Native American food source, was far more abundant in the Blue Mountain/Great Basin ecosystems before the introduction of European cattle (Murphey 1959). It seems likely that the same may have been true for these two local endemic species, since their preferred habitat has historically seen heavy grazing. Design measures for the action alternatives would minimize additional loss of these habitats; additional effects would be incidental. Alternatives proposed in Crawford would not have an adverse cumulative effect on the quantity and quality of potential habitat. There are no foreseeable future activities that would affect habitat or associated species.

Pellaea bridgesii (Bridge's cliff-brake)

Environmental Baseline

There are small areas of potential habitat, but no plants of Bridge's cliff-brake have been found within the analysis area.

Pellaea bridgesii is a small, evergreen fern that favors the rocky substrate of outcrops and talus slopes of metamorphic and igneous origin, especially granitics. The plant favors south or east aspects on the upper third of slopes within elevations ranging from about 4000 to 9500 feet and has been found in the Sierras, the Wallowa and Elkhorn Mountains of northeast Oregon, and the ranges of central Idaho.

Known sites are mostly in full sun, but are occasionally under trees, and may or may not include moss and forb ground covers. Granitic rock crevices provide favored locations for this fern.

Reproduction of this small fern is accomplished by the dispersal of spores on the wind and pollinators are not required.

Direct and Indirect Effects

Bridge's cliff-brake is rare primarily due to the limited extent of its favored rocky habitat, and management activities in general have little impact on it.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on potential habitat and associated species. Past road construction and mining activities may have affected some *Pelalea bridgesii* habitat, but because of Forest Plan standards that apply to thin soil areas, it is unlikely that future activities would be planned within this habitat.

Carex backii (Back's sedge)

Environmental Baseline

There is limited information on this species on the Malheur National Forest. The only documented report of Back's sedge on the Malheur is on very different habitat from other documented populations on the Wallowa-Whitman National Forest. On the Emigrant Ranger District (Malheur National Forest) this species has been found on a terrace above a stream in association with ponderosa pine (*Pinus ponderosa*), common snowberry (*Symphoricarpos albus*), and scattered Douglas-fir (*Pseudotsuga menziesii*), but generally in less shrubby areas of this plant association. At higher latitudes the preferred habitat of this sedge species is lowland to mid-montane sites that show substrate movement on steep slopes or are closely associated with rock outcrops. On the Wallowa-Whitman National Forest it has been found in dappled to deep shade and includes a shrub component or are within ponderosa pine forests on rocky ridge tops, or growing in proximity to basaltic rock outcrops. Associated species include red alder (*Alnus rubra*), red osier dogwood (*Coses sericea s. sericea*), mountain alder (*Alnus incana*), other dry land sedges, and old man's whiskers (*Geum triflorum*).[2]

The flowering period is July to August.

Direct and Indirect Effects

No populations of Back's sedge have been found within the analysis area, but potential habitat may exist.

Ground disturbing activities, such as use of logging equipment or fire line construction, would be detrimental to the species and habitat; however, such activities are not likely to occur within close proximity to riparian habitat or rocky outcrops.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on potential habitat and associated species. Past road building, yarding and log landing use may have reduced habitat by changing water availability. Invasive species such

[2] Jean Wood, former District Botanist, personal communications with Elizabeth Crowe, April 1999.

as red top (*Agrostis stolonifera*) and Kentucky bluegrass (*Poa praetensis*) have invaded from riparian areas and may be the most serious threat to this species.

Plant Species Associated with Seasonally Moist Habitat

These species are found in isolated areas where localized moisture is only available in the spring and are found within forested stands, veratrum meadows, or grass-steppe habitats.

Carex idahoa (Idaho sedge)
(Formerly *Carex parryana*)
Status Federal: none
State: none
Region 6: Sensitive

Phacelia minutissima (least phacelia)
Status Federal: Species of Concern
State: Candidate
Region 6: Sensitive

Effects Determination Plant Species Associated with Seasonally Moist Habitat

No Action

With Alternative 1, no actions would occur in the Crawford Project Area. The project would therefore have no impact to the plants listed above that are associated with seasonally moist habitats.

Action Alternatives

The proposed activities could impact individuals or habitat. Activities would not contribute to a trend towards federal listing or cause a loss of viability to either species.

Carex idahoa **(Idaho sedge)**

Environmental Baseline

No populations of *Carex idahoa* have been found within the analysis area, although there are several areas of potential habitat.

This sedge is a loosely tufted perennial that grows from lowlands to moderate elevation. Its range is chiefly east of the continental divide but it extends onto the Pacific slope in central and east Idaho and northern Utah; it is also known from northeast Oregon and central Nevada.

Carex idahoa grows in the driest communities of moist meadows, swales, and moist, low ground around streams and lakes, and on prairies and high plains as well. Associated plants found on a wetland classification plot on the Emigrant Creek Ranger District were *Poa pratensis*, *Agrostis stolonifera*, *Juncus balticus*, and *Carex praegracilis*. *Carex idahoa* can reproduce via creeping rhizomes, and by seed production. Because it is wind-pollinated, it requires no pollinator insects.

Direct and Indirect Effects

Because of its habitat, *Carex idahoa* is not likely to be affected by logging or thinning activities, as long as vehicles and machinery avoid meadows and moist ground around streams.

There is no information about the effects of fire on *Carex idahoa*. Because it grows in the driest associations of moist meadows, its habitat could be affected. If a fire is low to moderate in severity, the creeping rhizomes will probably survive and sprout after the burn. This sedge's overall habitat would probably not be negatively affected by low intensity prescribed burning, especially fall prescriptions.

Invasive/noxious weeds, knapweeds in particular, can spread rapidly in this species' preferred habitat. Knapweed sites as well as other invasive/noxious weeds are documented along roads within and adjacent to the project area.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on potential habitat and associated species. Historic heavy grazing, including late season use that removed the seed crop may have reduced occurrences of this sedge in northeast Oregon.

Lowered water tables associated with stream channel degradation, and the loss of beaver-created wetlands may have reduced potential habitat.

Phacelia minutissima (least phacelia)

Environmental Baseline

No populations of *Phacelia minutissima* have been found within the analysis area, although potential habitat is present.

Phacelia minutissima is a regional endemic of the Pacific Northwest, found in Oregon, Washington, Idaho, and Nevada. It grows at moderate elevations (generally 5000 to 7000 feet) in the mountains, in micro-habitats that are at least vernally moist. The plant is known to grow in the Wallowa Mountains, the Aldrich Mountains, and in one upland site, near upper Camp Creek, a tributary to the Middle Fork John Day River and southwest of the project area.

According to Atwood (1996), least phacelia grows along stream banks in sagebrush communities and in aspen stands. In the Blue Mountains it often occurs in association with *Veratrum californicum* (false hellebore) and *Wyethia helianthoides* (white mule's ears) in vernally moist meadows and small scablands that are common throughout the forest. In currently known sites, it exists in relatively disturbed habitat where its greatest threat may be invasion by exotic plant species such as *Lotus corniculatus* (birdsfoot trefoil).

Populations of least phacelia are most abundant in wet years, though its diminutive size, along with its annual life cycle, makes this plant difficult to locate. For this reason it is possible that it is more widespread than current records indicate. The first population to be found in the Middle Fork John Day watershed was documented in summer, 2001.

Direct and Indirect Effects

Timber harvest activities have little effect on least phacelia as long as they avoid wet meadows and riparian habitat. Meadows supporting *Veratrum californicum* (California false hellebore) should be avoided with vehicles and heavy equipment, even if they dry out late in the season.

Prescribed fire allowed to creep is not likely to adversely impact favored habitat if conducted in the fall. Wet meadows and scabs supporting least phacelia should be avoided by heavy foot or ATV traffic in spring. Burning through these areas early spring would likely not be possible because of moisture and lack of flammable vegetation. Because the population documented in the upper Camp Creek area has continued to produce new plants after various disturbances, proposed activities would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on potential habitat and associated species**.** Historic heavy grazing and overuse of riparian zones and meadows, as well as invasion by weeds, may have reduced the extent and abundance of least phacelia throughout its range, and may have degraded potential habitat as well. While it can exist in areas of moderate disturbance, its survival on severely impacted soils is in question.

Plant Species Associated with Riparian Habitat

The following nine species are found in perennially moist ground at the edges of riparian areas, including bogs and wet meadows, seeps, springs, or streams.

Botrychium ascendens
(ascending moonwort)
Federal: Species of Concern
State: Candidate
Region 6: Sensitive

Botrychium crenulatum
(crenulate moonwort)
Federal: Species of Concern
State: Candidate
Region 6: Sensitive

Botrychium lanceolatum
(lance-leaf moonwort)
Federal: None
State: None
Region 6: Sensitive

Botrychium minganense
(Mingan moonwort)
Federal: None
State: None
Region 6: Sensitive

Botrychium montanum
(mountain moonwort)
Federal: None
State: None
Region 6: Sensitive

Botrychium pinnatum
(pinnate moonwort)
Federal: None
State: None
Region 6: Sensitive

Carex interior
(inland sedge)
Federal: None
State: None
Region 6: Sensitive

Cypripedium fasiculatum
(clustered lady’s slipper)
Federal: Species of Concern
State: Candidate
Region 6: Sensitive

Listera borealis
(northern twayblade)
Federal: None
State: None
Region 6: Sensitive

Effects Determination for Plant Species Associated with Riparian Habitat

No Action

Since the No Action Alternative may ultimately increase vegetation susceptibility to high intensity fire, it may adversely impact *Botrychium* species, *Listera borealis*, and *Cypripedium fasiculatum* by affecting habitat: high intensity wildfire could remove shade, damage rhizomes, or reduce or temporarily eliminate necessary mycorrhizal associations. However, no action will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Carex interior thrives in full sun, growing in very wet habitats that are unlikely to be affected by any but the most extreme wildfire. Consequently, Alternative 1 is determined to have no impact to *Carex interior*.

Action Alternatives

Riparian areas, seeps, and springs should be avoided by vehicles and all off-road equipment and logging activity. While *Botrychium* species, *Listera borealis*, and *Cypripedium fasiculatum* were not located during the survey period, habitat exists in several drainages and seeps within the project area. *Carex interior* habitat exists in several meadow systems within the project area. Prescribed fire, especially fall burns, allowed to back into riparian areas may impact individual plants, but as long as fire intensity is low, impact to surrounding habitat, overstory trees and shade should be minimal.

Proposed activities should have minimal impact on habitat or individuals and will not likely contribute to a trend towards federal listing or cause a loss of viability to the species.

Botrychium Species

Environmental Baseline

None of the six *Botrychium* species have been documented within the project area; however several species are documented in the Vinegar Creek drainage northwest of the project area. In this evaluation, all *Botrychium* species with occurrence potential on the district are treated under a single analysis because they have common habitat requirements and are frequently found growing together.

Botrychiums, also known as moonworts, are small primitive plants closely related to ferns. They reproduce by spores, and are known to be mycorrhizal, though many details of their life history and growth requirements are still unknown. Although green and apparently photosynthetic, the species considered here are all capable of surviving for years with only sporadic above-ground growth, apparently drawing reserves from the host plants with which they have mycorrhizal connections. As a result, populations of these moonworts appear to fluctuate from year to year, depending on how many plants produce visible leaves or fruiting bodies. The factors determining yearly growth are not yet understood.

These six *Botrychium* species are found sporadically throughout the mountains of the Pacific Northwest and the Rockies, and *Botrychium minganense* is known across Canada to the eastern part of the continent. In the Blue Mountains they have primarily been found between 5000 and 7500 feet elevation.

Preferred habitat of these species is perennially moist ground at the edges of small streams, wet meadows, springs, and small seeps within forest openings. It should be emphasized that even the smallest spring or seep provides good potential habitat, especially above 4500 feet elevation.

Plants often favor shade from an overstory of conifers or riparian shrubs such as alder and red-osier dogwood, but also occur in openings or meadows with only grasses and forbs providing shade. Wet meadow edges with encroaching lodgepole pine are prime habitat sites, as are the mossy openings around springs in mixed conifer forest that includes sub-alpine fir and Engelmann spruce. On the Umatilla National Forest several *botrychium* species are found under young spruce in moist tree plantations that are 20 to 40 years old. Plants frequently associated with *botrychiums* in the Blue Mountains include strawberries and violets, *Pinus contorta, Picea engelmannii, Alnus incana, Vaccinium scoparium, Carex aurea, Geum macrophyllum, Hypericum anagalloides, Mimulus moschatus, Orthilia secunda, Platanthera dilatata, Ranunculus uncinatus,* and other *botrychium* species.

In many instances, moonworts appear to be "seral" species favored by one-time ground disturbance, tending to appear 10 years or more after such disturbance occurs. It is possible that they die out eventually, as forest succession shades out understory plants. A mosaic of forest habitats that shift over time, providing new openings as old ones fill in, may best ensure the long-term survival of botrychiums. However, until this is definitively known and the needs of these moonworts are better understood, it is important to preserve existing populations. Since most of the plants are quite small and are difficult to find, they may be easily overlooked except in intensive surveys. Their habitat, on the other hand, is readily identified and protected or avoided during management activities.

Reproduction of these plants is accomplished by the dispersal of spores by wind and water, and pollinators are not required.

Direct and Indirect Effects

Ground disturbance, such as soil disruption by logging and yarding activities, would reduce the quality of habitat, and could disrupt needed mycorrhizal connections, and cause direct mechanical damage to above-ground plants during the growing season. Loss of individual above-ground stems, by herbivores, unseasonable frost, or mechanical damage, may not harm plants in the long run, considering that they do not appear above ground every year, and probably rely on nutrients obtained from the mycorrhizal connections to persist.

Along with ground disturbance, changes in moisture availability such as loss of ground water sources or hydrological changes are probably the most potentially damaging to moonwort populations. While existing plants may have the capacity to survive droughty periods through their mycorrhizal connections, germination and establishment of new plants require ample moisture.

The effects of fire are not known. Because moonworts are limited to very wet microhabitats in the Blue Mountains, they are unlikely to be directly affected by fire, unless it is severe. However, the death of overstory trees due to burning may remove a necessary mycorrhizal host and impact an entire population, as in those that grow at the edges of meadows around small lodgepole pine. Loss of the shade that many populations favor could also affect long term survival of these species. It is not known what consequences such fire effects might have, or whether an existing population could persist under these circumstances.

Because sites capable of supporting botrychiums are usually classified as riparian, they should not be affected by harvest activities because design measures protect these areas and RHCAs. For the same reason, low intensity prescribed fire is unlikely to damage potential habitat or any plants that may be present. Since the six *Botrychium* species considered here have a broad distribution on the continent, possible impacts to individuals from this project would not jeopardize the survival of the species as a whole.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on potential habitat and associated species. Loss of undisturbed wet sites capable of supporting botrychiums, whether due to water developments for livestock or mining, or to upstream, upslope hydrologic disturbance can most effectively eliminate potential habitat. The Forest Plan, as amended by PACFISH, and design features to limit impacts to riparian areas should adequately protect potential habitat and minimize cumulative effects.

Carex interior (interior sedge)

Environmental Baseline

No *Carex interior* populations were found within the project area, but two populations were located in 1999 just east of the project area, within the Idaho Creek drainage. Potential habitat exists in the wetter areas of meadows and within less shaded seeps and springs in forested areas. These isolated seeps and bogs are not always mapped.

Carex interior is a densely tufted sedge that grows in lowland to mid-montane elevations. It is a widespread North American species found throughout the range of the Pacific Northwest, as defined by Hitchcock and Cronquist; however, it is apparently uncommon in Oregon. It is known to inhabit saturated riparian areas with year-round surface water. It thrives in full sun, but can survive with small amounts of shade. Associated species include *Alnus incana, Carex cusickii, Carex utriculata, Cicuta douglasii, Deschampsia cespitosa, Juncus spp*., and *Menyanthes trifoliata*.

Carex interior is not rhizomatous and reproduces only by seed.

Direct and Indirect Effects

Inland sedge grows in very wet habitats that are unlikely to be affected by prescribed fire. If fire did creep into an area where this sedge grows, it would likely only affect the above ground portions of the plant. The roots embedded in wet mud can probably survive all but the most severe fires, allowing the plants to sprout rapidly after a burn.

The use of heavy equipment associated with logging and road construction can harm fragile, wet soils on which *Carex interior* grows. Because of its location in wet areas, its habitat is protected from mechanical disturbance by Forest Plan standards and direct and indirect effects would be limited.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on potential habitat and associated species. Heavy domestic livestock grazing and wild ungulate use may have decreased the abundance of this sedge across the landscape. Like other sedges, *Carex interior* remains palatable fairly late in the summer and may become preferred forage when other plants are drying and late season grazing can remove the seed crop, negatively impacting this species' reproduction. Excessive use by ungulates can also harm the fragile, wet soils this sedge inhabits. The alternatives design features to limit impacts to wet meadows, seeps and springs should adequately protect potential habitat and minimize cumulative effects.

Water developments such as cattle troughs and ditches for irrigation have decreased wet meadow habitat. Lowered water tables associated with stream channel degradation and loss of beaver wetlands has also reduced wetland habitat that has the potential to support *Carex interior*. Conifer encroachment of once wet meadows increases shade, further reducing potential habitat.

Cypripedium fasciculatum (clustered lady's-slipper)

Environmental Baseline

No plants of clustered lady's-slipper have been documented within the analysis area. Because its potential habitat includes most of the moist forest and dry forest, it is impractical to survey all of it. Therefore, searches have been limited to representative samples of the most likely habitat.

Cypripedium fasciculatum is an uncommon orchid that occurs sporadically in a variety of forested environments. It has been found over a range of elevations from 1600 to 8000 feet throughout the Pacific northwest, from British Columbia south on both sides of the Cascade Range, to California and Utah. It is unlikely this species is present on the Blue Mountain Ranger District. It has only been found on the northern portion of the Umatilla National Forest in areas that supply more humidity or cooler overall temperatures than are available on the Blue Mountain District.

Habitats in which the clustered lady-slipper grows range from wet forests dominated by grand fir overstory to more commonly, drier forest types such as ponderosa pine or Douglas-fir overstory with pinegrass (*Calamagrostis rubescens*) understory. It prefers at least dappled shade from overstory trees or shrubs, and can apparently tolerate fairly dense shade. It has been found near springs and creeks in moist plant associations, as well as in drier environments in duff and moss under Douglas-fir and oceanspray (*Holodiscus discolor*), and Douglas-fir and ninebark (*Physocarpus malvaceus*). It sometimes grows with its larger and more conspicuous relative, *Cypripedium. Montanum*, which does occur on the Blue Mountain Ranger District.

Cypripedium fasciculatum is a long-lived perennial that grows from a rhizome shallowly buried in duff or soil. Each year it puts up at least one pair of leaves and, probably only after reaching 12 years or more of age, an associated flowering stalk. Harrod (unpublished report) has found that each separate population probably consists of a single genet derived from one rhizome, which explains the lack of genetic variation between apparently separate "plants" within the population. Genetic variability is generally low throughout the species, suggesting the importance of protecting any populations found in order to preserve as much of that genetic potential as possible.

Seed set in the clustered lady's-slipper is typically low, and requires the activity of a pollinator, possibly a bumblebee. Seed germination, as in other orchids, requires a particular symbiotic fungus. Seeds, though tiny, do not move far at typical understory wind speeds, but may also be dispersed by wild ungulates that browse on the fruits. Seedling establishment is probably extremely limited, based on the above factors, making the genetic contributions of each new individual especially important to the species as a whole.

Direct and Indirect Effects

Harrod (unpublished report) found that this lady's-slipper is particularly susceptible to mechanical soil disturbance. Ground disturbing activities such as logging operations, subsoiling, and the construction of fire-lines would adversely affect habitat and any individual plants encountered. However, since this orchid has a widespread distribution, the species as a whole would probably not be severely impacted.

Response of *Cypripedium fasciculatum* to fire depends on burn intensity. The Conservation Assessment for Region 1 reports the effects of several recent fires on known populations, and concludes that the lady's-slipper "can survive some low to moderate intensity fires, but not higher intensity fires" (Greenlee, 1997). Because the single new bud on each plant is starting to grow by April (Harrod, unpublished report), plants are likely to be highly susceptible to spring burning. By late summer or fall, the above-ground portions have died, and the underground rhizomes have gone dormant, so are probably more fire resistant. Prescribed fire that results in partial duff retention and little or no reduction of the dominant conifer overstory is beneficial to *Cypripedium fasciculatum* habitat because shade is retained while the threat of high intensity fire is reduced.

Possible effects of fire on pollinators of *Cypripedium fasciculatum* are unknown. Design measures to limit soil disturbance would limit direct and indirect effects to potential habitat.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on potential habitat and associated species. Since there seems to be limited *Cypripedium fasciculatum* habitat on the Blue Mountain Ranger District, even past timber management activities that reduced tree density using seed tree or regeneration treatments may not have affected potential habitat. The same is probably true for the disruption of mycorrhizal connections caused by mechanical treatments associated with reducing compaction and restoring normal hydrologic function (temporary roads and landings). Changes to timber management activities since the 1996 Regional Foresters' Eastside Forest Plans Amendment have reduced impacts to any potential lady's-slipper habitat. Silvicultural prescriptions now focus mostly on removing the smaller, under-story trees and have greatly reduced the more soil disturbing mechanical ripping treatments.

As a result of successful fire suppression activities, duff and organic litter has increased in some forested habitats, resulting in altered fire regimes over landscape size areas. This change in fire behavior poses an increased threat to individual rhizomes growing in that duff because such accumulations can burn long and hot in a wildfire. Catastrophic fire could also adversely impact the lady's-slipper habitat by removing tree cover, and thereby the shade that this species requires for survival. The alternatives design features to limit soil disturbance should adequately protect potential habitat and minimize cumulative effects.

Listera borealis (northern twayblade)

Environmental Baseline

Listera borealis has not been documented within the project area, but has been found on the Blue Mountain and Prairie City Ranger Districts.

Listera borealis, northern twayblade, is a perennial orchid of moist forests. Its distribution ranges from Alaska and northern Canada, south into the Rocky Mountains to northern Wyoming and Utah. It is known in the Blue Mountains of eastern Oregon from the Wallowa and Greenhorn ranges. It is common in the north, but becomes quite scarce, with widely separated occurrences, near the southern extreme of its range. Known populations in the U.S. range in elevation from 3000 to 6500 feet.

Listera borealis is typically found in moist coniferous forest, either along streams, or in dryish humus. It occurs from mid elevations to subalpine and alpine slopes. It inhabits cold air drainages, usually at streamside at lower elevations, but is not restricted to streamside at higher elevations. It most often grows with spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), and Douglas-fir (*Pseudotsuga menziesii*) in the inland northwest. Most occurrences are associated with old-growth forest with a tree canopy cover of greater than 60%. Low slope (less than 10%), continuous moss cover, and organically rich substrate with a thick duff layer are other common features of *Listera borealis* habitat (Cronquist et al. 1977; Hitchcock et al. 1969; Salstrom and Gamon 1993).

Listera borealis typically flowers in June and requires insect pollination, though pollinator species are not known. Like other orchids, *Listera borealis* requires a fungal symbiont for seed germination and growth. The plant may then remain as an underground “mycorhizome” for several years before it produces a photosynthetic stem. It may take another dozen years before the plant produces a flowering stem, judging from studies of similar species (Salstrom and Gamon 1993).

Threats to *Listera borealis* include direct mechanical damage by human activities and by grazing animals, changes in local hydrology, decrease in canopy cover, and site contamination by soluble minerals from mining activities. According to Salstrom and Gamon (1993), the capacity of the fungal relationship to turn pathogenic towards the orchid as soil nitrogen increases may mean that fertilizer application, including manure and urine from cattle, could have severely detrimental impacts on *Listera borealis* populations. For this reason, cattle use of *Listera borealis* sites may prove more of a threat than is indicated from simple mechanical damage to visible plants.

Direct and Indirect Effects

No populations of *Listera borealis* have been found within the analysis area.

Direct effects to *Listera borealis* include mechanical damage by ground disturbing activities such as timber harvest, road construction, and fire line construction.

Indirect effects to existing *Listera borealis* populations include hydrologic changes and decrease in canopy cover. The alternatives design features to limit soil disturbance should adequately protect potential habitat and minimize direct and indirect effects.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on potential habitat and associated species. Since many forested stands are outside the historical range of variability they would remain at risk to large-scale disturbances by insects, disease, and eventually wildfire. High intensity wildfires could drastically alter tree cover over landscape sized areas.

Canopy removal and changes in hydrology associated with historic placer and dredge mining has likely reduced potential habitat for *Listera borealis* in the Blue Mountains, along with associated soil contamination from mining processes. The alternatives design features to limit impacts to soil should adequately protect potential habitat and minimize cumulative effects.

Consistency with Direction and Regulations

All alternatives are consistent with the Forest Plan direction guiding management of sensitive plant resources. The Crawford Project is consistent with the Forest Plan standards and Forest Service Manual direction for threatened, endangered and sensitive species.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to sensitive plants.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on sensitive plants can be found in the Sensitive Plants Biological Evaluation located in the project record.

Invasive/Noxious Weeds

Regulatory Framework

Forest Service Strategies, Regulations, and Policies Related to Invasive/Noxious Weed

- **Malheur National Forest Land and Resource Management Plan**
  This analysis is tiered to the Malheur National Forest Land and Resource Management Plan which was amended by the Pacific Northwest Regional Final Environmental Impact Statement for the Invasive Plant Program, 2005, hereby referred to as the R6 2005 FEIS. The R6 2005 FEIS culminated in a Record of Decision (R6 2005 ROD) that amended the Malheur National Forest Plan by adding management direction relative to invasive plants.
- **1988 Record of Decision for Managing Competing and Unwanted Vegetation (1988 ROD) and the 1989 Mediated Agreement**
- **National Strategy and Implementation Plan for Invasive Species Management**
  The Forest Service strategy for invasive and non-native invasive plant management.

  National Interagency "Pulling Together" Strategy
  A National Strategy for Invasive Plant Management.
- **Federal Noxious Weed Act**
  P.L. 93 – 629, Sec 2, Jan 3, 1975, 88 Stat.2148, and as amended
  P.L. 101 – 624, title XIV, Sec 1453, Nov, 8, 1990, 104 Stat. 3611
- **Invasive Species Executive Order, Feb 3, 1999**
  An Executive Order to prevent the introduction of invasive species, provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
- **Forest Service National Noxious Weed Direction, FSM 2080**

Oregon Invasive Weeds Laws

- Chapter 452 – Vector and Weed Control
- Chapter 561 – State Department of Agriculture
- Noxious Weed Quarantine; OAR 603 – 52 – 1200
- Chapter 570 – Plants: Inspection, Quarantine, Pest and Weed Control

Analysis Methods

The analysis area for evaluating existing invasive/noxious[3] weed populations is consistent with the project area (Mill Creek Subwatershed, north of Highway 26); with the exception of noteworthy adjacent infestations or infestations in rock source sites and road rights of ways along proposed haul routes. Invasive/noxious weeds will be discussed based on inventoried and known

[3] The many terms used to describe and discuss “invasive plants” and “noxious weeds” may be confusing. Frequently used terms include: invasive species, noxious weeds, non-native, weeds, exotic and alien. While often used interchangeably, there are important distinctions between these terms. Definitions are found in the glossary. However for this EIS, we will use the term “invasive/noxious weeds” in our discussion.

invasive/noxious weed sites that occur in the project area. Invasive/noxious weed surveys have been conducted throughout the Malheur National Forest. All documented weed sites from these surveys are recorded in a National database, Natural Resources Information System (NRIS). The database includes individual site records indicating the location, size of infestation, plant numbers and density, type of past treatment implemented, recommended follow-up treatments and effectiveness. The NRIS data base along with weed surveys completed in 2005 were used to identify weed sites within the Crawford Project Area.

Location, site density and size, species and characteristics, the potential and rate of spread, along with soil disturbance will be the basis for this analysis. Other measures or elements discussed for evaluating the alternatives:

- Miles of temporary road,
- Miles of road reconstruction
- Miles of log haul and road maintenance,
- Acres of timber harvest and tree cutting treatments, and
- Acres of invasive/noxious weeds within prescribed burning units.

Affected Environment

BMRD personnel periodically identify new invasive/noxious weed infestations and report occurrences to the District weed specialist for inclusion into the national/forest/district database, NRIS. This database includes individual species site records that include location and size of infestation, plant numbers and density, type of treatment implemented, follow-up treatments and effectiveness of treatments. Invasive/noxious weed species occurring in the proposed project area are Canada thistle (*Cirsium arvense*), dalmation toadflax (*Linaria dalmatica*), diffuse and spotted knapweeds (*Centaurea* sp.), houndstongue (*Cynoglossum officinale*), St. John's wort (*Hypericum perforatum*), whitetop (*Cardaria draba*), and yellow starthistle (*Centaurea solstitialis*). These invasive/noxious plants infest approximately 218 acres in 90 sites (Table I – 1). These infestations can be vectors for the spread of weeds into other areas in the project area and beyond.

Table I – 1. Summary of Known Invasive/Noxious Weed Species in the Crawford Project Area.

COMMON NAME	Number of Sites	Largest Site (acres)	ACRES
CANADA THISTLE	34	23.0	174
DALMATIAN TOADFLAX	11	0.4	2
DIFFUSE KNAPWEED	18	3.9	8
HOUNDSTONGUE	5	3.7	4
SPOTTED KNAPWEED	6	3.3	5
ST. JOHNSWORT	13	47.7	24
WHITETOP	2	0.1	0.2
YELLOW STARTHISTLE	1	0.4	0.4
Total	**90**		**217.6**

These known weed infestations are primarily located along roads, old logging units and landings, recreational use areas, rock-pits and other disturbed areas. Some vectors of past and ongoing spread of invasive/noxious plants are:

- Seeds becoming attached to fur of wildlife and domestic livestock as they pass through existing infestations and then falling off at another location.

- Seeds and weed propagules being transported by vehicles and machinery that have been operated in infested area.
- Management actions that disturb soils and reduce competing vegetation therefore making more desirable sites for invasive/noxious weed establishment.

In addition to the above vectors, invasive/noxious weed species can spread via natural vectors such as birds, insects, or wildlife, and natural forces such as wind and water.

The invasive/noxious weed species of greatest concern (Grant County A & T Noxious Weeds List) within the project area are Spotted Knapweed, Diffuse Knapweed, Yellow Star Thistle, St. Johnswort and Houndstongue. High priority weeds are considered such because they are invasive, persistent, prolific reproducers and are difficult to eradicate once established. These weeds can spread quickly; they displace desirable vegetation, and presently occur in infestations at scales which are feasible to treat.

Currently the populations of low priority (Grant County listed B) invasive/noxious weed species, such as Canada Thistle, Whitetop, and Dalmatian Toadflax, are so extensive in Grant County that they are not treated, except in special circumstances such as whitetop. Whitetop populations on the Forest and in the project area are small and can be treated effectively along with other higher priority plants. These lower priority invasive/noxious weeds tend to be less persistent and aggressive than high priority weeds, and may give way to healthy desirable vegetative species over time. On many occasions, low priority weeds are treated in conjunction with high priority weeds. Since these weeds are less abundant on the Forest than other areas of Grant County the smaller infestations are being treated.

The Malheur National Forest is presently utilizing manual methods of treating (controlling) non-native invasive/noxious plant species. Therefore treatment emphasis has been on those species with infestations small enough to treat with a limited work force. This means that much of the Canada thistle and St. Johnswort populations in the project area have not been treated, while the majority of the other species have been treated. No invasive/noxious weed sites were treated in the project area during 2006. In 2005 the species in Table I – 2 were treated in the project area by manual methods:

Table I – 2. Summary of Invasive/Noxious Weeds Treated in 2005 on the Crawford Project Area.

COMMMON NAME	In Project Area		Treated	
	Number of Sites	ACRES	Number of Sites	ACRES
CANADA THISTLE	34	174		
DALMATIAN TOADFLAX	11	2	1	0.2
DIFFUSE KNAPWEED	18	8		
HOUNDSTONGUE	5	4		
SPOTTED KNAPWEED	6	5		
ST. JOHNSWORT	13	24	2	53.1
WHITETOP	2	0.2		
YELLOW STARTHISTLE	1	0.4		
Total	**90**	**217.6**		**53.3**

Manual methods involve grubbing or cutting with hand tools/weed eaters, twice during the growing season. Grubbing uses hand tools to cut stems or tap roots below the ground surface (1 to 2 inches). Cutting severs heads from the root above the ground level. Both are effective in controlling or slowing the spread of targeted weed species, however may not be effective methods of eradication. Eradication by this method has been successful only on the early stages of infestation. Manual control methods are highly labor intensive and often require repeated treatments within the same or subsequent growing season to be effective. In addition, depending on the site, species, and degree of plant maturity, manual practices may also involve the collection of plant residue by bagging or piling and burning.

As the weed infestations are treated the adjacent areas are monitored to determine if any new invasive/noxious weeds have become established. Infestations are recorded in the NRIS data base as they are located. This monitoring takes place annually. The amount of monitoring varies from year to year based on available funding.

A file containing site specific information on all inventoried invasive/noxious weed sites is maintained in the Blue Mountain Ranger District Office. Based on observations of this area during the past 3 years, there does not appear to be any appreciable change in the size of the sites that were treated manually.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

While the potential for spread of invasive/noxious weeds under the No Action Alternative is expected to stay the same as found presently, continuing uses of the forest for hunting, grazing, firewood cutting and other recreational purposes along with weed seed transport via natural vectors could contribute to a spread of weeds. Annual monitoring and control measures combined with the relatively small populations should not cause a major increase in invasive/noxious weed species in the project area.

The No Action Alternative would maintain conditions which pose a risk of future high severity fire. The more severe the fire, the higher the risk of producing favorable conditions for invasive/noxious weeds to spread and establish new infestations. Fire has not been permitted to perform its natural role of frequent under burning, forest stand density has increased and vigor has diminished. This diminished health has contributed to more frequent outbreaks of insects and disease epidemics that have further increased the probability of large stand replacing fires (Hall 1980). Without the proposed prescribed (low intensity) burn this process will continue as the interval between fires increases and the fuel loads increases. The lengthening of fire intervals has contributed to fires burning more severely in communities where fire once passed through with less severity owing to lighter fuels. (Johnson 1998) When this area does burn the intensity (severity) of the fire may be more than if it was burned now under more controlled circumstances.

All Action Alternatives

Activities associated with timber harvest, site preparation for planting, road maintenance, and temporary road construction all disturb the soil to some degree. Ground-disturbing activities would increase the risk for spread of invasive/noxious weeds because if seeds are introduced they can germinate more readily than if the soil surface was intact (Gelbard & Belnap 2003; Silveri et al. 2001). This weed seed could come from a nearby weed patch, be carried in soil clinging to recreational vehicles, or be introduced and transported from some other source (e.g. birds, animals, water, etc., to mention just a few of the vectors). With the design measures (refer to Management Requirements, Constraints, and Design Measures in Chapter 2) and monitoring protocols incorporated into this project to reduce invasive/noxious weed spread, the risk of weed propagule introduction and spread due to project activities will be minor. The potential for spread will vary between alternatives as the amount of acres and types of activities proposed varies.

All action alternatives propose grapple piling activities. These activities are proposed within some of the areas proposed for commercial harvest in Alternatives 2 (877 acres) and Alternative 3 (631 acres). Although Alternative 4 does not propose commercial harvest, grapple piling is proposed to treat existing fuel and precommercial thinning slash on approximately 649 acres. Heavy equipment is used during grapple piling activities creating some soil disturbance and contact with existing weed sites, increasing the potential for weed spread within treatment areas. Design measures such as cleaning equipment that operates outside the road prism and cleaning of equipment used within known locations of invasive/noxious weed infestations prior to moving to another site would reduce the risk of weed spread.

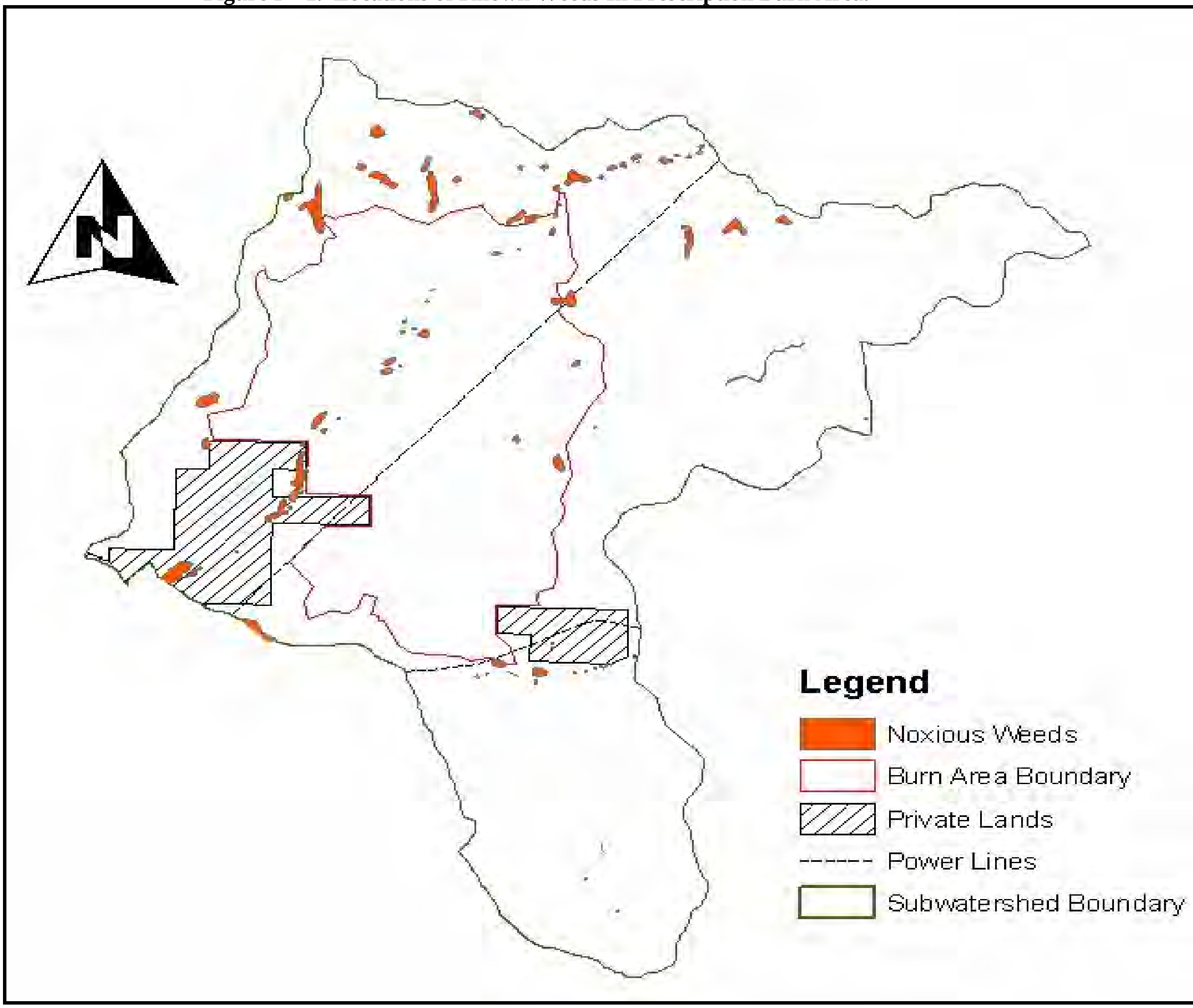
All action alternatives propose varying amounts of precommercial thinning (PCT). PCT operations do not use heavy equipment such as used in tree harvest activities. Thus, there is very little to no soil disturbance expected minimizing the risk of promoting the spread of invasive/noxious weeds. However, as the acres of thinning increases the risk of spreading weeds increases slightly. Alternative 2 proposes the greatest number of acres of precommercial thinning at 935 acres. Alternatives 3 (666 acres) and 4 (795 acres) propose slightly fewer acres and offer a slightly lower risk of weed spread. As mentioned above, design measures would reduce the risk of weed spread.

Prescribed burning may increase invasive/noxious weed populations (Maret and Wilson 2000, and Briese 1996). Burned areas do provide nutrients and space for invasive/noxious weeds to establish. However, fire is expected to be low intensity which reduces the risk of increasing weed populations. A monitoring study done in the Malheur National Forest noted that an increase in invasive/noxious weeds was closely related to the intensity of a fire. Lower intensity fires had fewer weeds develop on the site (Kerns et al. 2006). Therefore, because low intensity fires are proposed in this project the risk of producing conditions for invasive/noxious weeds increases are minor and certainly less that if the fire was a wildfire. All three action alternatives will burn the same amount of acres (5,300) therefore the risk is the same for all three. It is expected that when the invasive/noxious weeds are burned the risk of spread in close vicinity to the site is at more risk of weed establishment than an area burned further away. Risk of spread would depend on the differences in resiliency to fire of the weed and surrounding vegetation, soils, and fire intensity. Since the areas of weeds within the prescribed burn area are the same in all three action alternatives there is no expected difference in risk of spread between alternatives due to fire being applied directly to the known invasive/noxious weed infestations. Following (Table I – 3) is a summary of known acres of weeds within the prescribed burn unit. Figure I – 1 shows the location of weed sites within the burn unit.

Table I – 3. Summary of Acres of Known Invasive/Noxious Weeds in Rx Burn.

COMMMON NAME	In Project Area		Acres within Rx Burn
	Number of Sites	ACRES	
CANADA THISTLE	34	174	20
DALMATIAN TOADFLAX	11	2	0.7
DIFFUSE KNAPWEED	18	8	2
HOUNDSTONGUE	5	4	0
SPOTTED KNAPWEED	6	5	0.08
ST. JOHNSWORT	13	24	8
WHITETOP	2	0.2	0
YELLOW STARTHISTLE	1	0.4	.3
Total	**90**	**217.6**	**31.1**

Figure I – 1. Locations of Known Weeds In Prescription Burn Area.



Alternatives 2 and 3

Roads and roadside habitats are particularly susceptible to plant invasions and are primary vectors for the spread of invasive species via natural dispersal or transport by humans or animals. Temporary road construction and road reconstruction would increase the amount of soil disturbance, thus increasing the potential for invasive/noxious weed spread. Alternatives 2 and 3 both have varying amounts of road work planned. The larger amount of disturbance due to road related activities the larger the potential for spread. Therefore, Alternative 2 has the potential for the greatest amount of spread, with a lower potential of spread in Alternative 3. Design measures such as incorporating invasive plant prevention practices during road blading, brushing and ditch cleaning along with monitoring specifically along decommissioned, closed and temporary roads as well as skid trails and landings used during the project, along with other prevention practices, would greatly reduce the risk of spreading invasive/noxious weed due to project activities. In addition, closing and obliterating roads would remove the possibility of weed seed transport via motorized vehicles.

Due to the possible direct contact with weed propagules and possibly disturbing soils within and immediately adjacent to the infestation those commercial harvest units proposed in Alternatives 2 and 3 containing invasive/noxious weed have more potential for promoting the spread of invasive/noxious weeds than do units without them. Although the acres of harvest treatments (commercial thinning and shelterwood) vary between Alternatives 2 and 3 the acres of weeds within the harvest units are the same. Twelve of the proposed harvest units in Alternatives 2 and 3 (Units 22, 24, 60, 62, 68, 80, 82, 116, 118, 120, 126, and 148) contain populations of invasive/ noxious weeds ranging from 0.2 acres to 14.4 acres in size. Table I – 4 summarizes the acres of weeds within proposed harvest units. Design measures would reduce the risk of spreading invasive/noxious weeds with project activities.

Table I – 4. Summary of Acres of Invasive/Noxious Weeds within Harvest Units (Alternatives 2 and 3).

COMMMON NAME	In Project Area		Acres within Harvest Units
	Number of Sites	ACRES	
CANADA THISTLE	34	174	31
DALMATIAN TOADFLAX	11	2	0.3
DIFFUSE KNAPWEED	18	8	0.2
HOUNDSTONGUE	5	4	2
SPOTTED KNAPWEED	6	5	0
ST. JOHNSWORT	13	24	8
WHITETOP	2	0.2	0
YELLOW STARTHISTLE	1	0.4	0
Total	**90**	**217.6**	**41.5**

Alternative 4

Alternative 4 does not propose commercial harvest activities, eliminating the potential for spread of existing weed sites from logging activities. In addition, Alternative 4 does not propose temporary road construction or road reconstruction. Therefore, there is no potential for weed spread due to these activities.

Cumulative Impacts

SCOPE OF THE CUMULATIVE EFFECTS ANALYSIS

The cumulative effects analysis boundary for the invasive/noxious weeds consists of the Mill Creek Subwatershed and incidental amounts of Idaho Creek and Dry Fork subwatersheds north of Highway 26. Idaho Creek and Dry Fork subwatersheds north of Highway 26 are isolated from the bulk of the remainder of their subwatershed acres by Highway 26. Therefore, cumulative effects associated with those two subwatersheds will similar to those discussed for Mill Creek subwatershed and will not be discussed separately. The temporal scale selected for this analysis is from 1978 to 2018: The reasoning for this time scale is supported by:

- Part harvest activities (consisting of various harvesting methods) in the analysis area indicate that the majority of harvest was conducted between 1978 and 1998.
- The future planned activities proposed by the Malheur National Forest are, in general, on a 10-year planning cycle.

A comprehensive list of potentially cumulative actions considered for this project is presented in FEIS Appendix D.

Alternative 1 – No Action

Past and ongoing actions, such as timber sales, fire suppression, livestock grazing, road construction, fire wood cutting, road maintenance, and recreation uses (refer to Appendix D for more information about these actions), have introduced invasive/noxious weed populations within the project area.

There are several foreseeable activities that would occur within the project area which can and do provide a moderate to high probability of the introduction and spread of invasive/noxious weed propagules. These reasonably foreseeable future activities include (but are not limited to) motorized and non-motorized recreation, road maintenance, livestock grazing, firewood, fire suppression, and associated rangeland improvement projects and resource enhancement projects.

The Forest's weed management program consisting of annual surveys combined with mechanical and hand pulling treatments would continue. The amount of treatment, in the project area, will vary annually based on funding and Forest priorities. Upon completion of the Malheur Forest's NEPA analysis and plan for treatment of invasive plants Forest wide, additional weed treatments may occur in the project area.

Alternatives 2, 3, and 4

Past actions such as timber sales, fire suppression, livestock grazing, road construction, fire wood cutting, road maintenance, and recreation uses (refer to Appendix D for more information about these actions), have increased invasive/noxious weed populations within the project area.

The potential for invasive/noxious weed spread is expected to increase in the short term due to the proposed activities. Proposed design measures listed in Table 2.11 will help reduce the magnitude of spread. Post-project surveys of the area annually for 1 to 5 years would provide for early detection and treatment if weeds do establish in the project area.

The Forest's weed management program consisting of annual surveys combined with mechanical and hand pulling treatments will continue in the future. The amount of treatment, in the project area, will vary annually based on funding and forest priorities. Certain invasive/noxious weed populations will continue to expand, regardless of the alternative chosen, due to natural increase of existing populations from all the complex ways these species are spread. However, other species that occupy limited area (plus other species that are not yet here) will be managed to the extent possible to stop the spread by the forest's weed management program.

Cumulatively there are several activities that occur within the project area which can and do provide a moderate to high probability of the introduction and spread of invasive/noxious weed propagules. These reasonably foreseeable future activities include (but are not limited to): domestic live-stock grazing, mining, motorized and nonmotorized recreation, road construction and maintenance, and resource enhancement projects. As identified in the Range Resources Report for the Crawford Project, all action alternatives could increase the level of accessibility and use by domestic livestock (as well as wildlife and recreationists), increasing the transport of weed seeds by these vectors. This increased accessibility could result in cumulative spread of invasive/noxious weeds.

Upon completion of the Malheur Forest's NEPA analysis and plan for treatment of invasive/ noxious plants Forest wide, additional weed treatments may occur in the project area. A proposed action has not been developed to date, therefore possible treatment methods, species, site locations, and acres are not known at this time.

Consistency with Direction and Regulations

All alternatives are consistent with Forest wide standards for invasive/noxious weeds, including Forest plan modifications made by the Pacific Northwest Region 2005 Invasive Plant Program FEIS and Record of Decision.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from implementing the alternatives with respect to invasive/noxious weed management.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on invasive/ noxious plants can be found in the Invasive/noxious Plants Report, located in the project record.

Rangeland Resources

Regulatory Framework

- Laws, regulations, and policies direct Forest Service rangeland management.

Laws

- The authority to protect, manage, and administer the National Forest System, and other lands under Forest Service administration for range management purposes, is found in the following acts:
  - Granger-Thye Act of 1950 – authorizes the Forest Service to issue grazing permits and use grazing receipts for range improvements; provides direction on establishment of local grazing advisory boards and other purposes.
  - The Multiple Use Sustained Yield Act of 1960 – establishes the policy and purpose of the National Forests to provide for multiple-use and sustained yield of products and services.
  - Forest and Range Renewable Resources Planning Act of 1974 – establishes public land policy and guidelines for the management, protection, development, and enhancement of the public lands.
  - Public Rangelands Improvement Act of 1978 – establishes and reaffirms the national policy and commitment to inventory and identify current public rangeland conditions and trends; manage, maintain and improve the condition of public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process; charge a fee for public grazing use which is equitable; continue the policy of protecting wild free-roaming horses and burros from capture, branding, harassment, or death, while at the same time facilitating the removal and disposal of excess wild free-roaming horses and burros which pose a threat to themselves and their habitat and to other rangeland values.
    - Section 8 of the Public Rangelands Improvement Act (PRIA) of 1978 – this section allows for consultation and cooperation in the development and execution of allotment management plans for grazing permits.
  - The Rescission Act of 1995 (Public Law 104 – 19) – required each National Forest to establish and adhere to a schedule for completing NEPA analysis and decisions on all grazing allotments within a 15 year period.

Regulations

- Regulations governing range management on the National Forests are found primarily at 36 CFR 222. In addition, policy relating to range resources and coordination of range activities of the USDA agencies and other executive agencies, organizations, and individuals is included in the following:
  - Secretary's Administrative Order of August 1963, Administration of Lands under Title III of the Bankhead-Jones Farm Tenant Act; Establishment of National Grasslands.
  - Departmental Regulation, Number 9500–5 – dated December 15, 1983; Subject: Policy on Range.

Policies

Forest Service's Rangeland Management Manuals and Handbooks.

- **FSM 2200 –** this manual summarizes laws and regulations governing rangeland management and forest planning.
- **FSH 2209.13 – Grazing Permit Administration Handbook**

Management Direction

The **Malheur National Forest Land and Resource Management Plan** (USDA Forest Service 1990) provides general direction, objectives, and goals for the management of forest wide resources.

Forest Goals for range resources: (Forest Plan, pg IV – 2)

- Provide a sustained production of palatable forage for grazing by livestock and dependent wildlife species.
- Manage rangelands to meet the needs of other resources and uses at a level which is responsive to site-specific objectives.
- Permit livestock use on suitable range when the permittee manages livestock using prescribed practices.

Basic management direction is described in the Forest Plan as Management Areas (MAs).

The **Forest Plan was amended in 1995 by PACFISH** to provide interim direction to maintain management options for anadromous and native fish habitat while the Forest Service developed long-term management strategies.

The Malheur National Forest Post Fire Grazing Interim Guidelines (2003) is an interim providing direction that establishes minimum timeframes that an area would be rested from grazing following a fire (wild and prescribed fires).

Analysis Methods

The analysis area for evaluating rangeland resources is consistent with the Crawford Project Area. This report provides basic rangeland resource information within the project area. However, discussions may at times divide the project area into two subunits (two separate grazing allotments and their respective pastures) for the purpose of addressing specific environmental consequences, administrative impacts or effects, or impacts to permittees.

Information was gathered from various sources; condition and trend transects, permanent camera points, Proper Functioning Condition Assessments (USDI, 1993), riparian vegetation assessment surveys (Winward), multiple indicator monitoring, Area 3 Ecologist’s notes, analysis completed for the Draft Middle Fork Grazing EIS (1950), grazing files containing the history of the allotments/pastures, past permittee performance and compliance, on the ground knowledge of area, conversations with permittees, and professional judgment.

Affected Environment

This section provides an overview of current existing forested and non-forested rangelands, riparian vegetation resources, and upland forested and as they relate to forage availability for domestic livestock grazing.

General Rangeland Vegetation Conditions

Ground vegetation and shrub species vary throughout the project area from small areas of grass and shrub steppe at lower elevations near the Middle Fork John Day River, through meadows and riparian shrub stands, to the species adapted to survival under forest canopy from open ponderosa pine stands to the heavy shade of higher elevation fir forests. Upland vegetation makes up approximately 95% (or more) of the acres in the project area, whereas the riparian plant communities in the project area account for 5% (or less) of the total acres.

Non-forested upland habitats dominated by grasses in the project area cover a small percentage of the landscape. They include a few larger scablands (areas of “very shallow, very stone soils,” most commonly over basalt bedrock [Anderson et al. 1998]) that support both shrub land and grassland plant associations. Also present are numerous smaller dry forest openings and several sub-alpine mosaics of grasses and sagebrush.

Non-forested habitats at lower elevations include scabland inclusions in the forest, riparian meadows, and occasional rock outcrops. Shrubs such as low sage or rigid sage dominate some non-forest areas, while grass communities predominate on others. Both of these potentially species-rich habitat types have been degraded by past management practices, with loss of some of the native bunchgrasses, and subsequently of the soil that used to support them. Those that were most degraded now support populations of cheatgrass (*Bromus tectorum*) and tarweed (*Madia glomerata*) to varying degrees.

Rock outcrops occasionally support relic populations of mountain mahogany (*Cercocarpus ledifolius*), many of which may have shrunk from their historic extent since fire suppression has allowed encroachment and shading by conifers.

Many shrubs are dependent on gaps in the forest canopy for both establishment and maximum growth, and tend to be sparsely represented in much of the planning area due to historic fire suppression and current canopy closure (e.g. mountain mahogany, Scouler willow, snowbush ceanothus).

In area Ecologist, Charlie Johnson’s, notes from the mid 1990s, he characterizes the land within the project area as outside the normal range of variation. He asserts key factors influencing this are based on disturbances that have been either too severe or due to the lack of maintenance disturbance processes. Fire is the element of the ecosystem, which has had the most profound influence on the quality of the plant communities following the intensive grazing period. Where overgrazing was rampant in many parts of the southern Blue Mountains in the first half of the century, the effects of curtailment of fire over time from having its normal cycle of activity in the communities has been pronounced during the past 50 years. Although his report was generated for grazing permit renewal or continuation, he adds the health of the land relates to the incursions by administrative projects to harvest trees. This has been intensive on most areas. The removal of larger trees coupled with removal of fire from the ecosystem has led to promotion of later seral tree species when fire seral tree species were favored in the removal. These plant communities are now far outside the natural range of variation, which effects the overall forest and rangeland health and production. (Charles G. Johnson, Jr.; Summary Report for Rangeland Health on Selected Allotments, June 1995).

General Riparian Vegetative Conditions

The riparian vegetation in the project area ranges from cool-moist, conifer-dominated and moist meadow communities in the upper stream reaches, to mixed conifer/hardwood types in the middle elevation reaches, to grass/sedge dominated communities in the lower elevation wider valley bottoms. Hardwoods (primarily alder) in these upper reaches are generally limited to areas where there are natural or created openings in the canopy. Mid-elevation reaches currently show the most predominant effects of past management activities; lack of fire, historic harvest, livestock grazing, big game browsing and poor road location. These hardwoods often show reduced vigor due to the effects of excessive browsing pressures and lack of natural disturbances such as fire or beaver.

Wider valley bottoms lower in the watershed sustain wet meadow grass communities consisting of various sedges and rushes. These riparian areas are generally preferred by domestic livestock due to their productivity, gentle slopes and proximity to water. In some areas native grass species are largely displaced due to a combination of factors, which include changes in water table levels.

A few wet meadows in the upper and mid elevations (Lobelia, Pie, and Japanese Meadows) in the Blue Mountain Allotment still support a large proportion of native grasses and forbs (Upper Middle Fork John Day River Watershed Analysis Report, 1998 and personal observations with species composition information).

Some streamside roads limit the vegetative production and potential along creeks where roadbeds occupy significant portions of the historic floodplains; Crawford Creek is a good example.

Aspen clones occur in isolated small areas of localized high soil moisture, such as riparian zones, ephemerally wet draws, wet meadows, and areas of groundwater seeps. Communities are most commonly found in the mid-elevations (4500 – 5500 feet). The current aspen populations are predominantly mature to over mature with little structural or age diversity. The present successional processes have led to diminished patch size and loss of vertical structural diversity. Browsing by domestic livestock, deer and elk has exacerbated the stagnant condition of most aspen clones within the Crawford Project Area.

Forested Understory Vegetation Conditions

Prior to European-American settlement of this area, fire played a dominant role in shaping the landscape. Current policies of fire suppression have significantly altered the ecosystem. Areas of open park-like stands of ponderosa pine have been converted to dense, overstocked, dead and dying stands of diseased forest which provide little in the way of forage for grazing animals. Conifers have now encroached upon areas that were once open meadows and dry rangeland. Much of the densely stocked forest stands have succumbed to insects, disease and reduced vigor because of over crowding. Where significant tree mortality has occurred, fallen trees often restrict the movement of livestock, thereby further limiting the amount of forage produced and available for domestic livestock.

Understory vegetation in cold forests has probably changed the least of any forest type, since management was initiated. Due to dense canopy cover, understory species tend to be sparsely represented and tolerant of shade. Riparian shrubs are few, except where disturbance has created gaps.

Moist forest supports a more varied and abundant understory that increases wherever light becomes more available. Elk sedge (*Carex geyeri*) and pinegrass (*Calamagrostis rubescens*) are widespread, along with a number of forbs. Upland shrubs are noticeably sparse and heavily browsed, with little seed set or vegetative reproduction.

Dry forest has generally sustained more alteration of its understory due to the combination of loss of regular fires, past management practices, and current populations of wild ungulates, therefore is the most changed from its historic condition. Native understory grasses and forbs in dry forest environments are adapted to short fire return intervals, and common species such as pinegrass (*Calamagrostis rubescens*), Elk sedge (*Carex geyeri*), blue wildrye (*Elymus glaucus*), tailcup lupine (*Lupinus caudatus*), and heartleaf arnica (*Arnica cordifolia*) are stimulated by low intensity burns, especially where adequate light is available. Canopy gaps and a mosaic pattern of forest openings enhance opportunities for the growth of such species of the forest floor. The alteration of natural fire regimes has resulted in uncharacteristically dense shade from the overstory in areas heavily stocked with climax tree species, with a resulting decrease in grass cover and resultant forage availability.

Since most understory shrubs, both riparian and upland, are early seral, they are also dependent on a mosaic forest pattern and overstory gaps to provide the light-rich environment that they need in order to establish. Most are either dependent on top-kill by fire to remove diseased older stems and stimulate regrowth, or require the scarified substrate created by fire to germinate seed. The alteration of natural disturbance regimes in the last 100 years, combined with use by ungulates, has resulted in degraded shrub communities throughout the analysis area.

Native grass and forb species are still predominant in the dry forest, but in areas have been mixed with exotic species introduced to stabilize soils along roads, skid trails, and landing sites, while enhancing domestic livestock forage. Some of these same disturbed locations now host populations of invasive/noxious weeds.

Grazing Allotments

Two grazing allotments, Upper Middle Fork (UMFA) and Blue Mountain (BMA), are within the project area (Table RL – 1).

Blue Mountain Allotment

The Blue Mountain Allotment lies between Highway 7 and Highway 26 (See Figure RL – 1). The current situation in this allotment, as indicated by stream surveys and evaluation of data in year-end reports, shows that the past management system has paid off with riparian areas in an upward trend (MFJD River Grazing BAs 1999-2006 individual year consultation, UMFJDR Watershed Assessment, 1998).

The Blue Mountain Allotment is now comprised of six pastures; two large ones (Idaho and Crawford), three smaller ones (West Summit, Squaw, East Summit) and a recently added small riparian pasture (Upper Phipps). The current ten year term grazing permit authorizes 163 cow/calf pair on the Blue Mountain Allotment from June 16th until October 9th each year.

Table RL – 1. Rangeland Information for the Crawford Project Area.

Allotment	Unit	Pasture & Total Allot. Acres	Acres in Project Area
Blue Mountain	Crawford	8,431	7,482
	Idaho Creek	9,796	96
	East Summit	1,196	62
	West Summit	2,320	1,879
	Squaw Creek	124	26
TOTAL		**21,867**	**9,545**
Upper Middle Fork	Butte	13,334	0
	Caribou	9,592	0
	Austin	4,408	3,402
	Deerhorn	13,854	527
	Lower Vinegar	7,001	0
	Upper Vinegar	5,569	0
	River	111	0
	Shop	133	0
	Tailing	47	0
TOTAL		**54,049**	**3,929**

In the past the permittee has voluntarily reduced the number of livestock on the Blue Mountain Allotment to accommodate annual fluctuations in allotment forage/water conditions. In recent years (for various reasons) the Blue Mountain Allotment has not been grazed by domestic livestock (2003, 2006, and 2007).

Rangeland vegetative cover for the allotment consists of bluebunch wheatgrass plant communities, pinegrass-elksedge communities and Idaho Fescue. Rangeland conditions on the Blue Mountain Allotment can generally be described as good to excellent with an upward trend. Numerous Meadows on this allotment provide the majority of the forage. Crawford Meadow was evaluated by a range technician in 1998. A condition and trend transect within this meadow which was established in 1956 was re-read. The rangeland was judged to be in “excellent” condition. Another transect (established 1960) was read in Pie Meadow. The rangeland condition in this meadow was “good.” Based on Forest Service records, most of the rangelands on the Blue Mountain Allotment have an upward trend however, with effective wildland fire prevention/suppression and reduced forest management forested lands are expanding and overstory crown cover is increasing over time.

Generally the forested upland portions of this allotment are becoming increasingly overstocked with ponderosa pine, Douglas-fir, white fir and lodgepole pine resulted in a loss of area suitable to cattle grazing and has resulted in reduced forage production. Some of these stands also have limited access to livestock due to dense undergrowth of small sized trees and brush as well as downed dead timber. Lack of fire and timber harvest has the potential effect of concentrating livestock and wildlife grazing onto fewer total acres of the allotment. The majority of riparian areas within this allotment have displayed dramatic improvement in riparian health and aquatic functionality. Both hardwood and conifer stands are recovering along the streams (MFJD River BA, UMFJDR Watershed Assessment, 1998).

Upper Middle Fork Allotment

The Upper Middle Fork allotment (UMFA) is located near the head of the Middle Fork John Day River, north and west of Highway 7 (See Figure RL – 1). The river divides this allotment in nearly two equal pieces, one north of the river and the other to the south. Currently 473 cow/calf pairs are authorized to graze from June 1st until October 15th.

Figure RL – 1. Map Showing Grazing Allotment in Relation to Project Area.

Over 45 miles of fence have been constructed on the Upper Middle Fork Allotment to improve livestock distribution and facilitate further control of timing, duration and intensity of use. The current fence/pasture configuration has six major pastures; Austin, Lower Vinegar, Upper Vinegar, Caribou, Deerhorn, and Butte; two smaller ones left over from range evaluation project research; Blackeye and Ragged Rocks, with three riparian pastures on the river; Shop, River and Tailings.

During the last 15 years, this allotment has had 7 years of rest, with the most recent rest period being 2004 thru 2006.

Vegetative cover for this allotment varies greatly, as with topography. Elevation ranges in from 3600-8100 feet. Vegetative sites vary from open ponderosa pine stands at lower elevations to mixed conifer over story stand in mid elevation and alpine/shrub lands. Each of these timbered types supports an herbaceous under story of forage in varying quantities depending on canopy closure. There are pockets of dry meadows, moist meadows, and scablands scattered throughout the allotment.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Current grazing practices would continue on all allotments in the project area. The No Action Alternative would have no overall short-term impact on the range resource or range permittees. However, mid to long-term effects of the No Action Alternative may result in a reduction in forage availability and distribution of livestock due to increased vegetation shading and duff layer accumulations.

If no action is taken and resources are left to continue within the analysis area at the present regression, forage quality and production would decline, reducing the quantity of primary, secondary and suitable rangeland over time. There would be a decreased likelihood that the area could be managed in the long-term toward open forest conditions, consistent with the historic range of variability. This would have a negative cumulative effect on available forage. The amount of forage developed within dense ponderosa pine/Douglas-fir is well below forage quantities associated with an open forest that is consistent with the historic range of variability. Forest stocking levels would continue to increase, along with conifer encroachment into meadows, grasslands and riparian areas. Less forage availability in the upland area would increase use by ungulates (both domestic and wildlife) in more open riparian areas and have potential detrimental impacts to fisheries as well as aquatic resources.

In the long-term, as forest health declines, the abundance of downed logs is likely to present more physical difficulties to livestock grazing operations. Long-term accumulations of woody debris may impede the movement of cattle and permittee ability to distribute livestock use. Some minor increased in maintenance costs may be incurred by the permittee in the long-term as the forest ages to repair fences damaged from falling snags and maintain fence right-of-ways.

With no action many of the forested hot-dry and warm-dry biophysical environments would remain outside of the Historical Range of Variability (HRV), with overstocked stands that cannot be sustained in the long-term. Because fire has not been permitted to perform its natural role of frequent under burning, forest stand density has increased and vigor has diminished. This diminished health has contributed to more frequent outbreaks of insects and disease epidemics that have further increased the probability of large stand replacing fires (Hall 1980).

Alternatives 2, 3, and 4

Forest stand cutting treatments and prescribed burning would positively affect both in the short- and long-term range conditions by reducing conifer density in stands, reducing ground fuel loading that restricts livestock movement, and increasing transitory range forage.

Table RL – 2. Commercial Harvest by Allotment.

Allotment	Unit	Commercial Harvest Alternative 1	Commercial Harvest Alternative 2	Commercial Harvest Alternative 3	Commercial Harvest Alternative 4
Blue Mountain	Crawford	0	721	358	0
	Idaho Creek	0	0	0	0
	East Summit	0	0	0	0
	West Summit	0	514	455	0
	Squaw Creek	0	0	0	0
TOTAL		**0**	**1,235**	**813**	**0**
Upper Middle Fork	Butte	0	0	0	0
	Caribou	0	0	0	0
	Austin	0	900	621	0
	Deerhorn	0	0	0	0
	Lower Vinegar	0	101	76	0
	Upper Vinegar	0	0	0	0
	River	0	0	0	0
	Shop	0	0	0	0
	Tailing	0	0	0	0
TOTAL		**0**	**1,001**	**697**	**0**

Commercial harvesting and precommercial thinning treatments would increase available forage for livestock. The amount of forage increase varies between alternatives depending on the acres treated and type treatment. The differences in forage increases between types of treatment is the more the treatment opens a stand of trees (reduces tree canopy cover) the more availability of sun and nutrients are to forage producing herbaceous species. Thus, a shelterwood treatment opens a stand more than a commercial thinning treatment and both of these treatments opens the stand more than a precommercial treatment.

Densely shaded stands opened up by thinning or harvest cuts would allow herbaceous forage production to increase, especially that of pinegrass, elk sedge and dry site bunchgrasses (Idaho fescue, bluebunch wheatgrass). Cover of the palatable shrub, bitterbrush, has no doubt declined in recent years as stands have closed and shade increased. This “light sensitive” shrub should increase after treatment, on environments where it was previously suppressed by shade. Forage production would begin to improve rapidly with the reduction of competition for light, and higher yields may continue for a decade or more depending on light conditions in this “transitory range” environment. Open grown feed is more palatable. This higher quality forage is preferred by livestock which would attract and encourage more use in open areas. This should improve livestock distribution over the pastures. It may also reduce pressure on riparian zones early in the season, especially if management is used to encourage this action. Livestock management/ herding would be improved with more open vegetation since livestock movement is less restricted and stock are much more visible to ranchers. The anticipated flush in livestock forage production could be a positive impact on the rancher (permittee) economic situation, especially if open stands can be maintained over time, as in historic periods, by future forest management.

The fuel reduction activities in all alternatives would have a beneficial effect for livestock grazing on approximately 5,300 acres. Even though the scheduling of the burn operations would be coordinated with the grazing permittee this activity is likely to create some disruption of his grazing operations and increase his operation costs in the short-term. This would be complicated more by the need to rest the burn area for at least one growing season following the burn (Malheur Forest Post-Fire Grazing Guidelines, 2003). Areas burned would be evaluated to determine if additional rest is needed to promote the establishment of bunch grasses and other herbaceous vegetation. Prescribed burn operations would be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fitted to the grazing systems being used on the affected allotments to minimize impacts to the permittee's ranch operations. Several other design measures have been added to reduce impacts to permittee operations and improvements. These measures are listed in Table 2.13 in Chapter 2.

Mid to long-term effects of this prescribed burning on rangeland management are positive.

Higher forage yields and availability on upland sites may result in more AUMS to be harvested, held in reserve, or take some pressure off riparian zones by better distributing livestock. Due to the large size of the grazing pastures in the planning area, the staggered and varied treatments of this transitory range would not have a measurable influence of the carrying capacity of the range. However forest stand treatments that open up stands previously not accessible to livestock would redistribute grazing effects in a more uniform scope across the pasture.

Access for livestock and personnel would be much better, livestock visibility and herding would be greatly improved. Long-term maintenance costs may be reduced due to improved access along fences and water sources.

Table RL – 3. Prescribed Burning Acres by Allotment.

Allotment	Unit	Prescribed Burning Acres Alternative 1	Prescribed Burning Acres Alternatives 2, 3, 4
Blue Mountain	Crawford	0	2,465
	Idaho Creek	0	0
	East Summit	0	0
	West Summit	0	1199
	Squaw Creek	0	0
TOTAL		**0**	**3,664**
Upper Middle Fork	Butte	0	0
	Caribou	0	0
	Austin	0	1,451
	Deerhorn	0	0
	Lower Vinegar	0	0
	Upper Vinegar	0	0
	River	0	0
	Shop	0	0
	Tailing	0	0
TOTAL		**0**	**1,451**

Treatments would also reduce and eliminate dead and down woody material and would enable increased livestock distribution resulting in improved utilization of forage, water, and salt. With the projected increase in the quantity of available forage there is increased potential to reduce impacts on riparian herbaceous and hardwood species.

Cumulative Effects

SCOPE OF THE CUMULATIVE EFFECTS ANALYSIS

The cumulative effects analysis boundary for rangeland resources consists of the Mill Creek Subwatershed. The temporal scale selected for this analysis is from 1978 to 2018: The reasoning for this time scale is supported by:

- Part harvest activities (consisting of various harvesting methods) in the analysis area indicate that the majority of harvest was conducted between 1978 and 1998.
- The future planned activities proposed by the Malheur National Forest are, in general, on a ten-year planning cycle.

A comprehensive list of potentially cumulative actions considered for this project is presented in FEIS Appendix D.

Cumulative Effects

Past actions in or near the project area include timber management, fire suppression, grazing, recreation, firewood cutting, big-game management, riparian enhancement, road and facilities construction and maintenance, and road closures. All activities have influenced the current forest composition and structure, and the management infrastructure of the area. Thus, these activities are still reflected, with individual variance, in the current condition of the areas natural resources and human environmental values. The following list identifies past, present, and future projects within the project area that have the potential affect the rangeland resource and allotment administration as a whole:

- Past harvest activities consisting of various harvesting methods starting in the railroad logging era (early 1900s). The majority of the project area was harvested within the last century. Logging generally had a beneficial impact on range resources, especially regeneration harvesting and commercial thinning that occurred between 1978 and 1993. Approximately 4,000 acres were harvested in the Mill Creek Subwatershed during that period.
- Forest Service road building starting in the 1920s improved access into the project area for grazing management, timber harvest and fire suppression.
- Road closures in the early to mid 1990s reduced the miles of road available for allotment management.
- Fire suppression over the last 50 to 60 years (1950 to present). Fire suppression as resulted in a general decrease in forage availability.
- Foreseeable noxious/invasive weed treatments.

Alternative 1 – No Action

Past activities have had both positive and negative impacts on range resources. Past timber harvest and fire suppression have converted forests from early seral species to a higher proportion of late seral species. Stand densities and multi-layer canopies also increased across the forests generally reducing the forage availability. Commercial thinning and regeneration harvesting in the 1980s and 1990s resulted in small scale changes in the timber stand densities, which have also improved range forage availability.

With no mechanical or prescribed fire treatments, the forested stands in the project area would remain at risk to disturbances by insects, disease, or wildfire that are larger in scale and severity than happened historically. There would be no change to the existing condition and there would be no additional cumulative effects from this project.

The ongoing and foreseeable actions listed in Appendix D would most likely still occur. These actions would cumulatively affect range resources in the project area to a very limited extent. Use of National Forest roads, summer recreation activities, and administration of special use permits may disturb and influence livestock movement. Sometimes gates are left open allowing livestock to breach areas, sometimes causing problems with utilization.

The Malheur National Forest is proposing to treat approximately 3,800 acres of noxious/invasive plants across the Forest. A proposed action has been scoped and includes manual pulling or use of hand tools, herbicide, cultural methods such as grazing or mulching, and biological controls. It is foreseeable that treatment of noxious/invasive species found in the Crawford Project Area would occur to some level, helping to promote recovery of desirable native vegetation for livestock forage. Noxious/invasive weeds compete with native grasses desired by livestock for forage.

Alternatives 2, 3, and 4

Cumulative effects of past, present, and foreseeable actions in association with the proposed action would generally have a positive effect on transition range availability and livestock distribution in the affected allotments. Commercial thinning and regeneration harvesting in the 1980s and 1990s resulted in small but positive improvement in range forage availability. Proposed commercial harvest, precommercial thinning, and fuel treatments will generally have a positive impact on all range resources reducing the overstory and allowing forage species to increase. All action alternatives would improve livestock distribution, and long-term protection of range improvements.

Past road closures have impacted grazing permittee access for allotment activities. The few roads proposed for closure would have minimal additive impact on grazing permittee access needs. Over 90% of the roads proposed for decommissioning are already closed. Occasional travel permits on closed roads may be granted to permittees for range improvement maintenance.

Ongoing and foreseeable actions taking place in the project area include hiking, camping, horseback riding, off-road vehicle use, fishing, hunting, firewood cutting, and special use permit administration. These actions would cumulatively affect range resources in the project area to a very limited extent. Motorized vehicle use in the area may disturb and influence livestock movement to some extent.

The Malheur National Forest is proposing to treat approximately 3,800 acres of noxious/invasive plants across the Forest. A proposed action has been scoped and includes manual pulling or use of hand tools, herbicide, cultural methods such as grazing or mulching, and biological controls. It is foreseeable that treatment of noxious/invasive species found in the Crawford Project Area would occur to some level, helping to promote recovery of desirable native vegetation for livestock forage. Noxious/invasive weeds compete with native grasses desired by livestock for forage.

Consistency with Direction and Regulations

All alternatives are consistent with Forest-wide standards for rangeland resources.
Range permittees were contacted during scoping to solicit comments on activities.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from implementing the alternatives with respect to rangeland management.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on rangeland resources can be found in the Rangeland Resources Specialist Report, located in the project record.

Recreation

Introduction

This section addresses affects on dispersed campsites and trails in the Crawford Project Area. Effects to Recreation are measured in terms of whether alternatives meet the Recreation Objectives outlined in the Forest Plan. These effects can be direct, indirect, or cumulative.

Forest visitors desire or expect specific types of recreational experiences and settings. Recreational opportunities are described in this recreation analysis in relationship to the Crawford Planning Area. This analysis describes the existing conditions of trails and the administrative and dispersed sites in the Crawford Planning Area. Analysis of the affects of proposed activities on those recreation resources is also provided.

Guidelines from the Malheur National Forest Land and Resource Management Plan 1990 are used to determine the condition of facilities and dispersed campsites.

Recreation Opportunity Spectrum (ROS)

The National Forest System lands encompassed within the Crawford Planning Area have been inventoried using the ROS system to determine what recreation opportunities and settings are available to visitors. Currently the area meets Roaded Modified and Roaded Natural. Management direction for recreation as outlined in the Forest Plan is to continue to maintain existing ROS settings.

Areas within the roaded natural classification are characterized by predominately natural-appearing environments as viewed from sensitive roads and trails with interaction between users being moderate. Evidence of human activity varies from area to area and includes livestock grazing and timber harvest. Roads and motorized equipment and vehicles are common.

Areas within the roaded modified classification are characterized by substantially modified natural environments. Roads, landings, slash and debris may be strongly dominant from within, yet remain subordinate from distant roads and highways. There is moderate to heavy evidence of other use on the main road with low to moderate evidence of other use on arterial roads.

The ROS is a framework for a change in resource management uses, policies, and actions on recreation opportunities so that they can be better identified and, when adverse, mitigated or prevented. Recreation opportunities were defined as the combination of biological, physical, social, and managerial conditions that give recreational value to a place. The ROS gives particular attention to the settings in which these uses and activities have occurred. This has the advantage of focusing attention and action on resource settings and conditions. For example, sound is a physical phenomenon susceptible to objective, quantitative measurement. When either the level of sound, or the particular form of sound, is judged as inappropriate or unacceptable, they are defined as “noise,” a measure of importance. Sound is reflected across different kinds of recreation settings (ranging, for example, from a highly developed campground to a wilderness), where one finds that what constitutes “noise” changes dramatically.

The ROS framework therefore can help managers in thinking about, and developing appropriate management responses for, a particular type of impact. It forces an explicit consideration of assumptions (e.g., the idea of “no impact”), it requires mangers to think across functional and jurisdictional boundaries (e.g., what types of sounds, their origin), and it provides the opportunity for consideration of alternatives (e.g., banning the source, buffering its effects, altering its timing, informing users about it).

Regulatory Framework

The Forest Plan direction is to manage General Forest and Rangeland (MA–1 and 2) to construct, relocate, or protect designated system trails/trailheads and facilities during management activities. To maintain dispersed camping opportunities in a roaded setting and to manage these areas for partial retention and to provide for roaded recreation opportunities.

Administrative Site (MA–19) is to be managed for administrative needs and to consider these sites' historic and architectural values.

Recreation in MA–3A (Non-Anadromous Riparian) is managed as roaded modified but standards include limiting and distributing recreation use as necessary to protect and/or rehabilitate riparian areas.

Analysis Methods

The area analyzed for recreation impacts includes the Crawford Project Area and the area to the west adjacent toward Highway 26. This area to the west is included because of the public use centered in this area of the Austin House.

The source of the recreational information is the Forest GIS data base that was compiled from recreational inventory information.

Affected Environment

Snowmobile Trails

Crawford Creek snowmobile trail #S – 258 is co-located on the following road: 2620. Summit Creek snowmobile trail #S – 259 is co-located with the 2622240, 2620204, 2600207, 2600212, and 2622 Roads. Grooming a snowmobile trail consists of compacting snow to a width of approximately 10 to 12 feet. Grooming is only done with a minimum snow depth of 1 to 2 feet and does not remove or side cast material. The ground is frozen during this period. No disturbance to soils is expected from this activity, or fisheries resource impacts. At stream crossings the snowmobile groomer would fill the stream with snow for snowmobile and snowmobile groomer access. General maintenance concerns include felling of hazard trees to protect the trail. These trails are in fairly good condition and require minimal maintenance. Use of these roads occurs during the winter recreational season, generally December 15th through April 15th (though timing varies with snow conditions).

Snowmobile riding is a popular activity mainly on groomed trails of the Summit and Crawford Creek roads where the Crawford Project Area is proposing activities.

Other family oriented winter use such as Nordic skiing, snowshoeing, or sledding occur within project area.

Bike Trails

The Tipton Summit Trail lies within the Crawford Project Area. There are approximately 9.3 miles of co-located trail on Forest Roads 7000449, 7000479, 2620051, 2620, and 2620249. The route also passes through a gate and on an old railroad grade.

Dispersed Camps

Crawford Project Area receives low to moderate dispersed recreation use. The dispersed campsites are rustic in nature. User constructed toilets can be found at some sites. Campsites are concentrated primarily in flat areas off main transportation systems where water can be accessed. Many are near springs or creeks. There is a wide range in size and amount of disturbance for all the dispersed camps. Camp size ranges from very small to fairly large. Use of these sites varies throughout the year, with the majority of sites showing heaviest use during the fall hunting season. Where dispersed camp sites are used year after year with concentrated use the ground appears compacted and tends to leave vegetation not as vigorous as non-dispersed used areas; e.g. the concentrated use at the junction of Idaho and Crawford Creeks on Forest Road 2622. Other concentrated use areas are along Forest Roads 2620 and 2622. There are five identified dispersed campsites within riparian areas with varied degrees of vegetation. Riparian zone damage occurs throughout the project area due to vehicles, sanitation practices, and removal of vegetation in heavily used areas. There are approximately 20 areas that are traditionally popular for dispersed camping scattered throughout the project area. Of these, five areas show varied degrees of vegetation and riparian zone impacts caused by vehicles, sanitation practices, and removal of vegetation by recreation visitors. Use of these sites varies throughout the year, with the heaviest use typically beginning in late August through the fall hunting seasons into November.

Administrative Sites

Austin House Special Use Permit located on U.S. Highway 26 at Austin Junction is adjacent to the Crawford Project Area. Austin House is a private business and residence located on Forest Service land. The permitted area is less than 5 acres and is operated under a Resort Special Use permit with current use as a restaurant, gas station, and post office. Effects to administrative sites will only focus on potential impacts to recreation visitors at the Austin House site since the site is not actually within the project area boundary.

The Blue Mountain Work Center (BMWC) is a fire suppression station used by Forest Service fire personnel. BMWC is located ¼ mile east of the junction of Highways 7 and 26, adjacent to the project area. The Oregon Department of Transportation Maintenance Shop is located across the Highway from BMWC, and is under a Special Use Permit administered by the Forest Service.

Other Uses

Currently, the Crawford Project Area plays an important role by providing settings for various types of outdoor recreation hunting, camping, driving in the woods, hiking and winter activities. Due to ease of access from U.S. Highway 26 and 7, this area is popular with recreationists. Visitors may enjoy the project area for a host of outdoor recreational opportunities. FSR 2620 and 2622 provides the main access for roaded admission from U.S. Highway 26 and 7 into the planning area. The major roads are gravel-surfaced, one-lane, and native surface routes initially developed to provide timber access, which now provides access for recreation type activities. Recreational hunting for shed deer and elk antlers, viewing scenery and enjoying the landscape is a part of all these activities.

One Recreation Event Special Use Permit located at Taylor Flat is issued every 2 years.

Hunting

The Crawford Project Area lies within the Sumpter and Desolation Big Game Management Units. The area is popular during general big game bow seasons and controlled big game hunts. Hunting seasons occur in late summer and fall. It is anticipated that Oregon Department of Fish and Wildlife will continue to offer hunting opportunities in this area as part of their management of big game. General bow-hunting and controlled hunts will have similar seasons and numbers of tags. Bow-hunter numbers have increased in recent years and this trend may continue.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Methods used to evaluate the effects of the alternatives include: changes in the ROS; harvest in currently important recreation places and recreation sites.

The ROS will not change from the existing condition.

Snowmobile and Bike Trails

Alternative 1, the No Action Alternative, would result in no change in snowmobile access in this area. The approximately 8.1 miles of existing designated snowmobile routes and approximately 9.3 miles of bike trail would remain with a mix of groomed and ungroomed conditions.

Dispersed Camping

No change in the availability of dispersed camping is expected for the typical use in spring, summer and fall.

Administrative Sites

There would be short-term evidence of prescribed burning in other areas of the forest with smoke drifting over the Austin House. Blue Mountain Work Center and Oregon Department of Transportation Maintenance Shop will have permanent employees that may be affected by drifting smoke.

Other Uses

The recreational experiences may be affected long-term at some point in time by landscape scale stand replacement fire due to the increasing vulnerability of the vegetation to this risk. With such an occurrence recreation opportunities would likely be eliminated in the short-term, followed by dramatically changed recreation settings, an emphasis on mushroom hunting for 1 to 2 years following fire, and burning returning within a 2 to 5 year period. Post-fire snags would create visitor hazards and potentially increase management requirements or limit visitor access for a multi-year period. Such fires have occurred within recent years.

While recreational visits within the project area would remain near the same levels as previous years, under this alternative traditional use patterns and recreational opportunities would not be impacted.

Hunting

In the No Action Alternative, no change is anticipated in the diversity of camping styles or use patterns in this area.

Fishing

Fishing access and opportunities to fish are expected to remain unchanged. Fishing opportunities, as managed by Oregon Department of Fish and Wildlife, are expected to be unchanged in the No Action Alternative.

Cumulative Effects

There are no cumulative effects under the No Action Alternative to recreation activities and opportunities.

Common to Alternatives 2 and 3

Direct and Indirect Effect

Affects to recreation are measured in terms of change in the ROS. There would be no effect on the ROS class for this area.

Snowmobile Trails

Snowmobile activity in the project area occurs on both groomed and ungroomed, designated trails with the majority of recreationists staying on groomed trails with minimal recreational activity on other area roads. Proposed road closures or decommissioning will not affect existing designated snowmobile trails in the Crawford Project Area in all action alternatives.

Other snowmobile activity is concentrated in open, nearly flat areas and nonforested hillsides in close proximity to designated snowmobile routes. These “snow play” areas are plentiful in the general area.

If winter logging occurs, plowing of the 2622240, 2600204, 2620 and 2622 Roads would be the expected haul routes. The use of these and other haul routes would be restricted to “logging use only” during the workweek and “closed to all” during weekends. Snowmobile activities may temporarily be affected if harvest activities occur in winter. If winter logging does occur, the snow plowing of the haul routes would directly effect approximately 8.1 miles of snowmobile routes. Plowing and working from the 2622240, 2600204, 2620 and 2622 roads may temporarily interfere with smooth trail crossings or create fragmented travel routes. Haul routes may coincide with designated snowmobile routes. In addition, area closures may be in effect for logging activity hazards near active harvest units, which may affect some cross-country travel. While unlikely that all haul routes and all available units would be active at any one time, it is anticipated that activities would be grouped for efficiency. Coordination with the Burnt River Snowmobile Club will take place for alternate routes, signage, and grooming. Alternate routes will not be on any haul route or interfere with haul. The alternate snowmobile route would be 343, cross Highway 26, then travel cross country ¼ mile, to 2665045, 2665, 2645, 2646, and back onto the groomed route on 2600207. This will replace the 204 route on the south end of Crawford. On the north end, the route would be 1940, to 080 to upper end of 2620. If the alternate routes are used, it would be low impact with little use that would be considered intermittent use. Any snowmobile routes that conflict with project activities will be signed with proper signage and alternate routes will be utilized during the implementation of the project.

Other winter activities, such as snowshoeing or Nordic skiing would likely access the area in the project area via one or more of the groomed snowmobile routes. These activities have minimal numbers of participants in this location due to the limited access compared with similar experiences available in the local area.

Bike Trails

Forest Roads 7000449, 7000479 2620051, 2620240 and 2620 are access roads into harvest units. During harvest activities log haul may conflict with bike users. It is anticipated that temporary road and/or area closures would be in place during harvest and fuel reduction activities, influencing traffic patterns, recreation use and duration of stay. Haul routes will be heavily used by logging traffic causing congestion. This would create a higher level of safety concerns for the recreating public on roadways. Signs would be posted to reduce this hazard. Associated noise and other disturbances may affect the tranquility of the recreation experience for an individual, regardless of the proximity to the activity.

Hunting/Camping/Fishing/Hiking

Short-term effects with Alternatives 2 and 3, harvest activities may displace some recreationists to new areas to camp, hunt, or to travel due to decreased aesthetic appeal of the forest resulting in displacing some forest visitors over a broader area on the landscape. Alternatives 2 and 3 would harvest whereas Alternative 4 would not have harvest. Noise may be heard from harvest actions resulting in some impacts on recreationists during this type of activity and may adversely affect the experiences of some people. It is useful to keep in mind that activities vary in importance over time. Therefore, dispersed campsites that are there today may not be in the future. This data is valid at the time this document is signed and shortly thereafter. Haul routes would be heavily used by logging traffic, creating a higher level of safety concern for the recreating public using roads. Closure of some roads within the project area to public use during logging and hauling activities would improve public safety, but would have a short-term negative effect on recreational access to the area. Long-term effects with Alternative 2 and 3 would provide safe and adequate roaded and trail access for the recreating public through the cutting of hazard trees. Dispersed recreation will continue to occur in the project area.

Road closures are not expected to greatly impact recreation access. Most roads proposed for decommission are already closed.

It is anticipated that Oregon Department of Fish and Wildlife will continue to offer hunting opportunities in this area as part of their management of big game. General bow-hunting and controlled hunts will have similar seasons and numbers of tags. Bow-hunter numbers have increased in recent years and this trend may continue. It is anticipated that temporary road and/or area closures will be in place during harvest and fuel reduction activities, influencing traffic patterns, recreation use and duration of stay. Associated noise and other disturbances may affect the tranquility of the recreation experience for an individual, regardless of the proximity to the activity. The recreational experiences available may be altered in the short-term by harvest and fuel treatments. The possible effects include increased sights and sounds of equipment and people within the planning area during prescribed burning activities for a short period of time.

Fishing opportunities, as managed by Oregon Department of Fish and Wildlife, are expected to be unchanged in all action alternatives. The recreational experiences available may be changed in the short term by fuel treatment. The possible effects include increased sights and sounds of equipment and people within the planning area during the burning for a short period of time.

The recreational experiences may also be changed in the short term by the smoke created by the fuel treatments. The recreational experiences over the landscape may also be changed in the short term by the smoke caused by the fuel treatments. The possible effects include the apparent smoke affecting breathing and vision being obscured for a short period of time.

Administrative Sites

Smoke can affect the safety of motorists and recreationists at Austin House, therefore highway signs may be necessary.

Alternative 4

Direct and Indirect Effects

There would be no effect on the ROS class for this area.

With no harvest activities there would be no log haul that would conflict with bike users. There would be no winter harvest activities so there would be no plowing of the 2622240, 2600204, 2620 and 2622 Roads on groomed snowmobile trails.

Fishing and hunting opportunities, as managed by Oregon Department of Fish and Wildlife, are expected to be unchanged in Alternative 4.

In Alternative 4, higher levels of snags may pose safety concerns particularly for those recreationists who enjoy cross-county hiking or those that hunt the area.

No harvest activities would occur, so recreationists would not be affected by noise and traffic from harvest; however, noise and traffic from fuels reduction and precommercial thinning activities would occur and could negatively impact recreational experiences. Dispersed sites would remain accessible as described in Alternatives 2 and 3.

Cumulative Effects (Action Alternatives)

The Crawford Project Area receives low to moderate recreation use, with most use occurring during big game hunting seasons. Elk populations have remained stable for over the last decade in both the Sumpter and Desolation Hunting Unit, providing opportunities for rifle and archery hunting in late summer and fall. In areas where vegetation treatment may occur within or immediately adjacent to dispersed sites, recreationists may choose to not use those sites for future camping. Big game populations' numbers are not expected to change. However, distribution of big game within project area may change, causing hunters to utilize other areas (See Terrestrial Wildlife Section for more detail). Hunting experience may change as the ground cover increases and provides more forage for big game animals. Hunters may experience a change in big game use as a result of changes in vegetation. Future recreation use within the project area is difficult to estimate. Smoke from fall burning may have a short-term impact to hunters.

Snowmobiling is popular on existing groomed trails in the area. Harvest activities may have a limited short-term effect to snowmobile use; however existing routes would not be impacted by harvest, road closures, or road decommissioning in the mid to long-term.

As described above, past activities and occurrences have affected the recreation resource. Past and proposed activities that could affect recreation resources have been analyzed in direct and indirect effects. Recreation activities, including hunting, camping, and other uses, would continue as described above. In review of the list of past, present, and foreseeable actions in Chapter 3 and Appendix D, no other ongoing or future actions are expected to have a measurable affect or cumulative effects on the recreation use to those described above.

Consistency with Direction and Regulations

This proposed project is consistent with Forest Plan direction and regulations. The proposed project will meet Forest Plan Standards for the Recreation of roaded natural and roaded modified. Proposed activities are consistent with Forest Plan direction to manage General Forest and Rangeland (MA–1 and 2) to maintain dispersed camping opportunities in a roaded setting and manage these areas for partial retention as roaded natural, and to provide roaded recreation opportunities.

Recreation in MA–3A (Non-Anadromous Riparian) is managed as roaded natural but standards include limiting and distributing recreation use as necessary to protect and/or rehabilitate riparian areas.

In terms of Executive Order 13287, the Austin House Resort is a historic property that was under special use permit prior to this project. The Austin House falls under MA–14 and is managed for roaded natural on the recreation spectrum. This project would not have an effect on the resort.

This project meets Forest Plan standards for management of the recreation resources and administrative sites within the management areas.

Facilitation of Hunting, Heritage and Wildlife Conservation (E. O. 13443):

The purpose of this 2007 Order is to direct Federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and the Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat. Federal agencies shall evaluate the effects of agency actions on trends in hunting participation; consider the economic and recreational values of hunting in agency actions; manage wildlife and wildlife habitats on public lands in a manner that expands and enhances hunting opportunities; and work collaboratively with State governments to manage and conserve game species and their habitats. The Crawford Project is consistent with this E.O. See the Other Disclosure section at the end of Chapter 3 for more detail.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments associated with the consequences of any of the alternatives analyzed to the recreation resource.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on recreation can be found in the Recreation Specialist Report, located in the project record.

Visuals/Scenery

Introduction

Managing the views along highways through National Forest System land is goal identified in the Malheur Forest Plan. Highways 7 and 26 that bisect the Crawford Project Area are major travel routes in northeast Oregon. These routes are identified as visual corridors in the Malheur Forest Plan.

The topography along these visual corridors ranges from steep and mountainous terrain in the upper elevations to gently rolling slopes and valley bottoms. Dixie Butte and Vinegar Hill are prominent middle-ground and background features while the two broad valleys near the old Bates mill site and Phipps Meadow dominate foreground corridor views.

The landscapes along the highways within the project area are dominated by expansive forested areas. The condition of these forested areas immediately adjacent the highways have been affected by past timber harvest. Beginning in the early 1900s most of the lower slopes in the viewshed was railroad logged. During these logging operations, most of the large ponderosa pine was removed. These areas are now stocked with younger even-aged small diameter ponderosa pine characterized by black-barked stems.

Regulatory Framework

Forest Plan

Approximately 57% of the project area is identified in the Malheur Forest Plan as Management Area (MA) 14 – Visual Corridors (Forest Plan, pg IV – 108).

The Malheur Forest Plan designated both Highway 26 and 7 as Sensitivity Level I Corridors within MA–14. These consist of the visible and potentially visible landscapes along major travel routes where the traveling public has a high-to-medium sensitivity to the scenery. The goal is to manage corridor viewsheds with primary consideration given to their scenic quality and the growth of large diameter trees. Visual quality objectives of retention, partial retention, and modification will be applied while providing for other uses and resources.

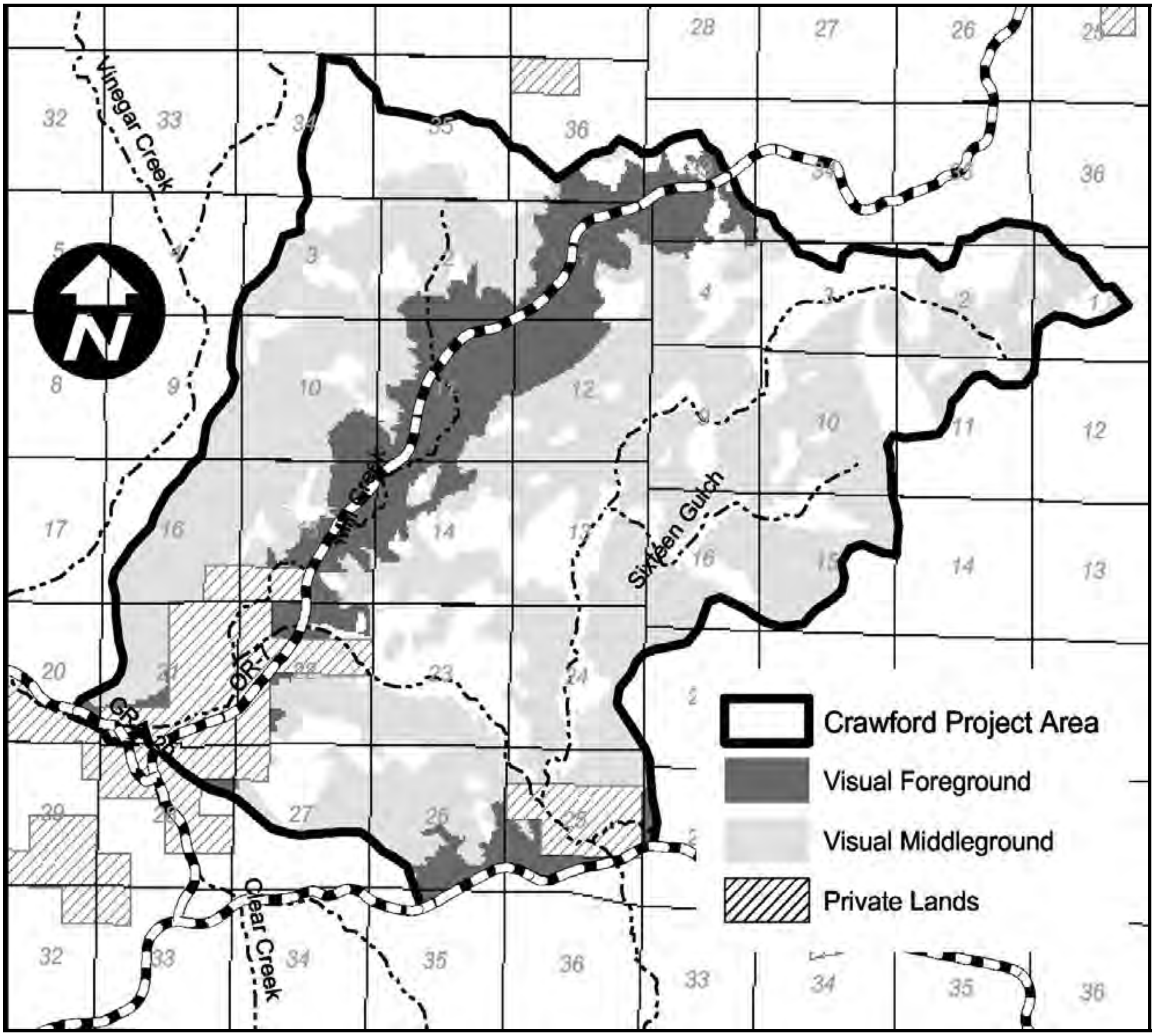
Projects occurring within the foreground area should not be visually noticeable to someone traveling along the highways. Middle-ground activities may be visible, but should be subordinate to the surrounding natural landscape. Background activities can dominate the landscape, but they should borrow from the shape, color, and texture of the area's natural scenery.

Standards (Forest Plan, pg IV – 109)

#11. Emphasize uneven-aged timber management in the foreground distance zones. The overall affect will vary from natural appearing to a slightly altered appearance. Manage foregrounds to meet a retention visual quality objective in Sensitivity Level 1 corridors to result in a natural appearing visual condition.

#12. (Correction #1 to Forest Plan, 1/31/1995). No regeneration or overstory removal harvesting activities will occur in the foregrounds of Sensitivity level 1 or 2 Corridors until viewshed corridor plans have been completed. Exception to this may be made, consistent with Forest-wide standard #3. Other silvicultural activities, such as salvage harvest, firewood removal, commercial thinning, precommercial thinning, pruning or prescribed fire, may be conducted after the appropriate environmental analysis process has been followed. Visual management objectives will guide the design and implementation of all such activities.

Figure VS – 1. Map of Foreground and Middle-Ground along Highways 7 and 26 – MA–14.



#14. When utilizing even-aged management in the middle-ground, use the shelterwood harvest method in the ponderosa pine type, shelterwood and clearcut regeneration in the mixed conifer type, and clearcut regeneration in the lodgepole pine type. Manage middle-grounds as slightly altered (partial retention visual quality objective) in Sensitivity Level 1 corridors and modified (modification visual quality objective) in Sensitivity Level 2 corridors.

#16. Emphasize horizontal diversity of vegetation by developing a sequence of visual experiences to be viewed as one moves through the corridor Apply uneven-aged management by utilizing group selection harvest techniques on small treatment units (¼ – 2 acres) in foregrounds. Apply even-aged management in treatment units up to 10 acres in partial retention middle-grounds. The desired effect is to have a multi-aged appearance in the corridor (both Sensitivity Levels 1 and 2) emphasizing uneven-aged timber management (group selection) in the foreground distance zones and even-aged timber management in the middle-ground distance zones.

Viewshed Corridor Plans

Two viewshed corridor plans, Highway 7 Visual Corridor Plan (1995) and the Highway 26 Viewshed Corridor Plan (2000) have been completed that identify the existing and desired scenic conditions, as well as recommending management opportunities within the corridors. These plans are a Forest Plan requirement prior to most timber harvest. (Forest Plan, pg IV – 109, #12).

The management opportunities/recommendations for each of the plans are summarized below by design cells (see corridor plans for cell maps):

Highway 7 – Visual Corridor Plan (1995)

General Recommendations:

- Thin foreground and middle-ground stands to improve stand health and tree vigor.
- Maintain or increase western larch stocking in both foreground and middle-ground stands.
- Use underburning to discourage the invasion of shade tolerant species in pine stands and to maintain open, grassy understory conditions and park-like stands of old-growth pine.
- Use thinning and small created openings on better sites to speed transition to an even-aged condition and to promote rapid growth of dominant trees to a target size of 36 inches.
- Distribute harvest units to create a mosaic of stocking levels and tree sizes through the design cell. Avoid creating abrupt transitions between thinned and unthinned stands in the foreground.
- Low cut all stumps within 200 feet of the road shoulder.
- Reduce overstocking and promote growth of large diameter trees.
- Within 200 feet of the road, place marking paint on the backside of trees, or use cut tree marking methods. Pull all boundary tags and unit flagging within 200 feet of the highway following harvest activities.
- Avoid ripping areas in the immediate foreground.

Highway 26 Viewshed Corridor Plan (2000)

Cell 4 – Dry Fork of Clear Creek

- Use thinning and prescribed fire to create a more diverse distribution of trees in all diameters. Several stages of continued fire and thinning will be necessary to reach the desired characteristics.
- Open stands to accelerate growth of small and medium diameter pine, encourage clumps of regeneration, and highlight scenic qualities of large ponderosa pine and western larch where present.

Analysis Methods

Management activities such as timber harvesting and prescribed burning can affect forest scenic quality by changing the predominant form, color, line, or texture in a given viewing area. The degree of visibility of these events depends on the interaction of certain elements to the viewers such as:

- Slope and aspect of the land
- Surrounding landscape
- Frequency and duration of view
- Change in forested area and amount of ground disturbance due to logging, road decommissioning, or prescribed burning

These factors have been incorporated into the analysis of the effects of each alternative. The scope of the analysis is limited to the Crawford Project Area.

Effects to Visual Quality are measured in terms of whether the alternatives meet the Visual Quality Objectives (VQOs) outlined in the Forest Plan. VQOs are minimum guidelines for meeting Forest Plan visual goals. Visual quality is addressed separately by management area (MA); visual quality objectives are different in the visual corridor (MA–14) than those outside the corridor.

The mapping boundaries of the visual foreground and middle ground areas was computer generated using a "seen area" modeling program from selected viewpoints along the highways. The mapping does not consider existing vegetative screening in this modeling.

Existing Conditions

The existing conditions are thoroughly described in the Highways 7 and 26 visual corridors plans. Since these plans were completed respectively in 1995 and 2000, there have been few vegetative changes in the landscapes within the Crawford Project Area. These few changes include precommercial thinning on private lands near Austin along Highway 7 and prescribed burning on National Forest lands to the south of Highway 26 near the Dry Fork of Clear Creek. After a recovery period of 2 to 3 years, these harvest activities now meet partial retention standards and the prescribed burning meets retention standards.

The following is a brief description of these existing conditions identified in the corridor plans that may be affected within the Crawford Project Area.

Highway 7 Corridor

Cell #2 – Dixie View (MP 1.0 to MP 2.0)

The foreground area is predominately open meadow and pasture lands. Most of the foreground is privately owned. The dominate characteristic of the middle-ground is the appearance of dark green continuously forested hillsides. Bands of western larch provide dramatic color contrast in the fall.

Cell #3 – Austin Views (MP 2.0 to 3.0)

Most of the foreground area is open river bottom meadow and pastures. Thick stands of black-bark young ponderosa pine frame the other portions of the highway. There are also views through the roadside vegetation of the valley around Austin and the surrounding ridges to the north and west.

Cell #4 – Ponderosa Pine Corridor (MP 3.0 to 5.5)

The foreground is characterized by a long winding corridor of even-aged stands of black-barked ponderosa pine. The gently rolling terrain permits views deep into stands on both sides of the highway. To the south, long distant views of the middle-ground and background of green, forested ridges are present. Alterations to the natural landscape include a lack of large overstory trees and size class diversity in the foreground pine stands. Middle-ground stands appear natural to slightly altered. No created openings are visible.

Cell #5 – Eastward Views (MP 5.5 to 6.2)

Foreground views are short; characterized by partially stocked non-forest areas dropping away on the eastside of the highway. Foreground views appear natural except where altered by roadcuts and fences. Middle-ground and background views dominate this portion of the corridor. Created openings in the middle-ground are visible, but blend in well with the surrounding landscape. An evenly forested texture is the primary visual feature in the middle-ground.

Cell #6 – Tipton Summit (MP 6.2 to Forest Boundary – 7.2)

The highway winds through gently rolling terrain passing through a large meadow. The foreground forest vegetation is a mix of multistory true conifer stands and stands with a mix of Douglas-fir, ponderosa pine, and larch. Larger diameter trees are present in these stands. Only a small amount of the middle-ground is visible from this portion of the corridor.

Highway 26 Corridor

Cell #4 – Dry Fork of Clear Creek (MP 191.25 to 193.8)

The foreground landscape along the north side of this stretch of Highway 26 into the Crawford Project Area is dominated by even-aged stands of ponderosa pine. These stands appear “managed” with few large trees and few areas of natural shrub and understory regeneration. Large pine stumps persist along the immediate foreground. Overstory removals in the past have left these even-aged stands of “black-barked” middle story pine in relatively uniform spacing. The stands lack the expected open park-like stands of ponderosa pine in warm-dry and hot-dry bioenvironments. Middle ground and background views from this stretch are limited due to the orientation of the road and screening from the foreground vegetation. Short-term – 1 to 10 years. Long-term – 20 to 100 years.

Environmental Effects

Alternative 1

Direct and Indirect Effects

Foreground

The forested landscape corridor along the highways would continue to move slowly towards the desired scenic condition. The valued landscape character would continue to appear slightly altered, meeting partial retention standards.

Foreground areas would continue to lack a diversity of scenic experiences common to visual corridors. The regular spaced, even-aged appearance of the ponderosa pine stands would persist. Existing large diameter, orange-bark ponderosa pine trees and western larch would remain partially hidden from view. The existing stumps would continue to be visible.

Middle-Ground/Background

Within the project area, middle-ground views would continue to appear as continuous canopy texture, with little or no obvious deviation from the valued landscape character, meeting the partial retention standard.

Cumulative Effects

The area considered for cumulative effects are the foreground and middle-ground areas along Highway 7 and 26, within and adjacent to the Crawford Project Area.

Past timber harvest, including road construction, (prior to development of visual corridor plans for Highway 7 and 26) has affected the visual quality that resulted in the existing condition being less than the Forest Plan objective of “retention” for the visual corridors along Highways 7 and 26. This includes stumps, skid trails, and logging roads that detract from the natural appearance along the highways. The impacts of older activities within the visual foreground have started to diminish. Revegetation of exposed soil and deterioration of stumps is evident; reducing the dominance of mans activities. More recent activities including precommercial thinning on private lands near Austin along Highway 7 and prescribed burning on National Forest lands to the south of Highway 26 near the Dry Fork of Clear Creek. After a recovery period of 2 to 3 years, these harvest activities now meet partial retention standards and the prescribed burning meets retention standards.

There are no cumulative effects foreseen since there would be no short-term change in foreground or middle-ground forested landscape. No foreseeable cumulative activities are identified in Appendix D that would impact foreground or middle-ground areas.

Common to Alternatives 2, 3, and 4

Direct and Indirect Effects

Foreground – Prescribed Burning

The 1,132 acres of prescribed burning in the visual foreground would be designed to minimize the visibility of limb and tree bole scorch and mortality to larger trees. Low intensity fire would be allowed to creep through the forested areas adjacent to highways. Tree mortality would be minimal (not exceeding 20%) in the 200 foot area adjacent the highways. The mortality would be limited to smaller sapling size trees. To ensure the larger pine trees within 200 feet of the highway would not be killed during burning, extra protection measure would be implemented. But needle scorch on lower branches of trees would be apparent immediately after burning and would persist for 1 to 2 years. The degree of visibility would depend on the flame length conditions during the burn. Smoke severity during the burning would depend upon wind conditions, moisture, duration of the burn, and direction of the burn. Overall evidence of fire would be obvious until scorched needles begin to fall after 1 to 2 years and understory green-up occurs. Some trees may not show evidences of effects from fire until after the first season. These effects are short-term and would appear slightly altered until re-growth of the understory vegetation occurs within a year after burning. At this time the forested area would again have the current natural appearance.

Middle-Ground/Background – Prescribed Burning

There would be short-term evidence of prescribed burning in forested landscape because of the scattered tree mortality that would show up in the dead topped trees. The scattered dead trees would be evident for a year following prescribed burning. Alternative 2, 3, and 4 proposes the same prescribed burning.

Foreground – Road Decommissioning

There are three roads immediately adjacent to Highways 7 and 26 that would be decommissioned: FS 7000043, FS 2620469, and FS 2600200. Alternatives 2, 3, and 4 propose the same road decommissioning. These roads are difficult to view from the highway due to vegetation growing on the road surface or vegetation along the edge of the roadways. All three roads have been closed for a long period of time to motorized vehicles and are not being driven. Proposed decommissioning activities consist of removal of one culvert on FSR 2620156, ripping/sub-soiling and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use and ensure proper drainage occurs over time. There would be no effect to views within the foreground areas, since they are difficult to view from the highway due to vegetation.

Middle-Ground/Background – Road Decommissioning

The would be no impact to the middle-ground views due to ground disturbing road decommissioning activities proposed in Alternatives 2, 3, or 4. The magnitude of the ground disturbance is very low and the impacted terrain is very flat and largely unseen.

Common to Alternatives 2 and 3

Direct and Indirect Effects

Middle-Ground/Background – Timber Harvest

There would be minimal visible change in middle ground due to the commercial thinning; partial retention standards would be met. The thinning timber harvest would create slight texture change in crown canopies but no created openings (including landing and temporary road construction) would be noticeable to those traveling the highway. The magnitude of harvest between Alternatives 2 and 3 are similar. Alternative 2 proposes middle-ground harvest on approximately 1,390 acres and Alternative 3 proposes 987 acres of harvest.

Alternative 2

Direct and Indirect Effects

Foreground – Timber Harvest

In this alternative, management activities would in the long-term create a more scenic and sustainable forest condition along the foreground areas in the project area. Immediately following the activities, the landscape character would appear slightly altered due to soil disturbance from logging and creation of slash piles. This short-term alteration would meet

Forest Plan long-term management goals by providing a natural appearing landscape with large trees.

No created openings due to harvest would occur in the foreground. Harvest would consist of approximately 461 acres of commercial thinning, followed by precommercial thinning and prescribed fire. The harvest would occur along 2.5 miles of Highway 7 (39% of the corridor within the project area) and 0.6 miles along Highway 26 (34%). Thinning would occur in variable densities, creating a more random, uneven-aged appearance in the foreground forested areas. Some areas would appear more open, encouraging pockets of regeneration. Views of large diameter pine and western larch would be accentuated. Growth and vigor of the existing ponderosa pine would be increased, accelerating their transition from black-barked appearance towards a wider fissured bark, typical of larger diameter orange-barked pine.

Logging activity would be obvious for the duration of the harvest lasting two to three months. Noise from mechanical harvesting equipment (chainsaws, skidders, feller bunchers, loaders, and log trucks) would be significant during this period. Additional stumps would be noticeable immediately after harvest. Visibility of stumps would be minimized by low and flush cutting, fire scorch from prescribed burning, and weathering though time. Although landings would be located in unseen areas, slash piles in these locations may be partially visible until the piles are burned. The scorching mortality to the surrounding trees from burning these large piles is limited to less than 20%. The most noticeable short-term impact would be the creation of two temporary roads that have their beginning point on Highway 7. This would create linear roadways that would be seen along this portion of the highway until the road is closed and rehabilitated. However, the duration of the view of the temporary road is very short due the location of road and limited clearing widths of the roads.

Following the use of these temporary roads, all debris created from the construction including stumps grubbed from the roadway would be removed, the road prism would be reshaped to the existing topography, the ditch along the highway would be restored, rocks and logs will be placed on the roadway, and small trees will be planted on the roadway. These measures would camouflage the effects of the clearing along the highway.

Alternative 3

Direct and Indirect Effects

Foreground – Timber Harvest

In this alternative, management activities would in the long-term create a more scenic and sustainable forest condition along the foreground areas in the Crawford Project Area. These effects are similar to those proposed in Alternative 2 except the magnitude of ground disturbance for Alternative 2 is higher. Immediately following the activities, the landscape character would appear slightly altered due to soil disturbance from logging and creation of slash piles. This short-term alteration would meet Forest Plan long-term management goals by providing a natural appearing landscape with large trees.

No created openings due to harvest would occur in the foreground. Harvest would consist of approximately 238 acres of commercial thinning, followed by precommercial thinning and prescribed fire. The harvest would occur along 1.7 miles of Highway 7 (27% of the corridor within the project area) and 0.4 miles along Highway 26 (24%). Thinning would occur in variable densities, creating a more random, uneven-aged appearance in the foreground forested areas. Some areas would appear more open, encouraging pockets of regeneration. Views of large diameter pine and western larch would be accentuated. Growth and vigor of the existing ponderosa pine would be increased, accelerating their transition from black-barked appearance towards a wider fissured bark, typical of larger diameter orange-barked pine.

The effects from logging and temporary road construction are similar to those described in Alternative 2.

Cumulative Effects (Alternatives 2 and 3)

The area considered for cumulative effects are the foreground and middle-ground areas along Highways 7 and 26, within and adjacent to the Crawford Project Area.

Past timber harvest, including road construction, (prior to development of visual corridor plans for Highways 7 and 26) has affected the visual quality that resulted in the existing condition being less than the Forest Plan objective of “retention” for the visual corridors along Highways 7 and 26. This includes stumps, skid trails, and logging roads that detract from the natural appearance along the highways. The impacts of older activities within the visual foreground have started to diminish. Revegetation of exposed soil and deterioration of stumps is evident; reducing the dominance of mans activities. More recent activities including precommercial thinning on private lands near Austin along Highway 7 and prescribed burning on National Forest lands to the south of Highway 26 near the Dry Fork of Clear Creek have been short-term in nature. After a recovery period of 2 to 3 years, these harvest activities now meet partial retention standards and the prescribed burning meets retention standards.

There are no cumulative effects foreseen from proposed timber harvest, prescribed burning, or the road decommissioning since there would be only a short-term change in the foreground or middle-ground forested landscape. Prescribed burning in the visual foreground would be designed to minimize the visibility of limb and tree bole scorch and mortality to larger trees. Logging activity would be obvious for the duration of the harvest lasting 2 to 3 months. No foreseeable cumulative activities are identified in Appendix D that would add cumulatively to proposed activities in foreground or middle-ground areas.

Cumulative Effects (Alternatives 4)

The area considered for cumulative effects are the foreground and middle-ground areas along Highways 7 and 26, within and adjacent to the Crawford Project Area.

Past timber harvest, including road construction, (prior to development of visual corridor plans for Highways 7 and 26) has affected the visual quality that resulted in the existing condition being less than the Forest Plan objective of “retention” for the visual corridors along Highways 7 and 26. This includes stumps, skid trails, and logging roads that detract from the natural appearance along the highways. The impacts of older activities within the visual foreground have started to diminish. Revegetation of exposed soil and deterioration of stumps is evident; reducing the dominance of mans activities. More recent activities including precommercial thinning on private lands near Austin along Highway 7 and prescribed burning on National Forest lands to the south of Highway 26 near the Dry Fork of Clear Creek have been short-term in nature. After a recovery period of 2 to 3 years, these harvest activities now meet partial retention standards and the prescribed burning meets retention standards.

There are no cumulative effects foreseen from proposed prescribed burning, precommercial thinning or the road decommissioning since there would be only a short-term change in the foreground or middle-ground forested landscape. Prescribed burning in the visual foreground would be designed to minimize the visibility of limb and tree bole scorch and mortality to larger trees. No foreseeable cumulative activities are identified in Appendix D that would add cumulatively to proposed activities in foreground and middle-ground areas.

Consistency with Direction and Regulations

Visual Corridor – Foreground (MA–14)

The Visual Quality Objective of Retention is met by all the alternatives. The current trend toward over-stocked stands composed of later seral species associated with fire suppression and exclusion will be interrupted and a more stable environmental situation developed, with implementation of Alternatives 2 and 3. This would occur to a lesser extent with Alternative 4 which is limited to underburning in foreground areas. Commercial thinning in Alternatives 2 and 3 will help to develop larger trees in a shorter time span, as stocking levels are reduced to varying levels to promote larger more healthy trees. Western larch can be promoted where appropriate. This is consistent with direction in the Forest Plan, and Highway 7 (1995) and Highway 26 (2001) visual corridor plan recommendations.

Visual Corridor – Middle-Ground (MA–14)

The VQO of Partial Retention within the project area would be met with all alternatives. Areas within the project area middle-ground currently meet partial retention standards. No activities proposed in Alternatives 2, 3, or 4 would change these conditions.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments associated with the consequences of any of the alternatives analyzed to the visual quality or scenic integrity.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on visuals can be found in the Visuals Specialist Report, located in the project record.

Roads/Access

Regulatory Framework

A Sub-Forest roads analysis was completed for the Mill Creek Subwatershed. The subwatershed boundary is not the same as the project area. Only the portion of the Mill Creek Subwatershed north of Highway 26 is identified as the project area. An interdisciplinary process was used involving members of the Blue Mountain and Prairie City Ranger Districts to complete this analysis for the roads analysis. The team was charged with analyzing all of the roads in the area and recommending whether to keep them open, block/close or decommission them. This determination was based on the guidelines included in the Malheur National Forest Roads Analysis dated December 2004. The roads decisions are documented in the Crawford Roads Analysis List with associated maps attached.

Sub-Forest road analyses need to continue to strive to meet long-range road density goals by identifying opportunities to reduce both open road densities and total road densities. Those results of those efforts should focus on reducing the amount of funding needed for road maintenance, reducing road related impacts to fish and reducing the spread of invasive/noxious weeds.

The Malheur Forest Plan provides direction to address road density concerns by establishing open road density goals of no greater than 3.2 miles/square mile in summer range, 2.2 miles/square mile in winter range, and 1.5 miles/square mile in wildlife emphasis areas by the end of the first decade (1999). The forest has generally met those open road density goals, as the plan indicates road densities are to be monitored and evaluated on a watershed basis (5th level HUC). However, there are still many subwatersheds (6th level HUC) that have open road densities that exceed these levels. The plan also states that access management planning will strive for 1.5 miles/square mile on summer range and 1.0 miles/square mile on winter range as a long-term goal, "unless these densities do not allow for a healthy and productive forest as envisioned in the desired future condition, or interfere with access to private land." (Malheur National Forest Roads Analysis, Executive Summary, pg iv.)

Analysis Method

Each road in the project was field checked and road logs updated to reflect existing conditions. This information was used to update the GIS data base (INFRA Travel Routes).

Affected Environment

This section describes the existing condition and effects on access/travel management and the maintenance of National Forest System roads from activities proposed in each alternative. Road closures, decommissioning, maintenance, reconstruction, and temporary construction are the proposed activities that would potentially affect access and travel management and maintenance. These activities can affect resources such as wildlife habitat, water quality and fish habitat. The management and maintenance of the open roads comes at a cost to the federal government. The fewer the number of miles of open roads the less cost to the tax payer.

The historic use and access development in the area is well documented in the Upper Middle Fork Watershed Analysis. The road system has evolved over time. The Forest Service was building roads for fire access starting in about 1925, and the area was well roaded by 1950, but the majority of roads were constructed between 1960 and 1995. The area can be accessed from many directions but the primary access is east from John Day on U.S. Highway 26. All of the analysis area is north of US Highway 26, and can be accessed by turning north onto Forest roads inside the analysis area, or turning onto State Highway 7 at Austin Junction and accessing the analysis area both north and south of the highway. Major developed Forest Service roads that access the analysis area include roads, FSR 2620 and 2622.

An optimum road system supports land management objectives. For the Forest Service, those objectives have markedly changed in recent years. How roads are managed must be reassessed in light of those changes. Expanding road networks have created many opportunities for new uses and activities in national forests, but they also dramatically altered the character of the landscape. The Forest Service must find an appropriate balance between the benefits of access to the national forests and the costs of road-associated effects to ecosystem values. Providing road systems that are safe and responsive to public need, environmentally sound, affordable and efficient to manage is among the agency's top priorities.

In recent years most of the available funding has been directed towards maintaining the Forest Arterial and Collector roads (Level 3 to 5 roads), which receive the highest traffic use. The maintenance needs of local roads (Level 1 and 2 roads) have usually been deferred, because the funds to maintain the roads to standard are simply unavailable. The overall result is that most of the Forest road system is in a downward or deteriorating condition, and this is particularly true for many Level 2 roads, which remain open despite receiving very little maintenance.

There is a total of 113.5 miles of road within the Mill Creek Subwatershed. These roads include Highways 26 and 7, County Roads, and private roads in addition to National Forest System roads.

Existing Open: 50.7miles

Existing Closed: 62.8 miles

The Mill Creek Subwatershed area covers 17,846 acres which equals 27.87 square miles. The existing total road density is 1.8 miles per square mile.

Most of the roads in the Crawford Project Planning Area will need maintenance to meet current road maintenance objectives and classification standards.

Approximately 10.9 miles of road will need to be reconstructed before project use for Alternatives 2 and 3. Approximately 32.5 miles will need to have maintenance done to them for Alternative 2 and 29.2 miles for Alternative 3.

Included in the maintenance requirements for these roads is the following work that can be performed as maintenance in any contract:

Blade and shape road including existing drain dips and grade sags:

- Constructing waterbars/cross ditches,
- Seeding,
- Spot rocking in wet areas of road,
- Brushing,
- Remove danger trees, and
- Improve existing road junctions to provide adequate access.

The following work is classified as maintenance under the definition listed in the Federal Register but will be listed as reconstruction in any contracts that are signed:

Widening roadbed to meet standard width:

- Constructing new drain dips and grade sags,
- Major brushing,
- Removing large amounts of excess material,
- Rocking roadbed and/or drain dips and grade sags, and
- Road realignment.

The accomplishment of this work will make the open roads safer to travel and reduce sedimentation that will improve fish habitat.

Decisions to decommission some of the roads that are not part of the potential minimum primary road system are expected to occur over time as an outcome of sub-forest level analysis. When those decisions are implemented, any annual and deferred maintenance cost for roads that are decommissioned will be eliminated. Depending on the type road and decommissioning effort, the cost would range from as low as $1,000 per mile to greater than $10,000 per mile. But it will likely take a considerable amount of funding over an extended period of time to accomplish a significant decrease in the total miles of classified roads and the associated road maintenance costs. (Malheur National Forest Roads Analysis, December 2004, pg 44.)

For 2004, the allocated road maintenance budget for planning, construction and maintenance of roads is estimated at $790,000 (the budget allocation averaged about $1,000,000 per year from 1997 to 2002). This funding covers many aspects of road maintenance and management including the organization necessary to accomplish the overall program and associated overhead costs. The net result is that only about half of this funding is available to accomplish annual on-the-ground maintenance activities (Reference: Malheur National Forest Roads Analysis, (Road Maintenance Budget, pg 30).

Environmental Effects

Alternative 1 – No Action

Direct/Indirect Effects

Under the No Action Alternative, all existing open roads would remain open and left in the same condition they are in now. Access would be provided at existing levels, but there would be no opportunity to close or decommission roads or to improve drainage by installing additional drainage dips, waterbars, or cross ditches. This alternative would continue to deliver sedimentation into streams at the current level or higher and would remain at the same cost to the Federal government to meet road maintenance standards.

The agency would continue to expend limited funds for maintenance of unneeded roads.

The amount of funding and opportunities available to complete annual maintenance needs has drastically declined over the past decade. As a result the Forest has a large backlog of deferred maintenance needs, which continue to grow in magnitude. Recent communication from the Regional Office indicates funding may be available in the near future to address road conditions and decisions.

The most important road related environmental issue is the effects of roads on aquatic resources in general, specifically threatened endangered and sensitive aquatic species. The magnitude of those effects is largely dependent on how well the roads are maintained. This alternative would not provide opportunities available to do any maintenance, which have drastically declined over the past decade.

This alternative would have the least impact on access. The road density within the subwatershed would remain below the 1999 Forest Plan objectives.

Alternative 1 would not follow the Malheur Forest Roads Analysis, dated December 2004, for recommendations.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects. The area considered for cumulative effects is the Mill Creek Subwatershed. Past road construction was very limited prior to 1940, but intensified from then until 1980 to the point where road density exceeded 3.0 to 4.0 miles/square mile on most of the Forest. Many roads built during that period were poorly located requiring frequent maintenance. The cumulative effects related to the maintenance costs for the entire road system would remain the same.

There will be ongoing and future actions that could affect roads and access, including replacement of culverts for fish passage.

Common to Alternatives 2, 3, and 4

Direct /Indirect Effects

All action alternatives include the same number of planned road closures and decommissioning. This was designed to maintain an adequate transportation system for the public and forest management activities such as wildfire suppression. Access to identified dispersed camping sites was generally not closed unless there were identified problems with the road such as sedimentation.

The majority of roads proposed for decommissioning are currently classified at Maintenance Level (ML) 1, which are currently closed.

With increasing budget constraints, the agency cannot adequately maintain the majority of road miles at their designed maintenance level. Failure to maintain these roads may impair water quality by eroding and/or contributing sedimentation to streams. Closure of these roads would improve water quality, and reduce maintenance costs.

When roads are closed, they are assigned a ML 1 status. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to minimally perpetuate the road to facilitate future management activities. Emphasis is given to assuring drainage structures suitable for the runoff pattern are in place and functional prior to closure. These newly closed roads are inspected annually for 2 or 3 years to assure the drainage facilities are adequate and self maintaining. Planned road deterioration, such as increased vegetation growth and bank slough to natural slope repose may occur at this level. While these roads are closed to motorized vehicles, they remain open and suitable for non-motorized travel.

Decommissioned roads are permanently closed and no longer maintained. Soil compaction may be reduced where feasible, and cut or fill slopes may be returned to natural contours. Manufactured drainage structures (culverts) are removed. Where appropriate, bank cuts or ditches created by the removal of these structures may be contoured to provide natural drainage and prevent erosion.

Road maintenance activities are proposed to correct erosion problems associated with roads used for commercial harvesting. Direct beneficial effects from this proposed activity would be improved road conditions. Blading road surfaces and cleaning ditches would have no negative impact on access, as roads remain open during these activities.

Within the Mill Creek Subwatershed, a total of 51.1 miles of road would remain open for public use; 0.7 miles would be closed long-term with gates. 17.5 miles of closed roads would be decommissioned, and 0.3 miles of open road would be decommissioned. Other closures and decommissioning would occur as funding becomes available during the next 5 years. Recent communication from the Regional Office indicates funding may be available in the near future to address road conditions and decisions.

The Table RA – 1 below shows the road closure comparison between alternatives.

These roads would be treated according to the recommendations in the Crawford Roads Analysis, which would reduce the miles of open and closed roads in the subwatershed by 17% compared to existing conditions and Alternative 1. The work that would be done under Alternatives 2, 3, and 4 would lower the open road densities and the total road densities and improve fish habitat by closing and/or decommissioning roads in the RHCAs.

Table RA – 1. Summary of Proposed Road Closures and Decommissioning Activities.

Activity	Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Roads Reopened	Miles	2.1	2.1	2.1	2.1
Roads Closed	Miles	1.5	1.5	1.5	1.5
Roads Decommissioned	Miles	18.0	18.0	18.0	18.0

Note: Rounding road miles during calculations may result in minor (0.1) mile discrepancies between alternatives.

New temporary roads, authorized under the timber sale contract would provide access for timber harvest activities. Since temporary roads are not intended to be part of the Forest Transportation system they would be decommissioned after timber sale activities were completed.

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects. The area considered for cumulative effects is the Mill Creek Subwatershed. Past road construction was very limited prior to 1940, but intensified from then until 1980 to the point where road density exceeded 3.0 to 4.0 miles/square mile on most of the Forest. Many roads built during that period were poorly located requiring frequent maintenance. The proposed road closures of these poor located roads would reduce the cumulative effects related to the maintenance costs for the entire road system.

The cumulative effects of these alternatives and road closures that are likely in the future would be a reduction in sedimentation, improve water quality, fewer roads to maintain, less money spent on maintenance, reduce access for all motorized users, increased response time for fire crews, and less disturbance to wildlife.

There will be ongoing and future actions that could affect roads and access. These include replacing culverts for fish passage and removing culverts on roads that will be decommissioned

Alternative 2

Direct/Indirect effects

This alternative proposes the highest level of road maintenance work through timber harvest activities. This alternative would close or decommission roads as part of the work done with the timber harvest activities. 1.5 miles would be closed and 18.0 miles would be decommissioned through timber harvest activities.

32.5 miles of road maintenance activities are proposed for this alternative. 10.9 miles will need to be reconstructed before timber haul begins. The 8.6 miles of temporary road construction would be utilized through harvest operations and scarified (if needed), and permanently closed at the conclusion of harvest operations. The additional closures and decommissioning would occur over the next 5 years as funding becomes available. Recent communication from the Regional Office indicates funding may be available in the near future to address road conditions and decisions.

Table RA – 2. Road and Access Activity Occurring During Harvest Activities for Alternatives 2 & 3.

Activity	Measure	Alt. 2	Alt. 3
Roads Closed	Miles	1.5	1.5
Roads Decommissioned	Miles	18.0	18.0
Road Reconstruction	Miles	10.9	10.9
Road Maintenance	Miles	32.5	29.2
New Road Construction	Miles	0.0	0.0
New Temporary Roads	Miles	8.6	1.5

Note: Rounding road miles during calculations may result in minor (0.1) mile discrepancies between alternatives.

Alternative 3

Direct and Indirect effects

This alternative recommends the least amount of temporary road construction for timber harvest activities. This alternative would close or decommission roads as part of the work done with the timber harvest activities. 1.5 miles would be closed and 18.0 miles would be decommissioned.

Road maintenance totaling 29.2 miles are proposed for this alternative. Approximately 10.9 miles will need to be reconstructed before timber haul begins. The 1.5 miles of temporary road construction would be utilized through harvest operations and scarified (if needed), and permanently closed at the conclusion of harvest operations. The additional closures and decommissioning would occur over the next 5 years as funding becomes available. Recent communication from the Regional Office indicates funding may be available in the near future to address road conditions and decisions.

Alternative 4

Direct and Indirect effects

Under this alternative, there would be no reconstruction, no temporary road construction and just the ongoing road maintenance. The closures and decommissioning are the same as proposed for Alternatives 2 and 3 and would occur over the next 5 years as funding becomes available.

Consistency with Direction and Regulations

Alternative 1 would not bring this area any closer to meeting the Standards and Guidelines for road densities, fish habitat, or water quality which is contained in the Malheur Forest Plan.

Alternatives 2, 3, and 4 would follow the General Road Management guidelines recommended in the Malheur National Forest Roads Analysis (pg 47) and would help move the Forest closer to meeting the guidelines for closing roads.

Irreversible/Irretrievable Effects

All alternatives use rock on roads for spot rocking. This would be an irreversible commitment of rock **(**considered to be a resource). This rock would come from Source #1 located on the 2646 road in T. 12 S., R. 35.5 E., Section 3 or Source # 2 in T.12 S., R. 35.5 E., Section 4. The rock is already pushed into a pile at both sites.

There would be a short-term loss of productivity where temporary roads are proposed in Alternatives 2 and 3. Those areas would be returned to productivity when the roads are rehabilitated.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on roads can be found in the Roads Analysis, located in the project record.

Heritage Resources

Regulatory Framework

The legal framework that mandates the Forest to consider the effects of its actions on cultural resources is wide-ranging. In this case, Section 106 of the National Historic Preservation Act (NHPA) of 1966 (amended in 1976, 1980, and 1992) is the foremost legislation that governs the treatment of cultural resources during project planning and implementation. Federal regulations such as 36 CFR 800 (Protection of Historic Properties), 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places), 36 CFR 296 (Protection of Archaeological Resources) and Forest Service Manual 2360 (FSM 2360) clarify and expand upon the NHPA. The Pacific Northwest Region (R6) of the Forest Service, the Advisory Council on Historic Preservation (ACHP), and the Oregon State Historic Preservation Office (SHPO), signed a programmatic agreement (PA) regarding the management of cultural resources on National Forest system lands in 2004. The 2004 PA outlines specific procedures for the identification, evaluation, and protection of cultural resources during activities or projects sponsored by the Forest Service. It also establishes the process that the SHPO utilizes to review Forest Service undertakings for NHPA compliance.

The National Environmental Policy Act (NEPA) of 1969 is also a cultural resource management directive as it calls for agencies to analyze the effects of their actions on sociocultural elements of the environment. Laws such as the National Forest Management Act (NFMA) of 1976, the Archaeological Resources Protection Act (ARPA) of 1979, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, Executive Order 13007 (Indian Sacred Sites) Executive Order 13084 (Consultation and Coordination with Indian Tribal Governments), also guide Forest Service decision-making as it relates to Heritage. The American Indian Religious Freedom Act (AIRFA) of 1978 requires that federal agencies consider the impacts of their projects on the free exercise of traditional Indian religions. Executive Order 13175 (EO 13175), Consultation and Coordination with Indian Tribal Governments, November 6, 2000, directs federal agencies to engage in regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications and to strengthen the United States government-to-government relationship with Indian tribes.

The Malheur National Forest Land and Resource Management Plan, the Malheur Forest Inventory Plan (Thomas 1991), and the Programmatic Memorandum of Agreement for Historic Railroad Systems (1986), all have been developed to tier to the previously mentioned laws and corresponding Forest Service manual direction as it sets forth resource management goals, objectives, and standards. Although, the Malheur National Forest was not originally included in the Programmatic Memorandum of Agreement for Historic Railroad Systems (1986), approval was issued Region wide with the 1995 Programmatic Agreement (which preceded the more recent 2004 Programmatic Agreement). Forest-wide management standards that are pertinent for this cultural resource effects analysis include:

- Conduct a professionally supervised cultural resource survey on National Forest lands to identify cultural resource properties. Use sound survey strategies and the Malheur National Forest Cultural Resource Inventory Survey Design.
- Evaluate the significance of sites by applying the criteria for eligibility to the National Register of Historic Places.

- Consider the effects of all Forest Service undertakings on cultural resources. Coordinate the formulation and evaluation of alternatives with the State cultural resource plan, the State Historic Preservation Office and State Archaeologist, other State and Federal agencies, and with traditional and religious leaders of Native American Indian groups and tribes with historic ties to the project planning area.

Analysis Methods

Cultural resource identification efforts in the vicinity of the project area have focused on two primary types of resources: prehistoric archaeological sites and historic archaeological sites. Cultural resource identification efforts that have been conducted include literature reviews and consultation with Native American tribes and other stakeholders that are historically associated with the area, as well as pedestrian survey. Twelve previous pedestrian cultural resource inventory surveys adequate to today's standards (as defined in Thomas 1991) have been conducted in the Crawford Project Area and the project area's immediate surrounding terrain. The cultural resource inventories which have been concurred by SHPO include the following: The Summit Weir Construction CRIS 645 – 89/112, Blue Mountain Stock Ponds CRIS 645 – 89/122, Wye Timber Sale CRIS 645 – 89/129, Dan Thin Timber Sale CRIS 645 – 89/130, Tie Timber Sale CRIS 645 – 89/132, Spike Timber Sale CRIS 645 – 90/136, Austin Seed Orchard CRIS 645 – 90/151, Tipwood Timber Sale CRIS 645 – 92/175, Summit Creek Analysis Area CRIS 645 – 93/179, Silviculture 1993 CRIS 645 – 93/194, Idaho Power Vegetation CRIS 645 – 95/219, OTEC Fiber Optic Line CRIS 645 – 95/230 and Crawford Vegetation Management Analysis Area CRIS 645 – 97/218.

Heritage Analysis Area

The Crawford Project Area includes all National Forest system lands administered by the Blue Mountain Ranger District (BMRD) that are within the designated boundary established for this project (see Figure 1.1). This boundary area is the Mill Creek Subwatershed located on the BMRD north of State Highway 26. The Mill Creek Subwatershed includes Mill Creek to its confluence with the Middle Fork John Day River (Middle Fork), Crawford Creek to its influence with the Middle Fork, and the Middle Fork from the confluences of Summit Creek and Squaw Creek downstream to the confluence of Bridge Creek. The cultural resources effects analysis will focus on historic properties identified within the Crawford Project Area. The proposed action and its alternatives do not have potential to have indirect effects (i.e., visual, auditory, atmospheric) on cultural resources that are distant from the analysis area.

Affected Environment

The Crawford Project Area contains the headwaters of the Middle Fork of the John Day River and tributary streams which are part of the John Day River Basin, eventually flowing into the Columbia River. The project area lies within the Blue Mountain Physiographic Region of Eastern Oregon. The topography of the area is mountainous with gentle to moderately steep slopes formed by tectonic activity and subsequent weathering and erosional processes. Primary landforms include ridgetops, mountain slopes, and dissected canyons. Additional physiographical description of the project area is available in the Crawford Project EIS.

Heritage surveys to date have identified 48 cultural properties recorded as sites inside the Crawford Project Area. Of the 48 total sites, 18 are prehistoric sites, 15 are historic sites, and 15 are multi-component sites with both historic and prehistoric elements. Twelve of the sites are eligible for the NRHP, 24 are potentially eligible (unevaluated), and 12 are concurred ineligible for inclusion on the NRHP. The Sumpter Valley Railway historic district, which was listed on the National Register of Historic Places in 1987, is also within the planning area.

No information currently exists that suggests that traditional cultural properties, as defined by Parker and King (1998), exist within the Crawford Planning Area. A general concern regarding cultural plant habitat and their protection from the proposed activities was expressed in a letter from the Burns Paiute Cultural Consultant.

Ethnographic Overview with Prehistoric Site Discussion

The Upper Middle Fork John Day River Watershed, within which the Crawford Project Area is located, may have been a scene of human activity for 11,000 years before present. This area is located on the boundaries of two of North America's Native American Cultural Areas: the Columbia Plateau and the Great Basin. Peoples from both of these regions occupied the Upper Middle Fork in the prehistoric period. The Confederated Tribes of the Warm Springs Reservation ceded the land the project area is located within to the United States by way of treaty in 1855 (United States Congress: Treaty With The Tribes Of Middle Oregon, 1855). Ethnographic information indicates that the Columbia Plateau Umatilla and the Great Basin Northern Paiute were the principal users of the Middle Fork John Day. While the Umatilla used the resources of the area it is said they recognized that the Northern Paiute had a territorial claim (Ray et al. 1938).

Culturally important plant species, such as lomatium, yarrow, wild onion, camas, and various berries, are present in the project area. Virtually every plant in the natural environment had cultural use among the Native American peoples of the region.

Prehistoric Sites in the Project Area

The majority of the cultural properties in the project area include lithic dominated archaeological sites known as “lithic scatters.” Sites of this type contain stone artifacts and the residues of their manufacture and rejuvenation and are visible at the surface of the ground. They are primarily valued due to their potential ability to contribute to scientific or scholarly information to studies of the prehistoric and Protohistoric past (Keyser et al. 1988). The 18 prehistoric archaeological sites within the planning area are generally small in area, display low levels of surface density, and have assemblages of formed tools that are marked by a low-level of tool class diversity. An exception to the generally small sized lithic scatters is the presence of a site that is in excess of 120 acres which served as a lithic procurement locality and early stage reduction workshop. Two other sites in the planning area that exceed 25 acres also display evidence of toolstone procurement and primary reduction activities.

The tool types observed in the lithic scatter sites in conjunction with their surrounding environs suggest that hunter-gatherer activities in the planning area were focused on the extraction of food and industrial resources such as big game, root crops, and toolstone. Intensive on-site processing of resources certainly occurred, as evidenced by the several fragments of groundstone from the planning area, although apparently far less frequently than resource procurement activities. Data from several of these sites indicate a potential for buried archaeological deposits.

Historic Period Overview

The discovery of gold in the 1860s in Canyon Creek at the confluence of the John Day River, led to an influx of fortune hunters in the Blue Mountains. Although the major deposits of gold were found downstream of the Upper Middle Fork Subwatershed, mining also took place along the whole length of the Middle Fork John Day River. Wagon roads were built to connect the various mining towns throughout the area. Some homesteads were established in the 1860s, with limited agriculture and stock raising, to serve the needs of the miners (Mosgrove 1980).

Grazing of livestock has been an important socioeconomic activity in the area. The allotments in the Crawford Project Area have historically been grazed by domestic livestock, with intensive sheep grazing in the late 1860s until the 1960s. From the 1940s until the preset day, most of the domestic livestock grazing in the area has been dominated by cattle.

The Sumpter Valley Railroad, a narrow gauge railroad, was constructed in 1905 to access the natural resources in this area of the Blue Mountains. This railroad system fostered the industrialization of logging and mining in the Blue Mountains, and enhanced transportation to outside markets and destinations for farmers, ranchers, and travelers. A preponderance of the thirty sites with historic components (15 of these also have prehistoric components) in the project area are related to use of the railroad during its construction and maintenance and the depression era logging operations. Historic site types in the planning area include: can and bottle dumps or debris scatters, log troughs, structural ruins, narrow gauge railway mainline, permanent and temporary railroad spurs, dendroglyphs, roads, springboard tree stumps, and the remains of lumber mills and logging camps.

Environmental Consequences

A project is considered to have an adverse effect on cultural property when it results in the alteration of characteristics that qualify the property for the National Register of Historic Places. The cultural properties that have been identified within the Crawford Project Area are eligible or potentially eligible (unevaluated) for the NRHP on the basis of their ability to yield scientific information that is important to studies of prehistory or history. Therefore, proposed activities that modify the patterning of surface or buried archaeological deposits are considered to result in an adverse effect. Project effects that enhance site stability and the potential effects of the No Action Alternative are also discussed.

Alternative 1 – No Action

Direct and Indirect Effects

If the No Action Alternative is pursued, there will be no direct effect on the existing conditions of the cultural resources identified within the Crawford Project Area. Forest stands and habitats within and surrounding significant historic properties and areas are potentially important for traditional use by regional tribes and would remain in their existing conditions. However, cultural properties within the Crawford Area and in adjacent areas would continue to be in jeopardy of damage or destruction by wildfire under the No Action Alternative. Selection of the No Action Alternative will also not enhance habitats that support fisheries, wildlife or plant species that are traditionally important to regional tribes of American Indians. This alternative would not meet the direction set forth in the Malheur National Forest Management Plan (1990), which instructs the Forest to take action to enhance cultural resources in the Middle Fork John Day River area. Also, if access is not reduced as proposed in the action alternatives, archaeological sites may be exposed to elevated levels of surface collecting or vandalism.

Cumulative Effects

Current fuel conditions are partially a result of past human caused cumulative effects such as those listed in Appendix D. The No Action Alternative would not reduce fuel loads across the landscape within the Crawford Project Area and not incrementally reduce risks that the resource will experience future wildfire events. The threat of severe or moderately-severe wildfire will not contribute to the long-term stability of heritage sites. Therefore, the No Action Alternative may result in a detrimental cumulative effect to heritage resources.

Common to All Action Alternatives

Direct and Indirect Effects

Timber harvest activities will have no direct effect on any archaeological or historic resources in the Crawford Project Area as long as the project design elements are observed. Since ground based logging activities, as proposed in Alternatives 2 and 3 can be detrimental to all site types, all NRHP eligible or potentially eligible cultural sites will be avoided/protected from all ground disturbing activities during commercial harvest activities. Actions necessary for the harvest activities of ground-based logging such as felling, skidding, decking, and slash disposal (i.e., hand-piling/burn and grapple piling/burn activities) may have direct detrimental effects on archaeological deposits situated within the project area. There is one prehistoric lithic scatter that is located within a commercial thinning unit under the action alternatives.

Indirectly, reducing the accumulations of fuels through commercial thinning (Alternatives 2 and 3) would reduce the severity of potential wildfires and would enhance the long-term stability of archaeological and historic resources within the Crawford Area and also lands adjacent to the analysis area. The risks that cultural resources face from additional wildfire events would diminish as standing large diameter fuels are reduced. Reducing the amount of small diameter fuels in the analysis area through precommercial thinning (Alternatives 2, 3, and 4) would also contribute to reducing the risk of wildfire recurrence.

The lithic scatter archaeological sites that have been identified in the project area could be damaged by reforestation measures that are conducted in their vicinity under Alternative 2 – the proposed action. Although there are no known archaeological sites within the planned 119 acres to be planted, the proposed action would reforest a shelterwood harvest area by planting conifer tree seedlings. Conversely, lithic oriented archaeological sites that could be located in reforestation units may realize an indirect beneficial effect as reforestation stabilizes erosive soils and reforests understocked areas. Reforestation will expedite the establishment of vegetative cover over exposed archaeological resources and reduce the likelihood that lithic scatters will be impacted by surface collection.

Activities associated with the construction of temporary roads and landings (Alternatives 2 and 3), as well as road closing or decommissioning (Alternatives 2, 3, and 4), can also degrade the integrity of archaeological sites. The action alternatives would construct between 1.5 and 8.6 miles of temporary roads, reconstruct about 10.9 miles, close up to 1.5 miles of road by gating, or decommissioning 18 miles, and constructing a maximum of 111 acres of log landings. Log hauling may occur on Forest Roads 2620000 and 2620498, which travels through an historic property, but this will not result in any additional effects on that site in the form of additional surface disturbances. A temporary road will be constructed across a segment of the Sumpter Valley Railroad, but this temporary road will avoid all wooden tie remnants and the grade will be returned to its previous existing condition after the temporary road is no longer in use. Indirectly, road closures and decommissioning might also protect exposed archaeological resources from artifact collecting and vandalism, to an unknown degree, as access is reduced.

Many of the cultural resource properties within the analysis area are lithic oriented prehistoric sites. Studies have shown that fire exceeding 300 degrees Celsius can damage obsidian hydration layers (Buenger 2003, Solomon 2000). Under the terms of the Management Strategy for the Treatment of Lithic Scatter Sites (Keyser et al. 1988), the deployment of low intensity prescribed fire (less than 300° C.) within the established perimeter of lithic scatter sites will have negligible to minimal effects on the scientific or scholarly values that such sites hold.

The BMRD Heritage Program, in consultation with Oregon SHPO (Rotell 2000), has determined that the proposed low-intensity prescribed fires planned for the Crawford Project Area should have no direct effect on properties that are eligible or potentially eligible for the National Register of Historic Places. If the prescribed burn remains in prescription, fire intensity would not rise to a level that could initiate or accelerate surface erosion and significantly detract from the scientific or scholarly value of buried archaeological sites. No more than 10% of the substrate underlying forest litter and ground cover vegetation is expected to be exposed. Root systems of shrubs, trees, and some grasses should remain intact after the burn. Prescribed burns applied over a landscape scale result in highly variable mosaic burn patterns in which large burned areas are adjacent to areas that are completely unaffected by fire. If implemented as planned the project should, in fact, reduce existing fuels that cover or surround sites and enhance long-term cultural site stability as the risk of wildfire is reduced.

Since concentrated fuels can reach high temperatures, and in turn, affect the integrity of lithic scatter sites, the project design elements do not permit the burning of concentrations of fuels, such as hand piles and burning or grapple piling and burning, within the boundaries of known lithic oriented archaeological properties.

Historic sites that include fire sensitive above ground features such as architecture, wooden structural remains, and glass and metallic artifacts would be protected through project design criteria. Only two historic sites potentially eligible to the NRHP are located within the prescribed burn area. These sites will be protected during any prescribed burning activities, through avoidance or the application of fire retardant.

Commercial thinning treatments that address the purpose and need may increase the density and distribution of culturally significant plants in the project area. Species that are dependent on riparian habitats such as aspen, chokecherry, and willow will realize the greatest benefits.

Adjustments of DOGs and additions to ROGs, and delineation of pileated woodpecker feeding areas would have no effect on any identified cultural resources.

Cumulative Effects

Related actions relevant to the analysis are the past, present, and reasonably foreseeable future actions noted and described in Appendix D. Previous timber harvest projects, including railroad logging and associated activities from 1910 to the 1960s, wildfires, mining activities, livestock grazing, Forest and State highway road construction, recreational activities, and firewood cutting have had incremental negative effects on the cultural properties that have been identified within the Crawford Project Area. With the implementation of the project design elements for heritage resources, there is minimal risk of additional incremental degradation of the cultural properties associated with the proposed action and its alternatives.

Characteristics of some heritage resource sites, such as portions of the Sumpter Railroad line and its spurs and an historic wagon trail, were compromised beginning in the 1920s when the old grades and trail were converted into roads, including Forest Service roads and State Highway 26, to access the Forest and other communities.

Reasonably foreseeable future activities in the planning area include conifer planting, prescribed fire, livestock grazing, road maintenance, and culvert replacement. Identified cultural properties will be avoided, and project implementation will be halted if it is determined that a cultural property has been damaged or may become damaged. However, most such potential impacts that heritage sites might incur from such foreseeable future actions as conifer planting, prescribed burning, hazard tree removal, and livestock grazing would be mitigated as per Stipulation III A of the 2004 Programmatic Agreement with Oregon SHPO.

Ground-based logging systems can present some risks to archaeological resources. Since site identification efforts were limited to surface surveys, it is possible that site boundaries may not be delineated with complete accuracy and that efforts to avoid sites during the timber harvest activities may not be entirely successful. It is likewise possible that undocumented archaeological resources in buried contexts may be inadvertently disturbed. Mechanical damage of the archaeological record is irreversible and permanent in duration. This risk is also cumulative, in that it increases in relation to the amount of ground-based logging activities conducted in the area.

The action alternatives reduce fuel conditions across the landscape within the Heritage Resource Area to some extent, and incrementally reduce the risk that the resource will experience future wildfire events. Actions reducing the likelihood of a severe or moderately-severe wildfire, will contribute to the long-term stability of cultural properties in the analysis area. The risks of fire-sensitive historic properties sustaining serious damage or destruction from wildfires will diminish as stands move toward a more fire-tolerant composition of species.

Consistency with Direction and Regulation

Heritage and Tribal interests are regulated by federal laws that direct and guide the Forest Service in identifying, evaluating and protecting heritage resources. All of the alternatives would comply with federal laws. The Malheur National Forest Plan tiers to these laws, therefore the proposed action alternatives will meet Forest Plan Standards. With the completion of the Heritage inventory under the terms of the 2004 PA with Oregon SHPO and by providing the interdisciplinary team with appropriate input as per NEPA, all relevant laws and regulations have been met.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to cultural resources. Ground disturbing activities will avoid all NRHP eligible and potentially eligible (unevaluated) cultural properties.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on cultural resources can be found in Heritage Specialist Report located in the project record.

Economics/Social

Regulatory Framework

The Malheur Forest Plan includes Forest-wide management goals to:

- Provide a sustained flow of timber for lumber, fiber, and/or associated wood products at a level that will contribute to economic stability, while providing for regional and national needs.
- Contribute to the social/economic health of communities, which are significantly affected by national forest management.
- Provide an economic return to the public.
- Provide and utilize wood fiber in the form of sawtimber, fiber, and/or associated wood products, while minimizing losses and maximizing outputs in a cost-effective manner, consistent with the various resource objectives and environmental standards.

The Code of Federal Regulations (CFR) is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. Minimum specific management requirements are identified in 36 CFR 219.27, to accomplish goals and objectives for the National Forest System. Those management requirements are addressed as follows:

- Section (b) Vegetative Manipulation: (1) Multiple-use; (3) Not chosen for greatest dollar return; (7) Practical transportation, harvest requirements, and preparation and administration.
- Forest Service policy sets a minimum level of financial analysis for project planning (FSH 1909.17).
- The National Environmental Policy Act requires integrated use of the natural and social sciences in all planning and decision-making that affects the human environment. The human environment includes the natural and physical environment, and the relationship of people to the environment (40 CFR 1508.14). Forest Service land management planning regulations require the integration of social science knowledge into forest and regional planning processes (36 CFR 219.5).
- Title 40, Code of Federal Regulations for NEPA (40 CFR 1502.23) addresses non-commodity values, stating “For the purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis, and should not be, when there are qualitative considerations.”
- 36 CFR 219.3 – National Forest System Land and Management Planning.
- Executive Order 12898 (February 11, 1994) on Environmental Justice directs federal agencies to identify and address agency programs that may have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes. The order directs federal agencies to focus attention on the human health and environment effects to ethnic minorities (American Indians, Hispanics, African Americans, and Asian and Pacific-Islander Americans), disabled people, and low-income groups.

Analysis Area

Although individuals and communities over a wide geographic area use national forest resources, the residents and businesses of counties near the forest depend most heavily on the availability of the resources. Consequently, the effects of forest management on social and economic factors are strongest within these areas. For this reason, the Malheur National Forest primary zone of influence is defined as Grant and Harney counties in Oregon.

Analysis Methods

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

An economic efficiency analysis was completed. It focused on identifiable and quantifiable ecosystem benefits and costs for each alternative in terms of the present net value (benefits minus costs); to assess which alternative comes nearest to maximizing net public benefits (36 CFR 219).

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

This analysis is based on identifiable and quantifiable economic benefits and costs, and is more typically a financial comparison between revenues and costs. The objective of the economic efficiency analysis is to show a relative measure of difference between alternatives, based on direct costs and values used. All dollar values have been discounted in terms of the present net value (2007 dollars). Discounting is a process whereby the dollar values of costs and benefits that occur at different time periods are adjusted to a common time period so that they can be compared. The real (exclusive of inflation) discount rate of 4% was used in the analysis over the planning period.

Present net value is defined as the present (discounted) net value of project benefits minus the present net value of project costs. A benefit-cost ratio is the ratio of present net benefits to present net costs. Present net value is a more appropriate measure for comparison between alternatives when land and productive activities are limiting, such as in an environ-mental analysis of alternatives. A benefit-cost ratio comparison is more appropriate when investment capital is limited, for example when considering budget allocation among a number of different activities.

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

Costs for reforestation and other direct work were developed based on previously experienced costs. Costs for temporary roads and road maintenance were included in the Transaction Evidence Appraisal.

Non-commodity values were not included in this analysis, because these resources are evaluated under the specific resource section (40 CFR 1502.23). Effects on resources are documented in individual resource sections.

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

Affected Environment

A social and economic analysis entitled *Recovery Efforts 2002 Fires – Final Environmental Impact Statement: Social and Economic Conditions*, has been completed for the fire recovery efforts on the Malheur National Forest (Kohrman 2003). This document is incorporated by reference under 40 CFR 1502.21. The document presents social and economic affected-environment information for this analysis. It provides information on human uses, social and economic characteristics, and conflicts among various users and uses of the ecosystem. It also discloses: the health of the relationships among the people (community), the forest, and the larger ecosystem; perceptions and values related to ecosystem management; and recent social and economic trends in the economic region. The focus is primarily on, but not limited to, Grant and Harney counties.

Changes in levels of resource use associated with the Crawford Project may affect the major social and economic characteristics of the surrounding geographic area. The affected area or impact zone for the Malheur National Forest consists of Grant and Harney counties in Oregon. Agriculture, manufacturing (particularly wood products), and retail trade are important sources of employment and income in this region. Grant County, for example, has a low level of economic diversity, a high dependence on federal timber and forage, and a low resiliency for change. Reliance on timber and forage from federal lands is moderate to high in counties in the impact zone (Haynes and Horne 1997).

Many communities are closely tied to the forest in both work activities and recreation. The local communities within an hour or two drive that are anticipated to be directly or indirectly affected by the proposed action, alternatives, and their associated economics include: Prairie City (population 1,080), Burns/Hines (4,565), Dayville (140), John Day/Canyon City (2,740), Long Creek (260), Mount Vernon (650), Monument (150), Seneca (230), Sumpter (175), and Unity (145). Austin, Greenhorn, and Hereford are examples of other smaller communities also located in the vicinity. Larger cities two or more hours away from John Day include: Bend (52,029), Baker City (10,160), LaGrande (12,795), Ontario (10,680), and Pendleton (16,915) (Kohrman 2003).

Employment

Cattle production and forest products provide the core employment for Grant and Harney counties. Forest products industries include three major lumber mills and numerous logging companies. Wood products employment totaled 410 direct jobs (i.e. mill workers and loggers) and 102 indirect jobs, approximately 5% of the total non-farm employment in Grant and Harney counties (average annual in 2007). Local government, retail trade, and services employ the most people in Grant and Harney counties (Oregon Employment Department 2003a). The area surrounding the Crawford Project Area is rural, and has disproportionately high unemployment compared with the Oregon state average and the National average. Grant County is in its sixth consecutive year of declining non-farm employment, and “this is quite possibly the longest on-going downturn any local labor market area in Oregon has ever experienced” (Kohrman 2003).

Ranchers in Grant County, with federal permits in the analysis area, are highly dependent on forage from federally-managed lands, compared to other counties in the region. The value of cattle reared on forage from federally-managed lands represents more than 10% of total agricultural sales in Grant and Harney counties (Kohrman 2003). Baker, Wheeler, and Malheur counties are rated moderately dependent (3.57 to 10% of total agricultural sales came from cattle raised on forage from federally-managed lands). Union, Umatilla, Morrow, and Gilliam counties are less dependent (less than 3.57%). Shifts in permitted use of federal grazing allotments change the availability of this forage source. The impact these shifts have on the local economy varies according to the adjustments that local ranchers have to make within their ranching operation.

Recreation-based industries, while prevalent elsewhere in the region, have not been a major contributor to the local economies. Recent efforts indicate that the volume of business is only enough to supplement income, rather than provide a primary source of income. The exception is hunting season, which typically draws larger numbers of people into the area. Stores that sell sporting goods benefit during this period. Recreation-based employment is seasonal and service-oriented, with wages at the lower end of the pay scale. Economic activity based on recreation may have limited growth potential for communities in the area. Seasonal limitations, the dispersed nature of recreation within the counties, along with a general lack of large, water-based recreational opportunities, does not create the concentrated numbers of recreationists and readily-identifiable recreation destinations necessary to support many recreation industries (Kohrman 2003).

Historically, government employment and expenditures has provided a degree of stability in rural communities. With reduced Forest Service budgets and work force, and a switch to management emphasis that produces generally lower amounts and value of products, federal workforce and program expenditures has not buffered economic downturns as in the past. This situation, combined with fluctuations in the other base industries, has had a significant effect on the economy (Kohrman 2003).

The communities surrounding the Crawford Project Area are considered rural in character, and have a disproportionately high unemployment compared with the Oregon State average of 5.2% and the National average of 4.6 % (seasonally adjusted). Unemployment in Baker County for December 2007 was 6.3%, Grant County – 8.7%, Harney County – 8.9% and Malheur County – 6.2%.(Oregon Employment Department 2007, Unemployment Rates.)

Average Wages

Average annual pay per job provides an indication of the quality of jobs in the analysis area. Average income for the affected counties is also below the national and state averages: United States $37,765, Oregon $34,446, Baker County $25,877, Grant County $25,342, Harney County $25,612, Malheur County $25,033 (Oregon Employment Department 2003a). Wages in Grant and Harney counties are lower, primarily due to lower wage rates per hour and a larger number of part-time jobs, compared to the state as a whole (Kohrman 2003).

Per Capita Income

Per capita income measures economic well-being, taking into account both population and income changes, although it does not address income distribution. Per capita personal income is total personal income divided by the estimated population. Per capita income in Grant and Harney counties is approximately $24,967 and $22,382 (2003 dollars), respectively. These counties lag behind the statewide average of $29,175 (2003 dollars).

Refer to: Kohrman E. B. 2003, Recovery Efforts 2002 Fires, Social and Economic Conditions, U.S. Department of Agriculture, Forest Service, Malheur, Umatilla, and Wallowa-Whitman National Forest, Social Economic White Paper, for further detailed description of the main social economic characteristics of the area.

Environmental Justice

The population of the area is predominately white, followed by American Indians. The region is sparsely populated, and contains low populations of minorities (5.5% of the Grant County population, 5.4% of Baker County, 9.9% of Harney County, and 31.2% of Malheur County (of which 25.6% is of Hispanic origin with the majority living east of Vale) (Kohrman 2003; United States Census Bureau 2003). The primary American Indian tribes involved are the Confederated Tribes of the Warm Springs Reservation, the Burns Paiute Tribe and the Confederated Tribes of the Umatilla Indian Reservation. With the exceptions of the Burns Paiute and Hispanics east of Vale, minorities are scattered throughout the counties.

Poverty rates provide some indication of the percentage of the population in surrounding communities with low-incomes. The poverty rate for Grant County is 13.7% and a Harney county is 11.8%. The Oregon statewide average rate of persons living below poverty is 11.6% (Oregon Employment Department 2001).

Data regarding minorities or people with disabilities employed in the region in the timber, mining, ranching, road construction, forestry services, and recreation sectors is unavailable. Some firms contracted by the Forest Service for reforestation work have traditionally hired Hispanic workers that comprise a migratory workforce in the area. Asian and Pacific Islanders uses of the area include commercial mushroom harvesting and developed camping associated with this activity. Some contracts are reserved for award to minority businesses under the USDA Office of Small and Disadvantaged Business Utilization and the Small Business Administration, although overall contract amounts to these groups has declined since 1998 (USDA 2000).

Environmental Consequences

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

Viability of Timber Harvest

Direct/Indirect Effects – All Alternatives

The area proposed for commercial harvest within the Crawford Project Area was analyzed to determine the economic viability of harvesting timber, by determining the tentative advertised bid rates per hundred cubic feet ($/ccf). The tentative advertised bid rates estimated for the Crawford Project reflect the most current volume, price, and cost estimates for this analysis. All alternatives that harvest timber would produce positive bid rates, indicating that the project would provide a viable harvest proposal. Based on this analysis, Alternative 2 provides the highest tentative advertised bid rate at $45.55/ccf, and therefore the highest potential revenue from the sale of timber. Alternative 3’s bid rate is slightly lower, at $40.96/ccf. Alternatives 1 and 4 would not harvest any merchantable timber, and therefore would not produce any revenue or benefits to wood products industries. Advertised bid rates have fluctuated over the last few years, reflecting the volatility of the timber market. Changes to prices would likely occur at the time of the appraisal, depending on actual market conditions at that time.

The 1990 Malheur National Forest Land and Resource Management Plan (Forest Plan) established an allowable sale quantity (ASQ) for the forest of 38.4 million cubic feet or 211 million board feet (MMBF) average per year. An ASQ is an upper limit for the plan period, not proposals for sale offerings or an assigned target. Actual sale levels depend on factors such as limitations of modeling, changes in law and regulations, changes in social-economic values, listing of threatened and endangered species, changes in budgets, and site-specific conditions. The Regional Forester amended this plan in 1994, through the Eastside Forest Plan Amendment 2, and by PACFISH and INFISH in 1995, in response to some of these changing factors. Table E – 1 compares the Malheur National Forest’s annual offered timber volume with its assigned target timber volume for the fiscal years since the 1990 LRMP went into effect. Accomplishment of timber targets is based on volume offered.

In response to a request by then Oregon Governor Kitzhaber, the Blue Mountains Demonstration Area published in 2002 an assessment entitled *Assessment of Timber Availability from Forest Restoration with the Blue Mountains of Oregon* (USDA 2002). The assessment describes management actions over the past decade, current vegetation conditions where a reliable supply of wood could be available, estimations of the quantity and type of forest timber products that may result from forest restoration actions, and a market analysis for potential timber products and the associated economic impacts on individual communities.

This assessment concludes that 71% of the national forest lands in the Blue Mountains of Oregon were not available for substantial and sustainable harvesting of timber. Only minimal amounts of timber would be harvested during restoration treatments of these lands, and prescribed fire may be the primary tool available to accomplish fuels reduction and thinning. This trend would likely continue because there is no anticipated change in management direction. The assessment further concludes that the remaining 29% of the national forest lands that are available for substantial and sustainable timber harvest (Active Forestry lands) was actively managed over the last three decades. Up to a third of these lands have experienced timber harvest or non-commercial thinning since 1988. Approximately 58% of these Active Forestry lands are currently overstocked; however, nearly half of these overstocked lands are suitable only for non-commercial thinning treatments, yielding only incidental amounts of merchantable timber. This trend is also likely to continue.

Table E – 1. Malheur National Forest Timber Offer by Fiscal Year 1991 to 2006.

Fiscal Year	Target Volume MMBF	Offered Volume MMBF
1991	229.0	201.6
1992	220.0	100.8
1993	197.0	71.7
1994	101.0	33.1
1995	85.0	66.9
1996	100.0	80.9
1997	110.0	38.9
1998	95.0	77.1
1999	63.5	34.1
2000	45.0	17.5
2001	36.7	15.4
2002	24.2	2.7
2003	26.8	11.8
2004	63.9	46.3
2005	38.0	18.1
2006	32.8	31.4

Selection of the No Action Alternative or the Precommercial Thinning Alternative has the potential to continue the decline of timber-related employment in the rural communities of Baker, Grant, Harney, and Malheur counties. Alternative 2 would provide short-term (1 to 2 years) economic relief. Alternative 3 would provide short-term (1 to 2 years) economic relief. The amount of local economic relief would be determined by whether the purchaser is local or distant, what mill(s) local or distant actually receives the logs, and the price for lumber.

Cumulative Effects – All Alternatives

These cumulative economic effects could cause cumulative "quality of life" social effects. Continued loss in timber-related jobs could affect the remaining infrastructure and capacity in the local rural communities, and could disrupt the dependent local goods and services industries. Diversification opportunities for these local rural economies are currently limited, and this trend is expected to continue until economical biomass utilization can be further developed (LeVan 1998).

Employment

Direct/Indirect Effects

The primary effect on timber harvest-related employment would occur from commercial harvesting associated with the alternatives over the next 2 years. Financially viable sales would be necessary to provide opportunities for timber harvest-related employment. Levels of harvest volume by alternative would affect employment and income in several ways:

- *directly* – effects attributable to employment associated with harvesting, logging, and mills and processing plants for sawtimber, pulp, chips, veneer, and plywood;

- *indirectly* – effects attributable to industries that supply materials, equipment, and services to these businesses; and
- *induced* – effects attributable to personal spending by the business owners, employees, and related industries.

No harvest-related activities would occur under Alternative 1 (No Action), and Alternative 4 (Precommercial Thin), therefore no contribution to direct, indirect, or induced employment and income associated with timber harvesting would result from the project. Declining trends in timber harvesting from National Forest System (NFS) lands would continue in the future, and contribute to declines in wood products employment and associated indirect employment over the next 2 decades. Changes in the economic base and wood products infrastructure for the impact area would also continue to be influenced by fluctuations in market prices, international market conditions, changes in technology, and industry restructuring.

The overall employment and income effect from the action alternatives would continue to support the wood products manufacturing component of the economic base of the impact area. The magnitude of the economic effects would be short term, 0 - 5 years, associated with the harvesting activities. Alternative 2 would support the highest level of employment, at 113 jobs over the 2 year period. An individual county or community in the impact area could experience greater benefits in the short-term (0 to 5 years), particularly the communities highly specialized in wood products manufacturing. However, several factors would influence the ability of any one county or community to experience the largest extent of the harvest-related employment and income effects. The financial viability of the timber sale proposals would influence whether potential purchasers closest to the project area could be competitive with other purchasers, to acquire the majority of the supply of wood. Employment projections would depend on other factors such as market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

The distribution of economic impacts would depend on the location of the timber purchaser awarded the contracts at the time of the sale, the availability of equipment and skills in the impact area, and the location and availability of the wood processing facilities and related infrastructure. Do to the lack of volume offered in the past several years throughout the Blue Mountains; several mills located in other counties in Northeast Oregon would be potentially interested in the supply of wood offered. Refer to the following table for an illustration of employment effects from timber harvesting by alternative.

Table E – 2. Employment Effects from Timber Harvest by Alternative.

Timber-harvest Related Employment and Income (2003$) by Alternative				
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Employment				
Total direct, indirect and inducted	0	61	39	0
% change		***0%***	***–37%***	***0%***
Income				
Total direct, indirect and inducted	$ –	$ 1,712,920	$ 1,083,170	$ –
% change		***0%***	***–37%***	***0%***

Cumulative Effects

Annual timber-related employment supported by timber harvested from the Malheur National Forest for the years 2003 to 2005 averaged 141 direct jobs. Annual harvest for these years averaged 25 MMBF. Employment supported by commercial harvesting in Alternative 2 would support approximately 43% toward this level of annual employment. Alternative 3 would support approximately, 28%, Alternatives 1 and 4 would not provide harvest opportunities and would not support employment in the impact zone from timber harvesting.

Other employment would continue to occur as a result of other timber sales in progress, domestic-livestock grazing, recreation activities, and other special use receipts across the Forest. Commercial collection of nontimber forest products, such as mushrooms, could continue to occur, although the quantity of harvest is unknown.

Economic Efficiency

Direct/Indirect Effects – All Alternatives

An economic efficiency analysis was completed and updated in 2008. It focused on identifiable and quantifiable ecosystem benefits and costs for each alternative, in terms of the present net value (benefits minus costs); to assess which alternative comes nearest to maximizing net public benefits (36 CFR 219.3).

Measurable and quantifiable economic market benefits identified in the Crawford Project include discounted revenue from timber volume proposed for harvest. Measurable and quantifiable costs at the project level include direct costs to the Forest Service for preparing and administering the commercial timber sales, and implementing other restoration activities including reforestation, decommissioning roads, and rehabilitating skid trails.

Alternative 2 has the greatest present net value $183,201 of the action alternatives, due to more acres treated thus producing greater volume; Alternative 3 has a lower present net value, $87,624 it treats less acres producing a lower volume. Costs for sale preparation and administration vary by alternative, based on the amount of timber harvested and acres treated. Alternatives 1 and 4 would have no costs associated with harvesting, although ongoing costs associated with management of the area would continue.

Table E – 3. Present Net Benefit, Present Net Costs, and Present Net Value Associated with Harvest.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Present Net Benefits				
Timber Value	$0	$570,350	$347,137	$0
Present Net Costs				
Sale preparation and administration	$0	$364,891	$246,932	$0
Restoration and mitigation projects	$0	$0	$0	$0
Fuel Reduction (material 7 to 11 inch)	$0	$0	$0	$0
Present Net Value				
Present Net Value	$0	$183,201	$87,624	$0

In addition to use values, existence values otherwise referred to as passive, nonuse, or preservation values may capture important economic value to the public (Swanson and Loomis 1996). Although these benefits are important components of the ecosystem services provided to humans, the production relationship between ecosystem functions and ecosystem services (such as changes in recreation visitor days, fishing days, animal unit months, or fish population) is not well-defined or measurable at the project level, in terms that provide meaningful comparisons of commensurate dollar values. Potential benefits include improvements to soil productivity, reduced erosion, water quality improvements in temperature, and terrestrial and aquatic habitat improvement. Potential improvements in fish habitat would increase fingerling survival rates, overall fish population levels, and recreational fishing opportunities.

Other potential qualitative economic benefits or costs from the alternatives include changes to the diversity, quality, and quantity of wildlife habitat for both game and non-game terrestrial species. The economic value of big-game hunting would depend on how changes in population levels and spatial distribution of game animals affect either the quality or intensity of the hunting experience. Consequently, the overall level of hunting would change with corresponding economic impacts from hunting-related expenditures. Changes in non-game populations and diversity would affect wildlife viewing, photography, and other nonconsumptive uses in the area.

Other opportunity or externalized costs that would potentially occur include damage to soils from harvest operations in tractor units, resulting in long-term losses in soil productivity and potential timber harvest. These costs are not well-defined or measurable at the project level in terms that provide comparison of commensurate dollar values.

Human Health and Safety

Health effects are limited in scope and duration. This analysis summarizes the human health and safety effects described in other sections of the EIS.

Direct and Indirect Effects – Alternatives 1 and 4

With no commercial activities associated with alternatives 1 and 4 there would be no-change to existing condition.

Direct and Indirect Effects – Alternatives 2 and 3

With commercial timber harvest, the level of road use would increase within the project area and accessing the area. Increases in the level of use on roads will potentially increase the number of encounters between heavy equipment for logging and recreational visitors, and increase the likelihood of accidents in the short-term (0 - 5 years). Reconstruction design standards for width, brushing, and hazard trees would mitigate potential encounters and provide safer access on current roads in the long-term, after the harvesting activities are concluded. Directional signing and public information about logging activities would lessen encounters and increase safety. Worker health effects and safety from all phases of logging operations would potentially occur. The work environment would be physically demanding and hazardous.

Cumulative Effects – All Alternatives

Because of past, present, and reasonably foreseeable future actions, there are economic and social cumulative effects due to road closures and timber harvest. Due to decreased roads funding for the Malheur National Forest over the past several years, there is a cumulative effect as the Forest continues to reduce road densities in other project areas in order to meet budgetary constraints and other resource needs. The costs of road maintenance and reconstruction would increase in the future, due to further declines in the system. Road closures and decommissioning would probably be considered and implemented in future timber sale areas. Socially, this means the current level of access by roads would decline. Recreation, acquisition of nontimber forest products, and other opportunities dependent on road access, would also decline in areas of the road closure or decommissioning.

Environmental Justice

The analysis focuses on potential effects from the project to minority populations, disabled persons, and low-income groups.

Direct and Indirect Effects – Alternative 1

All current uses of the National Forest System lands would continue, including recreation, harvesting of nontimber forest products, special-use permits, subsistence uses, and spiritual/aesthetic uses. Effects to minority populations, disabled persons, and low-income groups would not be disproportionate with other users of the National Forest System lands.

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

The action alternatives provide a variety of opportunities for potential contracts. The alternatives would have no impact on the contracting process or the USDA Small Business Administration program for reserving contracts for minority groups for tree planting, precommercial thinning, and road restoration. Employment and income would be available to all groups of people, subject to existing laws and regulations for set-asides, contract size, competition factors, skills and equipment, etc.

Set-asides for Small Business Administration Contracting opportunities would not be affected. Employment by firms that have hired Hispanic workers or other minority groups or low-income workers associated with reforestation or other potential contracting needs would not differ from those employed in the sectors as a whole. In the short-term (0 to 5 years), reforestation and precommercial thinning needs would potentially benefit this group.

There is no existing information on how much use the area receives from minority and low-income populations. It is estimated that this area receives limited use because of the road conditions and the number of roads closed to the public. The anticipated direct and indirect social effects to these populations would change proportionally to the rest of the population as a whole due to road reconstruction, road decommissioning, and road closures planned under this EIS. Opportunities for all groups of people to collect species from disturbed and nondisturbed sites would be maintained by all alternatives, and no disproportionate effect is anticipated to subsets of the general population.

None of the alternatives would have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes.

Consistency with Direction and Regulations

The Forest Plan contains several goal statements:

- Provide a sustained flow of timber for lumber, fiber, and/or associated wood products at a level that will contribute to economic stability, while providing for regional and national needs.
- Contribute to the social/economic health of communities, which are significantly affected by national forest management.
- Provide an economic return to the public.

- Provide and utilize wood fiber in the form of sawtimber, fiber, and/or associated wood products while minimizing losses and maximizing outputs in a cost-effective manner, consistent with the various resource objectives and environmental standards.

Otherwise, management objectives and standards for economics are not specifically addressed in the Forest Plan. This analysis attempts to display the effects to economic efficiency for this project. In this regard, all alternatives are consistent with the Forest Plan.

All economic elements are consistent with current regulations.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to economics.

More Detailed Information or Analysis

Additional details about the affected environment and the effects of the alternatives on economics can be found in the Social / Economics Specialist Report located in the project record.

Other Disclosures

NEPA at 40 CFR 1502.25 (a) directs “to the fullest extent possible, agencies shall prepare environmental impact statements concurrently with and integrated with…other environmental review laws and executive orders.” The following sections disclose those laws and executive orders.

Air Quality and Clean Air Act of 1977, as Amended

All action alternatives are in compliance with the Clean Air Act and the Oregon State Smoke Management Plan. Burning of any kind would not occur unless prior approval is granted by Oregon Department of Forestry. All amounts of PM 10 and PM 2.5 emissions would be calculated using the CONSUME software in the SmokeTracs reporting system, which is also submitted with planned burn operations to the Oregon Department of Forestry to determine compliance with the Clean Air Act. All burning would occur outside visibility-protection periods set for Central Oregon of July 1 to September 15. Burning would be planned for times when transport winds are sufficient to displace much of the smoke from the area.

American Indian Rights

This proposal would not conflict with any inherent rights or treaty provisions of any Tribal group.

Congressionally Designated Areas

Wilderness: There are no lands designated in the project area as wilderness; therefore, there would be no impacts on Wilderness. (See discussion on potential wilderness areas included in this section).

Wilderness Study Areas: There are no lands designated in the project area as Wilderness Study Areas or recommended for wilderness classification; therefore, there would be no impacts on any WSA.

National Recreation Areas: There are no lands designated in the project area as National Recreation Areas; therefore, there would be no impacts to National Recreation Areas.

Clean Water Act of 1982

All alternatives comply with the Clean Water Act (1982) as amended in 1981. All alternatives apply Best Management Practices (BMPs) as specified in “Forest Service R6 General Water Quality Best Management Practices” (1988), and in standards and guidelines in the Forest Plan. The site specific BMPs are listed in Chapter 2 (in the description of the alternatives and in the Management Requirements, Constraints, and Design Measures) and Appendix F (Best Management Practices). See Aquatics & Water Quality section in Chapter 3 for detailed analysis.

The Middle Fork John Day River, Crawford Creek, and Mill Creek are on the Oregon 303(d) list for water quality-limited water bodies for high temperatures. In the project area, the Middle Fork is listed for standards associated with the Designated Beneficial Uses of bull trout spawning and rearing. None of the alternatives considered singly or cumulatively, would cause measurable increases in stream temperature.

Energy Requirements and Conservation Potential of Alternatives

The potential energy consumption associated with any of the alternatives considered as well as the differences between the alternatives is not measurable.

The Endangered Species Act of 1973, as Amended and Magnuson-Stevens Fisheries Conservation and Management Act (MSA) of 2000

The Endangered Species Act requires protection of all species listed as "Threatened" or "Endangered" by Federal regulating agencies (Fish and Wildlife Service and National Marine Fisheries Service). The Forest Service also maintains, through the Federal Register, a list of species which are proposed for classification and official listing under the Endangered Species Act, species which occur on an official State list, or that are recognized by the Regional Forester as needing special management to prevent their being placed on Federal or State lists. On January 31, 2008, Regional Forester Linda Goodman released an updated Sensitive Species List which includes federally listed, federally proposed and sensitive species lists. In the cover letter for the updated species list the Regional Forester states that projects initiated prior to January 31, 2008 may use the updated sensitive species list or the list that was in effect when the project was initiated. The Responsible Official for the project has authority to decide which list to use. "Initiated" means that a signed and dated document such as project initiation letter, scoping letter, or Federal Register Notice for the project exists. The Draft Environmental Impact Statement for the Crawford Project was issued in November 2006. Consequently, the 2004 Regional Forester Sensitive Species list in effect at that time was used for field reconnaissance and the Biological Evaluation. All alternatives are consistent with the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the requirements of the Regional Forester's Sensitive Species list.

Biological Evaluations have been completed for all threatened, endangered, and sensitive (TES) plant, aquatic, and terrestrial wildlife. Alternatives would be expected to have ***No Effect*** to threatened Canada lynx.

Consultation with U.S. Department of the Interior (USDI), Fish and Wildlife Service (USFWS), has been completed (Biological Assessment and letter of concurrences are located in the project file). Informal consultation with the USFWS was completed on April 17, 2002 with the receipt of the Letter of Concurrence (LOC) for the Crawford Vegetation Management Project. When the 2002 LOC was issued, bull trout critical habitat designation was being proposed for the John Day Basin. Since then, a final critical habitat designation for bull trout, published on September 26, 2005, excluded the John Day River System. Thus, analysis of effects to bull trout critical habitat is not necessary. The effects determination for the Crawford Timber Sale EA (Alternative 2) was a ***may effect, not likely to adversely affect bull trout***. On March 27, 2008 the Forest Service received a letter from USFWS stating that the "Service concurs that the project, as modified, is not likely to result in additional effects to bull trout, beyond what were addressed previously in the 2002 LOC. Effects due to the project modifications are no greater than those analyzed in the original consultation so the April 17, 2002 LOC is still valid."

Formal consultation with the NMFS was completed on April 16, 2002 with the receipt of the Biological Opinion (BO) for the Crawford Timber Sale EA. The effects determination for the Crawford Timber Sale EA (Alternative 2) was a may effect, likely to adversely affect MCR steelhead. Reinitiation of consultation with NMFS began May 21, 2007 because critical habitat for Mid Columbia River Steelhead was designated that may be affected by the action and the proposed action changed. A final biological assessment has been submitted to NMFS with a may affect, likely to adversely affect (beneficial effect) for threatened Mid Columbia River Steelhead and designated critical habitat. The Forest Service has received notification from NFMS that the information that was provided is sufficient and that the BA is being submitted for review. The Record of Decision (ROD) will incorporate information from Biological Opinion.

Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (February 11, 1994) on Environmental Justice directs federal agencies to consider whether proposed alternatives may have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes. The order directs federal agencies to focus attention on the human health and environmental effects to ethnic minorities (American Indians, Hispanics, African Americans, and Asian and Pacific-Islander Americans), disabled people, and low-income groups.

The action alternatives provide a variety of opportunities for potential employment in logging, mill production, reforestation, and other potential contracts. Employment and income would be available to all people, including minority and low income groups. Opportunities for all groups of people to collect species from disturbed and nondisturbed sites would be maintained by all alternatives, and no disproportionate effect is anticipated to subsets of the general population.

None of the alternatives would have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes.

Facilitation of Hunting Heritage and Wildlife Conservation: (Executive Order 13443)

The purpose of this 2007 Order is to direct Federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and management of game species and their habitat. Federal agencies shall evaluate the effect of agency actions on trends in hunting participation; consider the economic and recreation values of hunting in agency actions; manage wildlife and wildlife habitat on public lands in a manner that expands and enhances hunting opportunities and work collaboratively with State governments to manage and conserve game species in their habitats.

With the implementation of any of the action alternatives, there will be limited short-term effects to hunters. Harvest activities and smoke from fuel treatment activities may displace some recreationists to new areas to camp, hunt, or to travel.

Road closures are not expected to greatly impact recreation access. Most roads proposed for decommission are already closed.

The economic values of big-game hunting would depend on changes in population levels and special distribution across the landscape. Hunting opportunities, as managed by Oregon Department of Fish and Wildlife, are expected to be unchanged in all alternatives. Elk population census data for the Desolation and Sumpter Management Units indicate a relatively stable, level, population trend. It appears that past forest management has not been detrimental to elk populations in these management units. It is not anticipated that planned activities under any of the action alternatives would cause a decline in elk populations either. However, activities would likely cause a redistribution of animals across the landscape.

Floodplains (Executive Order 11988)

Executive Order 11988 says that Federal agencies shall avoid adverse effects to floodplains or minimize potential harm. Floodplains several feet wide occur along much of the Middle Fork, Crawford Creek, and Mill Creek. The floodplains are well within RHCAs, and so all alternatives avoid adverse effects to the floodplains, and thus are consistent with Executive Order 11988.

National Landmarks

There are no National Landmarks in the project area. Therefore, no impacts would occur for any National Landmark.

National Forest Management Act (NFMA)

Requirements of 36 CFR 219.28, which are part of the NFMA regulations, will be met. Specifically: 1) Harvest will occur only on suitable timberlands; 2) Following commercial thinning activities, none of the action alternatives will require reforestation activities since the stands will remain fully stocked or overstocked; 3) Alternative 2 includes 119 acres of shelter-wood harvesting. Following shelterwood harvest, areas that are understocked and greater than ½ acre in size would be planted to meet direction that areas regeneration harvested will be reforested within 5 year. The National Forest Management Act of 1976 requires the disclosure of any silvicultural prescription that creates an opening larger than 40 acres, using even-aged vegetation management. The project proposed action and alternatives would not create openings greater than 40 acres.

National Historic Preservation Act

State Historic Preservation Office consultation has been conducted under the Programmatic Agreement among the United States Department of Agriculture, Forest Service, Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and Washington State Historic Preservation Officer regarding Cultural Resource Management on National Forests dated June 2004. Identified sites and any newly recorded sites would be avoided / protected from all ground disturbing activities. There would be no effect to any historic property listed in or eligible for listing in the National Register of Historic Places.

Municipal Watersheds

There are no municipal watersheds affected by the project; therefore there would be impacts on any municipal watersheds.

Parklands

There are no lands within the proposed project that would be characterized as parklands; therefore, there would be no impacts on any parkland.

Prime Farmlands, Rangelands, and Forestlands

Prime Farmlands: The project area is no located in or adjacent to prime farmlands; therefore, there would be no impacts to Prime Farmlands.

Prime Rangelands: The project does not contain prime rangeland because of soils and climate, and none of the proposed activities in the project area would covert rangelands to other uses. Therefore, there would be no impacts on Prime Rangelands.

Prime Forestland: The project would not convert forestlands to other uses. All lands designated as forested would be retained and managed as forested; therefore, there would be no negative impacts on Prime Forestlands.

Public Health and Safety

Public health and safety would be improved by reducing the potential for stand replacement wildfires and felling danger trees along open haul routes within the Crawford Project Area.

Relationship of Short-Term Uses and Long-Term Productivity

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

This project would result in short-term impacts on various resources but would result in Forest health and fuels reduction benefits, and an economic return to the economy. There would not be any long-term impacts on the productivity of the lands affected.

Research Natural Areas (RNA)

There are no research natural areas in the project area; therefore, there would be no negative impacts to Research Natural Areas.

Social Groups

The project would have no impacts on any social groups, including minorities, Native Americans, women, or the civil liberties of any American citizen.

Unavoidable Adverse Effects

There would be unavoidable short-term negative effects to air quality, soils, watershed, range, fisheries, wildlife, visuals, and recreation from the Proposed Action and all alternatives. See individual resource sections in Chapter 3. At the end of Chapter 2, several tables compare the effects of the alternatives.

Wetlands (Executive Order 11990)

There are no wetlands meeting this definition and therefore the project area would not impact any wetlands.

Wild and Scenic Rivers

There are no lands designated for Wild and Scenic Rivers in the project area; therefore, the project would not impact any Wild and Scenic Rivers.

Inventoried Roadless, Potential Wilderness and Areas with Undeveloped Character

Inventoried Roadless Areas:

As part of the Land and Resource Management Planning process (LRMP 46 CFR 219.27 (c)) the 1990 Malheur Forest Plan identified areas of at least 5,000 acres, without developed and maintained roads, and substantially natural conditions. These areas were called Inventoried Roadless Areas (IRAs). The IRAs for the Malheur National Forest can be found in Appendix C of the LRMP Final Environmental Assessment.

On 1/12/2001, the Department of Agriculture adopted the Final Roadless Area Conservation Rule (RACR), intended to protect and conserve inventoried roadless areas on National Forest System lands. Since adoption of the 2001 RACR, the term IRA has been defined to refer to areas identified in the set of maps published for the 2000 FEIS for that rule. The IRAs identified in the 1990 Malheur National Forest LRMP, Appendix C were included in the Final EIS RACR.

There are no IRAs within or adjacent to the Crawford Project Area, therefore, the proposed treatments are consistent with management direction regarding IRAs in the Malheur Forest Plan (1990).

Potential Wilderness:

The Malheur National Forest, in coordination with the Umatilla and Wallowa-Whitman National Forests, is involved in a tri-forest plan revision process, referred to as the Blue Mountain Forest Plan Revision. This process started in 2005 and there have been several reiterations of Forest wilderness potential inventory following the inventory criteria outlined in FSH 1909.12 Chapter 71. Existing inventoried roadless areas (IRAs) served as a starting point for the inventory.

In order to be consistent with the other forests, the Malheur made the following assumptions: forest roads would be buffered with a 300 foot buffer and past timber harvest activities would not meet potential wilderness inventory criteria. A potential wilderness area is an area that qualifies for placement on the potential wilderness inventory if they meet criteria as outlined in Forest Service Handbook 1909.12, Chapter 71. This inventory of potential wilderness is not a land designation, nor does it imply any particular level of management direction or protection in association with the evaluation of these potential wilderness areas. It is completed with the express purpose of identifying all lands that meet the criteria for being evaluated for wilderness suitability and possible recommendation to Congress for wilderness study or designation.

During the Forest Plan Revision inventory process, maps were consulted to determine what areas met the potential wilderness inventory criteria. Areas with wilderness potential were inventoried in 2005, 2006, and 2007. Within the Crawford Project area, there were no areas identified that met wilderness potential criteria as outlined in Forest Service Handbook 1909.12, Chapter 71.

For a project specific review, the Crawford Project Area was again reviewed for areas that met the potential wilderness inventory criteria, with the use of GIS generated maps, following guidelines in FSH 1909.12, Chapter 71. Due to the extent and location of forest roads and the amount of past harvest in the project area, the determination of “no areas identified that met wilderness potential criteria” was substantiated because the acres affected by the Crawford Project do not contain 5000 acres or more of land that do not contain forest roads, the acres cannot be preserved due to physical terrain and natural conditions, they do not contain acres that are self-contained ecosystems nor are they contiguous to existing wilderness. Since there are no areas that meet the criteria, the Crawford Project would not remove any potential wilderness from inventory.

Although there is no potential wilderness meeting Forest Service criteria within the Crawford Project Area, since the start of the Blue Mountain Forest Plan Revision in 2005 public comments and proposals for wilderness have been received by the Blue Mountain Revision Team. One potential wilderness proposal by Oregon Wild, referred to in their proposal as the Upper Middle Fork John Day River, included a block of land within the Crawford Project Area.

Areas with Undeveloped Character:

Areas with undeveloped character include large areas without roads or other developments that may have special characteristics unique to that general area.

The Crawford Project Area was reviewed for areas of undeveloped character using GIS generated maps. Similar to the discussion in the Potential Wilderness section, due to the extent and location of forest roads and the amount of past harvest in the project area, there are no undeveloped areas within or adjacent to the Crawford Project that provide high quality or undisturbed soil, water, and air; sources of public drinking water; diversity of plant and animal communities; habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; primitive, semi-primitive non-motorized, and semi-primitive motorized classes of dispersed recreation; reference landscapes; natural appearing landscapes with high scenic quality; traditional cultural properties and sacred sites; nor other locally identified unique characteristics.

The project also meets low density recommendations identified by the Road Density Analysis Task Team Final Report (01/30/2002).

Global Warming

The Global Climate Change Prevention Act (*7 USC 6701*) authorizes and directs the Secretary of Agriculture to take steps towards researching climate change, including establishing a Global Climate Change Program; a technical advisory committee; an Office of International Forestry; urban forestry demonstration projects; biomass energy demonstration projects. The Secretary is also directed to study the effects of global climate change on agriculture and forestry, and the interaction between forest greenhouse gas emissions and climate change. Supplemental information on the Global Climate Change Prevention Act (*7 USC 6701*) is in Appendix G.

Section 6701 of the Act directs the Secretary of Agriculture to establish a Global Climate Change Program in order to have within the Department of Agriculture a focal point for coordinating all issues of climate change. The Secretary must designate a director, who shall: coordinate policy analysis, long range planning research, and response strategies relating to climate change issues; provide liaison with other federal agencies, through the Office of Science and Technology Policy, regarding issues of climate change; perform other enumerated duties. The specific list of Director Tasks includes:

The Director shall—

(1) coordinate policy analysis, long range planning, research, and response strategies relating to climate change issues;

(2) provide liaison with other Federal agencies, through the Office of Science and Technology Policy, regarding issues of climate change;

(3) inform the Department of scientific developments and policy issues relating to the effects of climate change on agriculture and forestry, including broader issues that affect the impact of climate change on the farms and forests of the United States;

(4) recommend to the Secretary alternative courses of action with which to respond to such scientific developments and policy issues; and

(5) ensure that recognition of the potential for climate change is fully integrated into the research, planning, and decision-making processes of the Department.

Item #5 notes that the Secretary should ensure that the potential for climate change is noted in planning and decision processes of the Department, but nothing in the Act directs the Forest Service to conduct any specific analysis or disclose any specific effects in a NEPA document for specific forestry projects. However, the Forest Service has looked at what modeling of climate change is possible in planning projects. In a recent analysis, three Forest Service research scientists considered a methodology for modeling climate change in forest planning. In a letter to Lisa Freedman, Director of Resource Planning and Monitoring for the Pacific Northwest Region of the Forest Service, Pacific Northwest Research Station Deputy Director Cynthia West stated, "…the science of modeling climate change lacks certainty due to large spatial and temporal variation in the interactions of terrestrial, atmospheric, oceanic and human systems…" 4070 Letter of July 26, 2005 from Cynthia West. In a follow-up policy letter, Ms. Freedman concluded, "…there is no consensus or experience regarding how to model climate change at the subregional scale and it would require substantial research, model development and testing to provide such an approach." 1920 Letter of July 28, 2005 from Lisa Freedman.

It should also be noted that logging itself does not release stored carbon into the atmosphere; that carbon remains stored in the logged wood. The effects are in the loss of carbon-fixing capacity of the trees removed and this capacity begins to return as trees grow again. Moreover, this project focuses on the removal of dead trees, which would not have carbon-fixing capacity anyway. There is also a potential carbon loss as logging slash decays or is burned, but again, with an emphasis on dead tree removal, this loss should be minimal.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time. Irreversible and irretrievable commitments of resources are disclosed at the end of each section in Chapter 3.

CHAPTER 4. CONSULTATION, COORDINATION

Changes from Draft to Final EIS for this Chapter.

The following changes were made between the DEIS and FEIS. The listing does not include corrections, explanations, or grammar and spelling. Some of the changes resulted from comments made to the DEIS.

- The list of preparers and contributors to the FEIS was updated.

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

Interdisciplinary Team Members (IDT)

Name	Expertise	Education Degree	Years Experience
Susan Burton	Range Management	BS	29
Kim Conlee	Transportation Planning	AA	33
Dean Curtis	Range Management	BS	31
Scott Cotter	Fisheries Biologist	MS	16
Erin Dailey	NEPA Planning/ Writer/ Editor	AS & BS	4
Ryan Falk	District Environmental Coordinator, IDT Leader	BS	24
Suzanne Grayson	Wildlife Biologist	BS	25
Nancy Hafer	Botany	BS & BA	29
Patrick Haynal	Archaeology	PhD	28
Cindy Kranich	Botanist	BS	25
Richard Larson	Visuals/ Scenery & Writer/ Editor-Documentation	BS	31
Alan Miller	Fisheries Biology	BS & MS	7
Cheri Miller	Wildlife Biology	BS	7
Charlotte McCumber	Timber Sale Implementation/Management Planning, Economics	HS	26
Robert McNeil	Soil Science/Hydrology	PhD	17
Russ Riemers	Fuels Management	AS	15
Mary Robertson	Archaeology	BS & MS	15
Ken Schuetz	Wildlife Biology	BS & MF	21
Lori Stokes	Fuels Management and Silviculture	BS	17
Richard Vetter	Fisheries Biology	BS	10
Shannon Winegar	Recreation	BS	23
Eric Wunz	Silviculture	BS	29
HS – High School Diploma, AA – Associate of Arts, AS – Associate of Science, BA – Bachelor of Arts, BS – Bachelor of Science, MF– Master of Forestry, MS – Master of Science, PhD – Doctorate			

Extended Team Members, Management, or Reviewers

Carole Holly	Forest Environmental Coordinator
Elaine Kohrman	Economist/ Prairie City District Ranger
Brooks Smith	Blue Mountain District Ranger
Mike Montgomery	Blue Mountain District Ranger
Mike Tatum	Forest Silviculturist

Consultation and Coordination

The following Federal, State and local agencies, Tribal governments, businesses, organizations, and individuals provided comments during the development of this FEIS. Most of the comments were received during scoping on the proposed action, field trips, comments on the NOI published in the Federal Register, and comments received during the 45-day DEIS comment period. A summary of the Crawford Project public involvement effort is provided below.

Federal, State, and Local Agencies:

National Oceanic and Atmospheric Administration-Fisheries (NOAA)
USDI Fish and Wildlife Service
Grant County Court - Judge Dennis Reynolds (retired)
State Historical Preservation Office (SHPO)
U.S. Environmental Protection Agency (EPA)
Oregon Department of Fish and Wildlife
United States Department of the Interior

Tribes:

The Confederated Tribes of Warm Springs Reservation of Oregon
The Confederated Tribes of the Umatilla Indian Reservation
The Burns Paiute Tribe

Organizations and Businesses:

Oregon State Snowmobile Association, Howard Geiger, John Day, OR
O'Rorke Logging, Inc., John Day, OR
Prairie Wood Products, Dan Bishop, Prairie City, OR
Blue Mountains Biodiversity Project, Karen Coulter, Fossil, OR
Council for Grant County Court, Ron Yockim, Roseburg, OR
Malheur Lumber Company, Walt Gentis, John Day, OR
Sierra Club, Asante Riverwind, Sisters, OR
Terra Enterprises, Inc., Peter Vaughn, Genesee, ID
Redding Silviculture Laboratory, Ritchie Martin, Redding, CA
Oregon Wild, Doug Heiken and Chandra LeGue, Eugene, OR
Oregon Wild, Tim Lillebo, Bend, OR
Boise Cascade Corporation, John Fullerton, LaGrande, OR
Grant County Conservationists, John Day, OR
Elmwood Ranches, Russell Ricco, Prairie City, OR

Individuals:

Ramos, Coke and Dianne, Hereford, OR
Atkins, Harold and RoJean, Unity, OR
Christie, Christopher, Prairie City, OR
Davis, Beaverly, Canyon City, OR
Driskall, Linda, John Day, OR
Averett, Tom and Rosalie, Bates, OR
Kolkow, Clarence, Grants Pass, OR
Lysne, Michael, Redmond, OR
Vidourek, Bob, John Day, OR
Vinton, Joanne, Eugene, OR
Smith, Jack, Burns, OR
Carr, Clayton, Long Creek, OR
Seal, Thom, Prairie City, OR
Bach, John, Lakeview, OR
McMahon, Portland, OR
Cardwell, Leonard and Anita, Pendleton, OR
Porter, Don, Milwaukie, OR
Gaarde, Richard, Tigard, OR
Baker, L. BC, WA
Solomon, Laurie, Klamath Falls, OR
Johnson, Chris, Jasper, OR
Ryberg, Erik, Seattle, WA
Ray, Gary and Ruth, Bates, OR
Dave Traylor, John Day, OR
Fullerton, John, Summerville, OR

Public Involvement Summary

Public comments were received after four separate scoping requests. The original analysis began in the fall of 1993, and was called the Flat Analysis. Two scoping efforts were initiated during this season: during November, 1993 to alert hunters to the imminent project and in late October, 1993, to alert the general public. However, the analysis was delayed because of higher priority projects until April 1999, when it was renamed the Crawford Vegetation Management Project.

When the analysis resumed, the Upper Middle Fork John Day Watershed Report and its recommendations were included to define the purpose and need for the project. The formal scoping package was mailed to the public on May 21 and June 17, 1999. These letters and correspondence are filed in the Crawford Project Record.

Additional public comments on the Crawford Project were received in 2000 and 2001 during comment period on two different versions of the Crawford Vegetation Management Project EA. The comment letters and Forest Service response to these comments are in the project record.

A Decision Notice and FONSI were signed by Bonnie Wood, Malheur Forest Supervisor on April 26, 2002. This decision was appealed and then reviewed by the Appeal Deciding Officer, Richard Sowa. This review revealed that the analysis of cumulative effects was not sufficient to support the decision. The Forest Supervisor was directed to withdraw the decision.

Following the withdrawal of the decision, a Notice of Intent (NOI) was published in the Federal Register on October 9, 2003. The NOI asked for public comment on the scope of the analysis by November 15, 2003. One comment was received from Doug Heiken, Oregon Natural Resources Council (ONRC). Additional comments were provided by ONRC on January 31, 2006.

The project has been listed in the Malheur National Forest Winter Schedule of Proposed Activities (SOPA) starting in 2003 and subsequent quarterly SOPAs through the winter of 2008.

The analysis work on the Crawford Project was resumed in 2005. This delay was because Forest Planning Teams needed to work on high priority fire recovery projects. A Project Initiation Letter (letter of direction) was issued from the Blue Mountain District Ranger to the Team Leader and IDT on June 21, 2005. The Ranger stated in this letter that because there had already been substantial previous public comments received on past analysis projects in the Crawford Area. He felt this public involvement was adequate to continue the analysis without additional scoping. He directed the IDT to review all previous public comments received to date on the Crawford Project and past projects. After this review he asked the IDT to recommend any proposed changes to the key issues for his approval. To meet this direction, the IDT met in December 2005 to review the following:

- Comments received during initial scoping efforts. These comments were used to develop significant key issues in November, 2001 Environmental Assessment (EA).
- Public comments received during 30 day comment periods (November, 2001 EA).
- Appeal points on the November, 2001 Crawford EA and April 26, 2002 Decision Notice.
- Comments received on the October 9, 2003 Notice of Intent to Prepare an EIS.

In November 2006 the Crawford Project Draft Environmental Impact Statement was published by the Malheur National Forest, and a Notice of Availability (NOA) was published in the Federal Register by the Environmental Protection Agency on November 24, 2007. A news release announcing availability of the DEIS was also published in the Blue Mountain Eagle on November 22, 2006. The DEIS was mailed to over 50 individuals, organizations, or agencies, as well as The Confederated Tribes of Warm Springs Reservation of Oregon, The Confederated Tribes of the Umatilla Indian Reservation, and the Burns Paiute Tribe. The DEIS was made available to the public for a 45-day review and comment period which ended on January 8, 2007. Six timely comments were received in response to the DEIS (see Table 4 – 1). Information received from these sources of public involvement was used by the Interdisciplinary Team (IDT) to help refine and develop this FEIS.

Table 4 – 1. Individuals Who Commented During the DEIS 45-Day Comment Period.

Letter Number	Commenter
1	John Fullerton
2	Preston A. Sleeger, United States Department of the Interior
3	Doug Heiken, Oregon Wild (formerly Oregon Natural Resources Council)
4	Asante Riverwind, Sierra Club
5	Ryan Torland, Oregon Department of Fish and Wildlife
6	Christine B. Reichgott, United States Environmental Protection Agency

The IDT reviewed the six letters with comments on the DEIS and addressed each substantive comment provided. The six letters are disclosed in Response to Comments section in Appendix E of the FEIS. Comments received on the DEIS were assigned a number to track them through the review and response process. Table 4 – 1 lists those who commented and the tracking number assigned to their letter.

Distribution of the Final Environmental Impact Statement

This Final Environmental Impact Statement (FEIS) has been distributed to individuals who specifically requested a copy of the document and those who submitted comments during the formal DEIS 45-day comment period. In addition, copies have been sent to Federal agencies, federally recognized tribes, state and local governments. A notification letter along with the FEIS Summary has been sent to all other individuals, businesses, groups, and agencies that contributed to development of this FEIS.

CHAPTER 5. LISTS

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Glossary

A

Access Management Plan — The development of travel management policies that consider the development, maintenance, and protection of all forest resources.

Affected environment — The biological, social, economic, and physical aspects of the environment that will or may be changed by proposed actions.

Alternative — A combination of management prescriptions applied in specific amount and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision making. An alternative need not substitute for another in all respects.

Anadromous fish — Those species of fish that mature in the sea and migrate into streams to spawn (e.g., salmon and steelhead trout).

Analysis area — A delineated area of land subject to analysis of (1) responses to proposed management practices in the production, enhancement, or maintenance of forest an rangeland outputs and environmental quality objectives; and (2) economic and social impacts.

Aquatic (and riparian) health — Aquatic and riparian habitats that support animal and plant communities that can adapt to environmental changes and follow natural evolutionary and biogeographic processes. Healthy aquatic and riparian systems are resilient and recover rapidly from natural and human disturbance. They are stable and sustainable, in that they maintain their organization and autonomy over time and are resilient to stress. In a healthy aquatic/riparian system there is a high degree of connectivity from headwaters to downstream reaches, from streams to floodplains, and from subsurface to surface. Floods can spread into floodplains, and fish and wildlife populations can move freely throughout the watershed. Healthy aquatic and riparian ecosystems also maintain long-term soil productivity. Mineral and energy cycles continue without loss of efficiency.

Available water — The amount of water in the soil that can be readily absorbed by plant roots.

B

Biological diversity — (1) The distribution and abundance of plant and animal communities. (2) The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

Biophysical environment or bioenvironment — The interaction of climatic factors (moisture and temperature) and soil conditions on the expression of vegetation types and associated habitats. Climatic and soil conditions that result in similar successional pathways, disturbance processes and associated vegetative/habitat characteristics are referred to as a biophysical environment.

Board foot — A unit of measurement represented by a board one foot square and one inch thick.

C

Canopy — In a forest, the branches from the one or more uppermost layers of trees; on rangeland, the vertical projection downward of the aerial portion of vegetation.

Categorical Exclusion (CE) — Routine, administrative, maintenance, and other actions, established by the Chief of the Forest Service, which normally do not individually or cumulatively have a significant effect on the quality of the human environment and, therefore, may be categorically excluded from documentation in an EIS or EA unless scoping indicates extraordinary circumstances.

Canopy closure — The amount of ground surface shaded by tree canopies as seen from above. Used to describe how open or dense a stand of trees is, often expressed in 10% increments.

Channel (stream) — The deepest part of a stream or riverbed through which the main current of water flows.

Closure — A road management term indicating the road cannot be used by motorized traffic. This limitation can be accomplished by regulation, barricade, or blockage devices. The road can be available for emergency use or permitted use such as firewood cutting during dry periods.

Competition — An interaction that occurs when two or more individuals make demands of the same resources that are in short supply.

Connectivity — The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. The opposite of a fragmented condition.

Corridor (landscape) — Landscape elements that connect similar patches of habitat through an area with different characteristics. For example, streamside vegetation may create a corridor of willows and hardwoods between meadows or through a forest.

Cover — (1) Trees, shrubs, rocks, or other landscape features that allow an animal to partly or fully conceal itself. (2) The area of ground covered by plants of one or more species. The four levels of cover as defined for elk are: satisfactory cover; marginal cover; hiding cover; and thermal cover.

Cover type — A vegetation classification depicting a genus, species, group of species, or life form of tree, shrub, grass, or sedge. In effect the present vegetation of an area.

Crown — The part of a tree containing live foliage; treetops.

Cultural resource — The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

D

Decommissioning — Activities to permanently remove a road from the transportation system. The management objective of the activities is to restore the hydrologic function. These activities include, as needed: the removal of drainage structures such as culverts, re-contouring cut and fill slopes, subsoiling, and revegetating the old road beds.

Density (stand) — The number of trees growing in a given area, usually expressed in terms of trees per acre.

Desired condition — (1) A portrayal of the land or resource conditions that are expected to result if goals and objectives are fully achieved. (2) A description of the landscape as it could reasonably be expected to appear at the end of the planning period if the plan goals, objectives, standards, and guidelines for that landscape are fully achieved.

Detrimental soil impacts — Soil erosion, displacement, compaction, puddling, or burning that exceeds certain thresholds. For instance, displacement is a detrimental soil impact only if more than 50% of the topsoil or humus-enriched A-horizon is removed from an area of 100 square feet or more, which is at least 5 feet in width. A Forest Plan Standard limits the amount of detrimental soil impacts to 20% of an activity area.

Diameter at breast height (dbh) — The diameter of a tree measured 4-1/2 feet above the ground.

Disturbance — Refers to events that alter the structure, composition, or function of terrestrial or aquatic habitats. Natural disturbances include, among others, drought, floods, wind, fires, wildlife grazing, and insects and diseases. Human–caused disturbances include, among others, actions such as timber harvest, livestock grazing, roads, and the introduction of exotic species

Downed wood — A tree or part of a tree that is dead and lying on the ground.

Duff — The partially decomposed organic material of the forest floor that lies beneath freshly fallen leaves, needles, twigs, stems, bark, and fruit.

E

Ecosystem — A complete, interacting system of living organisms and the land and water that make up their environment; the home places of all living things, including humans.

Effects — Environmental changes resulting from a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Environment — The combination of external physical, biological, social, and cultural conditions affecting the growth and development of organisms and the nature of an individual or community.

Erosion — The wearing away of the land surface or stream channel by running water, wind, ice, gravity, or other geological activities; can be accelerated or intensified by human activities that reduce the ground cover of soils or that concentrate running water.

F

Fire-dependent systems — Forests, grasslands, and other ecosystems historically composed of species of plants that evolved with and are maintained by fire regimes.

Fire intensity — A term used to describe the rate at which a fire produces thermal energy in one square foot along a flaming front of fire; influenced by the amount of fuel available, local weather conditions, and the topography of the burn site.

Fire-intolerant — Species of plants that do not grow well with or that die from the effects of too much fire. Generally these are shade-tolerant species.

Fire regime — The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire.

Fire return interval — The average time between fires in a given area.

Fire Severity – The degree to which a site has been altered or the successional processes disrupted by fire. Fire severity, loosely, is a product of fire intensity and residence time. Depending on the amount and condition of organic material in them, burned areas are described as belonging to one of three fire severity categories: light-severity, moderate-severity, or high-severity.

Fire-tolerant — Species of plants that can withstand certain frequency and intensity of fire. Generally these are shade–intolerant species.

Flame length — The visible measurable indicator of fireline intensity. It is the length of a flame at the flaming front of a fire.

Floodplain — The portion of river valley or level lowland next to streams, which is covered with water when the river or stream overflows its banks at flood stage.

FOFEM — First Order Fire Effects Model. The model that helps determine mortality or survivability of plant and tree species based on effects of fire from scorch height to the crown or cambium kill under the bark. There is no model for residual burn time to ground root systems from burn out of large woody material, but the program does give an estimate for soil heating for time-temperature profile at specific depths.

Forage — Vegetation (both woody and non-woody) eaten by animals, especially grazing and browsing animals.

Forbs —Any herbaceous plant other than true grasses, sedges, and rushes.

Forest health — The condition in which forest ecosystems sustain their complexity, diversity, resiliency, and productivity to provide for specified human needs and values. It is a useful way to communicate about the current condition of the forest, especially with regard to resiliency, a part of forest health that describes the ability of the ecosystem to respond to disturbances. Forest health and resiliency can be described, in part, by species composition, density, and structure.

Forest plan (Forest Land and Resource Management Plan) — A document that guides natural resource management and establishes standards and guidelines for a national forest; required by the National Forest Management Act.

Fragmentation (habitat) — The break-up of a large land area (such as a forest) into smaller patches isolated by areas converted to a different land type. The opposite of connectivity.

Fuel (fire) — Dry, dead parts of trees, shrubs, and other vegetation that can burn readily.

Fuel ladder — Vegetative structures or conditions, such as low-growing tree branches, shrubs, or smaller trees, that allow fire to move vertically from a surface fire to a crown fire.

Fuel load — The dry weight of combustible materials per unit area; usually expressed as tons per acre.

Fuel Model (FM) — The combination of live and dead fuel loadings and arrangement that is used in conjunction with weather and topography inputs to model the fire behavior of a surface fire.

G

Graminoid — Grass like plants, such as grasses and sedges.

Ground fire — A fire that burns the organic material in the soil layer and the decayed material or peat below the ground surface.

H

Habitat — A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals.

Habitat type — A group of plant communities having similar habitat relationships.

Hard snag — A snag composed primarily of sound wood, particularly sound sapwood that is generally unmerchantable.

Harvest — (1) Felling and removal of trees from the forest; (2) removal of game animals or fish from a population, typically by hunting or fishing.

Headwaters — Beginning of a watershed; un-branched tributaries of a stream.

Historic Range of Variability (HRV) — The natural fluctuation of ecological and physical processes and functions that would have occurred during a specified period of time. Refers to the range of conditions that are likely to have occurred prior to settlement of the project area by Euro-Americans (approximately the mid-1800s), which would have varied within certain limits over time. HRV is discussed in this document only as a reference point, to establish a baseline set of conditions for which sufficient scientific or historical information is available to enable comparison to current conditions.

Hydrophobic soil — Soil that does not readily absorb water. Hydrophobic soil is highly erodible. It is sometimes formed during severe fire on coarse textured soils. Hydrophobic soil usually returns to a non-hydrophobic condition after one or two winters.

I

Indicator species — A species that is presumed to be sensitive to habitat changes; population changes of indicator species are believed to best indicate the effects of land management activities.

Interdisciplinary Team (IDT) — A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no on scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view to bear on the problem.

Intermittent stream — A stream that flows only at certain times of the year when it receives water from other streams or from surface sources such as melting snow.

Invasive weeds — A non-native plant species whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13122, 2/3/99). Invasive plants are distinguished from other non-native plants by their ability to spread (invade) into native ecosystems.

Issue — A point of discussion, debate, or dispute about environmental effects. Key issues are used to formulate alternatives, prescribe design measures, and analyze environmental effects. Issues are “significant” due to the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict. Analysis issues are defined as those directly or indirectly caused by implementing the proposed action

L

Landscape — All the natural features such as grass-lands, hills, forest, and water, which distinguish one part of the earth’s surface from another part; usually that portion of land which the eye can comprehend in a single view, including all its natural characteristics.

Large downed wood — Logs on the forest floor with a large end diameter of at least 21 inches.

Large woody debris — Pieces of wood that are of a large enough size to affect stream channel morphology.

Late and Old Structural (LOS) Forest — (a) Single-stratum with large tree (SSWL) forest refers to mature forest characterized by a single canopy layer consisting of large or old trees. Understory trees are often absent, or present in randomly spaced patches. It generally consists of widely spaced, shade-intolerant species, such as ponderosa pine and western larch, adapted to a low severity, high frequency fire regime. (b) Multi-strata with large tree (MSWL) forest refers to mature forest characterized by two or more canopy layers with generally large or old trees in the upper canopy. Understory trees are also usually present, as a result of a lack of frequent disturbance to the understory. It can include both shade-tolerant and shade-intolerant species, and is generally adapted to a mixed fire regime of both high severity and low severity fires. Other characteristics of old forests include: variability in tree size; increasing numbers of snags and coarse woody debris; increasing appearance of decadence, such as broken tops, sparse crowns, and decay in roots and stems; canopy gaps and understory patchiness; and old trees relative to the site and species.

Litter — The uppermost layer of organic debris on the soil surface, which is essentially the freshly fallen or slightly decomposed vegetation material such as stems, leaves, twigs, and fruits.

M

Management Area (MA) — An area with similar management objectives and a common management prescription.

Management direction — A statement of goals and objectives, management prescriptions, and associated standards and guidelines for attaining them.

Mitigation — Avoiding or minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact by preservation and maintenance operations during the life of the action.

N

National Environmental Policy Act (NEPA) — An act which encourages productive and enjoyable harmony between humans and their environment; promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity; enriches the understanding of the ecological systems and natural resources to the nation, and establishes a Council on Environmental Quality (CEQ).

Non-attainment area — Any area that has been designated as not meeting the standards established by the U.S. Environmental Protection Area (EPA) pursuant to Code of Federal Regulations (CFR) 40 CFR 51.52 for any criteria pollutant.

Non-Wildland Urban Interface (non-WUI) — The area outside a line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Noxious weed — "Any living stage (including but not limited to, seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is a foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry other interests of agriculture, including irrigation, or navigation or the fish and wildlife resources of the United States or the public health" (Public Law 93-629, January 3, 1975, Federal Noxious Weed Act of 1974). Noxious weed is also an important legal designation that can be assigned at both the State and/or Federal level. Noxious weed lists vary by State and often focus on species that have a negative impact on commercial agriculture or rangelands. States have developed laws that require the control or elimination of noxious weeds by landowner. Not all invasive plants are designated as a State or Federal noxious weed.

O

Old-growth — For all National Forests in the Pacific Northwest Region, an old-growth stand is defined as any stand of trees 10 acres or greater generally containing the following characteristics:

a. Stands contain mature and over-mature trees in the overstory and are well into the mature growth stage (see Handbook of Terminology, Society of American Foresters

b. Stands will usually contain a multi-layered canopy and trees of several age classes.

c. Standing dead trees and down material are present.

d. Evidence of human activities may be present but may not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand.

Old Forest Single-Stratum (OFSS) — See Stand Structure.

Old Forest Multi-Strata (OFMS) — See Stand Structure.

Ongoing actions — Those actions that have been implemented, or have contracts awarded or permits issued.

P

Prescribed fire — Intentional use of fire under specified conditions to achieve specific management objectives.

Prescription — A management pathway to achieve a desired objective(s).

Productivity — (1) Soil productivity: the capacity of a soil to produce plant growth, due to the soil's chemical, physical, and biological properties (such as depth, temperature, water–holding capacity, and mineral, nutrient, and organic matter content). (2) Vegetative productivity: the rate of production of vegetation within a given period. (3) General: the innate capacity of an environment to support plant and animal life over time.

Proper functioning condition — Riparian wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve flood-water retention and ground-water recharge; develop root masses and stabilize stream banks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding ,and other uses, and support greater biodiversity.

Proposed action — A proposal by a federal agency to authorize, recommend, or implement an action.

R

Recreation Opportunity Spectrum (ROS) — The Forest Service developed the Recreation Opportunity Spectrum (ROS) system to help identify, quantify, and describe the variety of recreational settings available in National Forests. The ROS system provides a framework for planning and managing recreation resources. The ROS settings are classified on a scale ranging from primitive to urban. Seven elements are used to determine where the setting belongs on the scale:

- •**Visual quality** – The degree of apparent modification of the natural landscape.
- •**Access** – The mode by which activities are pursued and how well users can travel to or within the setting.
- •**Remoteness –** the extent to which individuals perceive themselves removed from the sight and sounds of human activity.
- •**Visitor management –** The degree and appropriateness of how visitor actions are managed and serviced.
- •**On-site recreation development** – The degree and appropriateness of recreation facilities provided within the setting.
- •**Social encounters** – The degree of solitude or social opportunities provided.
- •**Visitor impacts** – The degree of impact on both the attributes of the setting and other visitors within the setting.
- •Based on the seven elements, the Forest Service assigns one of six ROS settings zones to all Forest Service land; four of these apply to the project area.
- •**Roaded Modified:** A natural environment substantially modified, particularly by vegetation and landform alterations. There is strong evidence of roads and /or highways. Frequency of contact is low to moderate.
- •**Roaded Natural:** A natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent. Motorized use is allowed.
- •**Semi-Primitive Non-Motorized:** A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. Use of local roads for recreational purposes is not allowed.
- •**Semi-Primitive Motorized:** A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The opportunity exists to use motorized equipment.

Reforestation — Treatments or activities that help to regenerate stands of trees after disturbances such as harvest or wildfire. Typically, reforestation activities include preparing soil, controlling pests, and planting seeds or seedlings.

Regeneration — The process of establishing new plant seedlings, whether by natural means or artificial measures (planting).

Rehabilitate — To repair and protect certain aspects of a system so that essential structures and functions are recovered, even though the overall system may not be exactly as it was before.

Resilient, resilience, resiliency — (1) The ability of a system to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages. (2) In human communities, refers to the ability of a community to respond to externally induced changes such as larger economic or social forces.

Restoration — Holistic actions taken to modify an ecosystem to achieve desired, healthy, and functioning conditions and processes. Generally refers to the process of enabling the system to resume acting or continue to act following disturbance as if the disturbances were absent. Restoration management activities can be either active (such as control of invasive/noxious weeds, thinning of over-dense stands of trees, or redistributing roads) or more passive (more restrictive, hands-off management direction that is primarily conservation oriented).

Riparian area — Area with distinctive soil and vegetation between a stream, or other body of water, and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Riparian Habitat Conservation Areas (RHCAs) — Portions of watersheds where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. Riparian Habitat Conservation Areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by (1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams, (2) providing root strength for channel stability, (3) shading for stream, and (4) protecting water quality.

Road density — The measure of the degree to which the length of road miles occupies a given land area.

S

Sawtimber — Trees suitable in size and quantity for producing logs that can be processed into lumber.

Scenery Management System — Management guidelines based on the premise that land management activities (including construction of facilities) should not contrast with the existing natural appearing landscape. Within a framework of regional landscape, character types, form, line, color, and texture should be used to make activities and structures “fit” within landscapes.

Scenic Integrity Objectives (SIOs) — The degree of direct human-caused deviations in the landscape, such as road construction, timber harvesting, or activity debris. Indirect deviations, such as landscape created by human suppression of the natural role of fire, are not included. The level to which an area meets its SIOs is indicated by the ratings Very High, High, Moderate, Low, Very Low, or Unacceptably Low.

Scoping — The early stages of preparation of an environmental impact statement/environmental assessment, used to solicit public opinion, receive comments and suggestions, and determine the issues to be considered in the development and analysis of a range of alternatives. Scoping may involve public meetings, telephone conversations, mailings, letters, or other contacts.

Sediment — Solid materials, both mineral and organic, in suspension or transported by water, gravity, ice, or air; may be moved and deposited away from their original position and eventually will settle to the bottom.

Sensitive species — Those species which (1) have appeared in the Federal Register as proposals for classification and are under consideration for official listing as Endangered or Threatened; (2) are on an official State list; or (3) are recognized by he Regional Forester to need special management in order to prevent the need for their placement on Federal or State lists.

Seral — Refers to the stages that plant communities go through during succession. Developmental stages have characteristic structure and plant species composition. Early seral refers to plants that are present soon after a disturbance or at the beginning of a new successional process (such as seedling or sapling growth stages in a forest); mid seral in a forest would refer to pole or medium sawtimber growth stages; late or old seral refers to plants present during a later stage of plant community succession (such as mature and old forest stages).

Seral stage — The developmental phase of a forest stand or rangeland with characteristic structure and plant species composition.

Shade-intolerant — Species of plants that do not grow well in or die from the effects of too much shade. Generally these are fire–tolerant species.

Shade-tolerant — Species of plants that can develop and grow in the shade of other plants. Generally these are fire-intolerant species.

Shallow soils — "scab" soils – highly and very highly erodible, unforested, shallow, rocky soils supporting low amounts of ground cover

Silviculture — The practice of manipulating the establishment, composition, structure, growth, and rate of succession of forests to accomplish specific objectives.

Site — A specific location of an activity or project, such as a campground, a lake, or a stand of trees to be harvested.

Snag — A standing dead tree, usually larger than 5 feet tall and 6 inches in diameter at breast height. Snags are important as habitat for a variety of wildlife species and their prey.

Soil — The earth material that has been so modified and acted upon by physical, chemical, and biological agents that it will support rooted plants.

Soil disturbance — Displacement or compaction (or other disturbance) of soil, that may or may not be severe enough to count as detrimental soil impact.

Stand — A group of trees in a specific area that is sufficiently alike in composition, age, arrangement, and condition so as to be distinguishable from the forest in adjoining areas.

Stand density — Refers to the number of trees growing in a given area, usually expressed in trees per acre.

Stand structure — The size and arrangement, both vertically and horizontally, of vegetation. Forested vegetation is classified into 7 different structural stages:

- **Stand Initiation (SI) –** When land is occupied by trees following a stand-replacing disturbance.
- **Stem Exclusion Open Canopy (SEOC) –** Forested areas where the occurrence of new trees is predominantly limited by moisture.
- **Stem Exclusion Closed Canopy (SECC) –** Forested areas where the occurrence of new trees is predominately limited by light.
- **Understory Reinitiation (UR) –** When a second generation of trees is established under an older, typically seral, overstory.
- **Young Forest Multi-Strata (YFMS) –** Stand development resulting from frequent harvest or lethal disturbance to the overstory.
- **Old Forest Multi-Strata (OFMS) –** Forested areas lacking frequent disturbance to understory vegetation.
- **Old Forest Single-Stratum (OFSS) –** Forested areas resulting from frequent non-lethal prescribed or natural underburning, or other management.

The abundance and distribution of these forest structures provides the basis for evaluation of the historic range of variability (HRV) of structural conditions providing insight to the interaction of disturbance processes and associated structural and compositional conditions of forested landscapes.

Stringer meadows — Refers to small meadows found along streams, often narrow but elongated up and down the stream.

Structure — The size and arrangement, both vertically and horizontally, of vegetation.

Structural stage — A stage of development of a vegetation community that is classified on the dominant processes of growth, development, competition, and mortality. See Stand Structure.

Subwatershed — A drainage area, equivalent to a 6^{th}-field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds (6^{th}-field HUC) are contained within watershed (5^{th}-field HUC), which in turn contained within a subbasin (4^{th}-field HUC). The size of subwatersheds has recently been redefined as 10,000 to 40,000 acres; formerly size of watersheds was 5,000 to 20,000 acres. The former size was used in this document. Subwatersheds are shown graphically in Figure 3, Map Section.

Subsoiling — Tillage to loosen compacted soil. On the Malheur, subsoiling typically is done by a bulldozer pulling three or two shanks that have a shoe at about 18 inches depth that lifts the soil and breaks up compaction above the shoe.

Surface fire — Fire that burns surface litter, other loose debris of the forest floor, and small vegetation.

T

Terrestrial — Pertaining to the land.

Terrestrial communities — Groups of cover types with similar moisture and temperature regimes, elevational gradients, structures, and use by vertebrate wildlife species.

Thermal cover — Cover used by animals for protection against weather.

Thinning — An operation to remove stems from a forest for the purpose of reducing fuel, maintaining stand vigor, regulating stand density/composition, or for other resource benefits. Although thinning can result in commercial products, thinning generally refers to non-commercial operations.

Threatened species — Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future through-out all or a significant portion of their range.

U

Underburn — To burn by a surface fire that can consume ground vegetation and ladder fuels.

Understory — Plants that grow beneath the canopy of other plants. Usually refers to grasses, forbs, and low shrubs under a tree or shrub canopy.

Understory Reinitiation (UR) — See Stand Structure.

Undesirable trees — Trees that, dependent on species or tree condition (insect, disease, damage,) are not sought-after for future management.

Uneven-aged stand — Stand of trees in which there are considerable differences in the ages of individual trees.

Upland — The portion of the landscape above the valley floor or stream.

V

Viability — In general, viability means the ability of a population of a plant or animal species to persist for some specified time into the future. For planning purposes, a viable population is one that has the estimated numbers and distribution of reproductive individuals to ensure that its continued existence will be well distributed in the planning area.

Visual Quality Objectives (VQOs) — A desired level of management based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration of the characteristic landscape.

- **Preservation —** Allows only ecological changes. Management activities, except for very low visual impact recreation facilities, are prohibited. This objective applies to specially classified areas, including wilderness.
- **Retention —** Provides for management activities that are not visually evident. Management activities are permitted, but the results of those activities on the natural landscape must not be evident to the average viewer.
- **Partial retention** — Management activities may be evident to the viewer but must remain visually subordinate to the surrounding landscape.
- **Modification —** Management activities may visually dominate the natural surrounding landscape but must borrow from naturally established form, line, color, and texture.
- **Maximum modification —** Land management activities can dominate the natural landscape to greater extent than in the modification objective, except as viewed from background when visual characteristics must be those of natural occurrences within the surrounding area.

W

Watershed — (1) The region draining into a river, river system, or body of water. (2) A watershed also refers specifically to a drainage area of approximately 50,000 to 100,000 acres, which is equivalent to a 5^{th} – field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds (6^{th}-field HUC) are contained within a watershed (5th–field HUC), which in turn is contained within a subbasin (4^{th}-field HUC).

Wetland — In general, an area soaked by surface or groundwater frequently enough to support vegetation that requires saturated soil conditions for growth and reproduction; generally includes swamps, marshes, springs, seeps, bogs, wet meadows, mudflats, natural ponds, and other similar areas. Legally, federal agencies define wetlands as possessing three essential characteristics: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. The three technical characteristics specified are mandatory and must all be met for an area to be identified as a wetland. Hydrophytic vegetation is defined as plant life growing in water, soil, or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic (without oxygen) conditions in the upper part of the soil profile. Generally, to be considered a hydric soil, there must be saturation at temperatures above freezing for at least seven days. Wetland hydrology is defined as permanent or periodic inundation, or soil saturation to the surface, at least seasonally.

Whole tree yarding — No cutting of limbs and tops before yarding of the tree out of the unit during salvage operations. This does not mean that there will not be limbs and tops left out in the unit due to breakage since the trees are dead.

Wildfire — A human or naturally caused fire that does not meet land management objectives.

Wildland Urban Interface (WUI) — The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Y

Yarding — The hauling of felled timber to the landing or temporary storage site from where trucks (usually) transport it to the mill site. Yarding methods include cable yarding, ground skidding, and aerial methods such as helicopter yarding.

Young Forest Multi-Strata (YFMS) — S**ee Stand Structure.**

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APPENDICES

Changes from Draft to Final EIS

The following changes were made between the DEIS and FEIS.

Change Items
A summary table that compares commercial harvest, precommercial thinning, and fuel treatments by alternative was added to Appendix A.
New maps were added to Appendix B: Existing DOGs / ROGs Map, Proposed DOGs / ROGs Map, Connectivity Corridor Map, Soils Map, and Watershed Map.
Tables in Appendix C were updated to summarize road maintenance, reconstruction, road closures, and decommissioning activities by subwatershed.
Appendix D – Cumulative Activities Considered – a new foreseeable activity was added, and the status of ongoing activities were updated.
New appendices were added, Appendix E- Response to Comments; Appendix F- Best Management Practices; Appendix G – Summary of Global Climate Change Prevention Act of 1990.

APPENDIX A – Alternative Summary

ALTERNATIVE SUMMARY: HARVEST ACTIVITIES AND CONNECTED ACTIONS				
	ALT 1	**ALT 2**	**ALT 3**	**ALT 4**
Harvest and Precommercial Thinning Activities				
Commercial Thinning	0	2073	1506	0
Shelterwood Harvest	0	119	0	0
Precommercial Thinning (PCT)	0	935	666	795
Fuel Treatments (Within Harvest and PCT Units)				
Yard Tops Attached	0	441	276	0
Hand Pile	0	147	140	146
Grapple Pile	0	822	631	649
Yard Tops and Hand Pile	0	11	0	0
Yard Tops and Grapple Pile	0	55	0	0
Prescribed Burning (Within Harvest Units)	0	563	327	0
Hand Pile and Prescribed Burning	0	16	6	0
No Fuel Treatment	0	138	133	0

FHB = Hand piling

HSH = Shelterwood Harvest

HTH = Commercial Thinning

PCT = Precommercial Thinning

YTA = Yard tops attached

ALTERNATIVE 2: HARVEST ACTIVITIES AND CONNECTED ACTIONS							
Unit #	**Acres**	**Treatment Prescription**	**Planting**	**YTA**	**FHB**	**Grapple Pile**	**PCT**
12	36	HTH				36	36
14	11	HTH				11	
22	6	HTH			6		6
24	9	HTH			9		9
32	50	HTH				50	50
38	31	HTH				31	31
39	7	HTH				7	7
40	99	HSH	99			99	99
41	20	HSH	20	20		20	20
49	13	HTH			13		13
52	13	HTH		13			
53	15	HTH		15			
54	15	HTH		15			
56	35	HTH		35		35	35
58	66	HTH		66			
60	58	HTH		58			
62	22	HTH		23			

ALTERNATIVE 2: HARVEST ACTIVITIES AND CONNECTED ACTIONS							
Unit #	**Acres**	**Treatment Prescription**	**Planting**	**YTA**	**FHB**	**Grapple Pile**	**PCT**
64	44	HTH		44			
66	33	HTH		33			
68	50	HTH				50	
69	7	HTH					
70	33	HTH					
72	139	HTH					
74	88	HTH					
76	30	HTH		30			
77	10	HTH		10			
78	72	HTH				72	72
79	21	HTH				21	21
80	20	HTH				20	20
82	51	HTH		51			
83	62	HTH		62			
84	12	HTH					
88	3	HTH		3			
90	22	HTH					
91	39	HTH			39		39
94	33	HTH					
95	11	HTH					
96	4	HTH					
100	18	HTH		18			
102	22	HTH					
103	7	HTH					
105	14	HTH					
106	27	HTH					
108	23	HTH			23		23
110	3	HTH				3	3
112	13	HTH				13	13
116	41	HTH			3		
118	12	HTH			3		
120	12	HTH			12		
122	63	HTH			5		
124	10	HTH				10	10
126	75	HTH				75	75
128	34	HTH				34	34
130	61	HTH			5		
131	13	HTH			13		13
132	51	HTH				51	51
133	50	HTH				50	50
134	42	HTH					
135	11	HTH		11	11		11
136	46	HTH					

ALTERNATIVE 2: HARVEST ACTIVITIES AND CONNECTED ACTIONS							
Unit #	**Acres**	**Treatment Prescription**	**Planting**	**YTA**	**FHB**	**Grapple Pile**	**PCT**
138	71	HTH				71	71
142	33	HTH				33	33
144	33	HTH					
146	58	HTH				58	58
148	13	HTH			13		13
149	19	HTH			19		19
150	27	HTH				27	
TOTAL	2192		119	507	174	877	935

Portions or entire units with prescribed fire as the activity fuels treatment include: 69, 70, 72, 74, 84, 94, 95, 96, 102, 103, 105, 106, 116, 118, 122, 130, 134, and 136. Portions of units 116, 118, 122, and 130 within the visual corridor have hand piling proposed within 200 feet of Oregon State Highway 7 and US Highway 26 corridor.

ALTERNATIVE 3: HARVEST ACTIVITIES AND CONNECTED ACTIONS						
Unit #	**Acres**	**Treatment Prescription**	**YTA**	**FHB**	**Grapple Pile**	**PCT**
12	36	HTH			36	36
14	11	HTH			11	
22	6	HTH		6		6
24	9	HTH		9		9
32	50	HTH			50	50
49	13	HTH		13		13
52	13	HTH	13			
53	15	HTH	15			
54	15	HTH	15			
60	58	HTH	58			
62	22	HTH	23			
66	33	HTH	33			
68	50	HTH			50	
69	7	HTH				
70	33	HTH				
72	139	HTH				
74	83	HTH				
76	30	HTH	30			
78	52	HTH			52	52
79	21	HTH			21	21
80	20	HTH			20	20
82	24	HTH	24			
83	62	HTH	62			
84	12	HTH				
88	3	HTH	3			
90	22	HTH				
91	39	HTH		39		39
94	25	HTH				

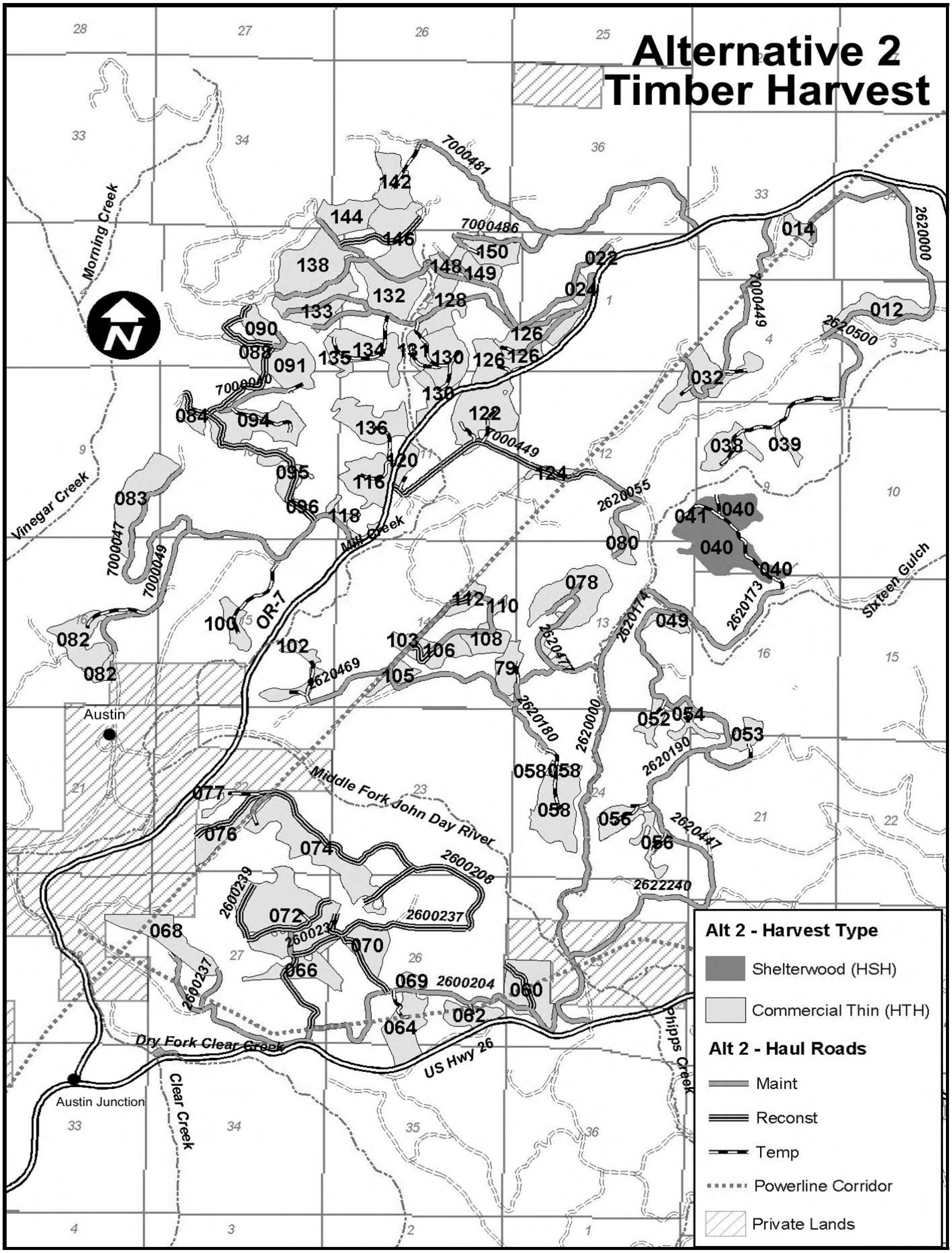
ALTERNATIVE 3: HARVEST ACTIVITIES AND CONNECTED ACTIONS						
Unit #	**Acres**	**Treatment Prescription**	**YTA**	**FHB**	**Grapple Pile**	**PCT**
95	7	HTH				
96	4	HTH				
103	7	HTH				
105	14	HTH				
106	27	HTH				
108	23	HTH		23		23
110	3	HTH			3	3
112	13	HTH			13	13
116	41	HTH		3		
118	12	HTH		3		
120	12	HTH		12		
124	10	HTH			10	10
126	75	HTH			75	75
128	34	HTH			34	34
132	51	HTH			51	51
133	50	HTH			50	50
138	71	HTH			71	71
144	33	HTH				
146	58	HTH			58	58
148	13	HTH		13		13
149	19	HTH		19		19
150	26	HTH			26	
TOTAL	1506		276	140	631	666

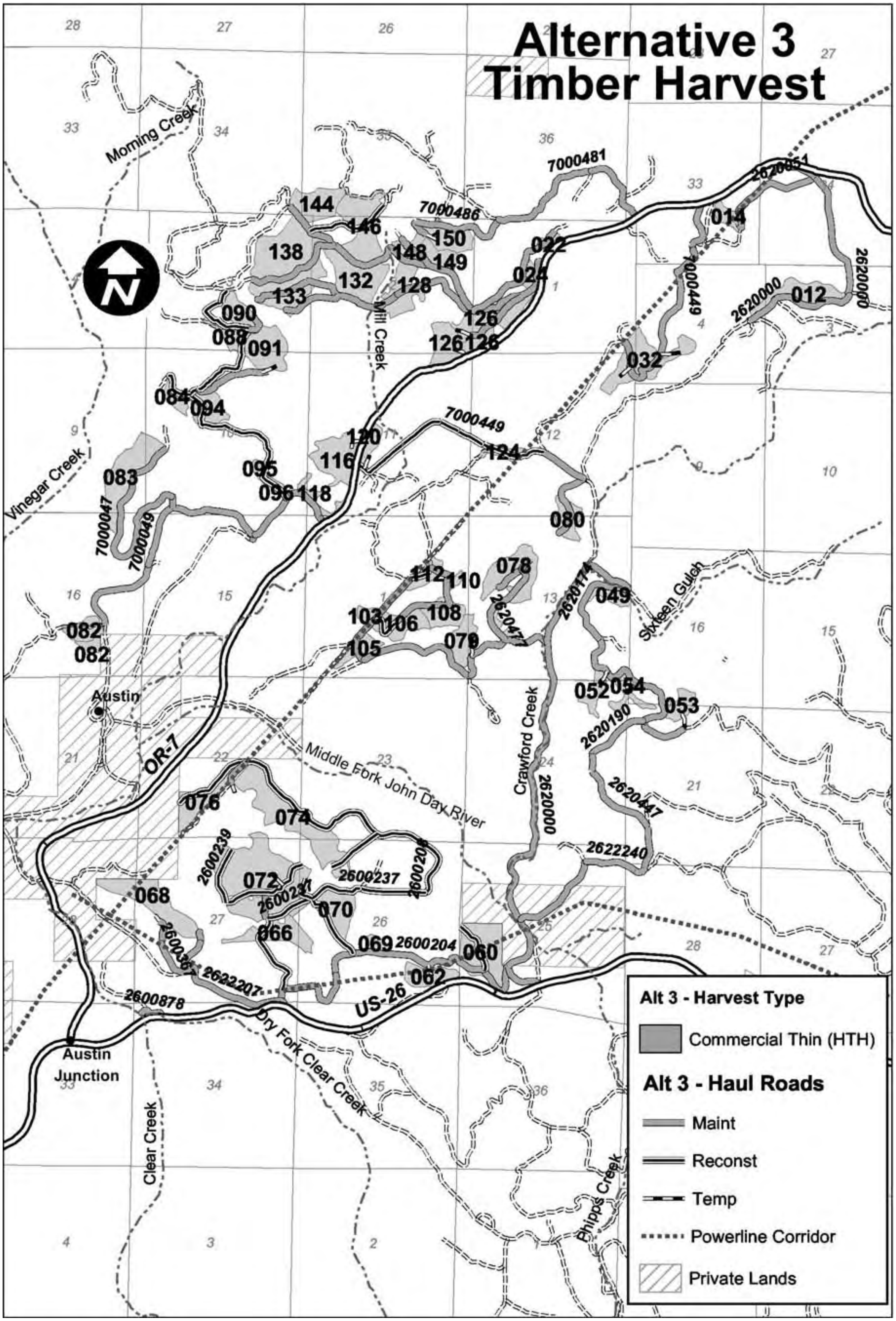
Portions or entire units with prescribed fire as the activity fuels treatment include: 69, 70, 72, 74, 84, 94, 95, 96, 103, 105, 106, 116, and 118. Portions of units 116 and 118 within the visual corridor have hand-piling proposed within 200 feet of Oregon State Highway 7 and U.S. Highway 26 corridor.

ALTERNATIVE 4: PRECOMMERCIAL THINNING AND CONNECTED ACTIONS					
Unit #	**Acres**	**Treatment Prescription**	**FHB**	**Grapple Pile**	**PCT**
12	36	PCT		36	36
22	6	PCT	6		6
24	9	PCT	9		9
32	50	PCT		50	50
38	31	PCT		31	31
39	7	PCT		7	7
49	13	PCT	13		13
56	35	PCT		35	35
78	51	PCT		51	51
79	21	PCT		21	21
80	20	PCT		20	20
91	39	PCT	39		39
108	23	PCT	23		23

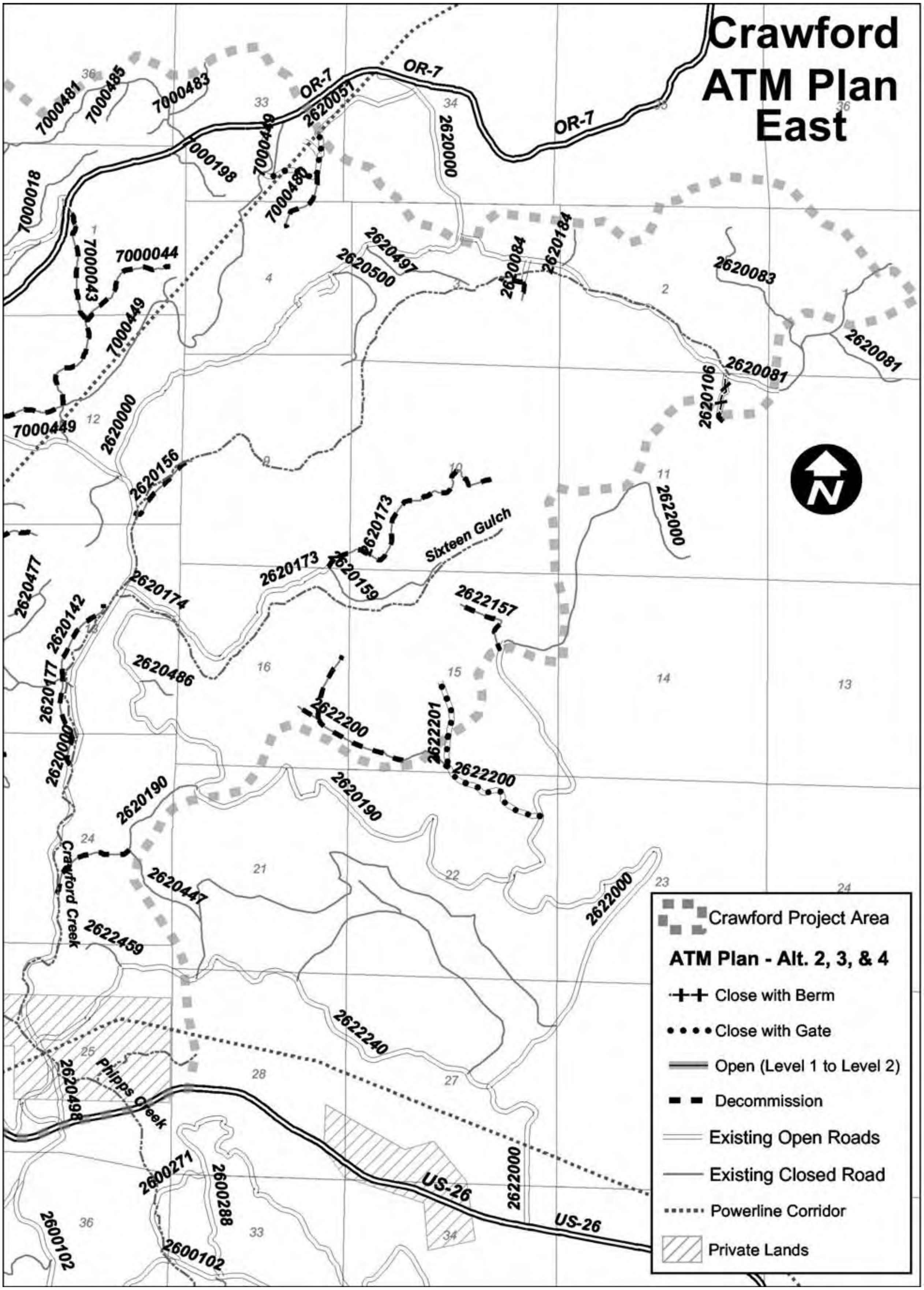
110	3	PCT		3	3
112	13	PCT		13	13
124	10	PCT		10	10
126	75	PCT		75	75
128	34	PCT		34	34
131	13	PCT	13		13
132	51	PCT		51	51
133	50	PCT		50	50
135	11	PCT	11		11
138	71	PCT		71	71
142	33	PCT		33	33
146	58	PCT		58	58
148	13	PCT	13		13
149	19	PCT	19		19
TOTAL	795		146	649	795

APPENDIX B – MAPS





Alternative 3
Timber Harvest
Alt 3 - Harvest Type
Commercial Thin (HTH)
Alt 3 - Haul Roads
Maint
Reconst
Temp
Powerline Corridor
Private Lands
Morning Creek
Vinegar Creek
Mill Creek
Crawford Creek
Sixteen Gulch
Middle Fork John Day River
Dry Fork Clear Creek
Clear Creek
Phipps Creek
Austin
Austin Junction
OR-7
US-26


Crawford
ATM Plan
East
OR-7
Crawford Project Area
ATM Plan - Alt. 2, 3, & 4
Close with Berm
Close with Gate
Open (Level 1 to Level 2)
Decommission
Existing Open Roads
Existing Closed Road
Powerline Corridor
Private Lands
Sixteen Gulch
Crawford Creek
Phipps Creek
US-26
7000481
7000485
7000483
7000018
7000198
7000449
7000043
7000044
2620051
2620000
2620497
2620500
2620084
2620184
2620083
2620081
2620106
2622000
2620156
2620173
2620159
2620174
2620477
2620142
2620177
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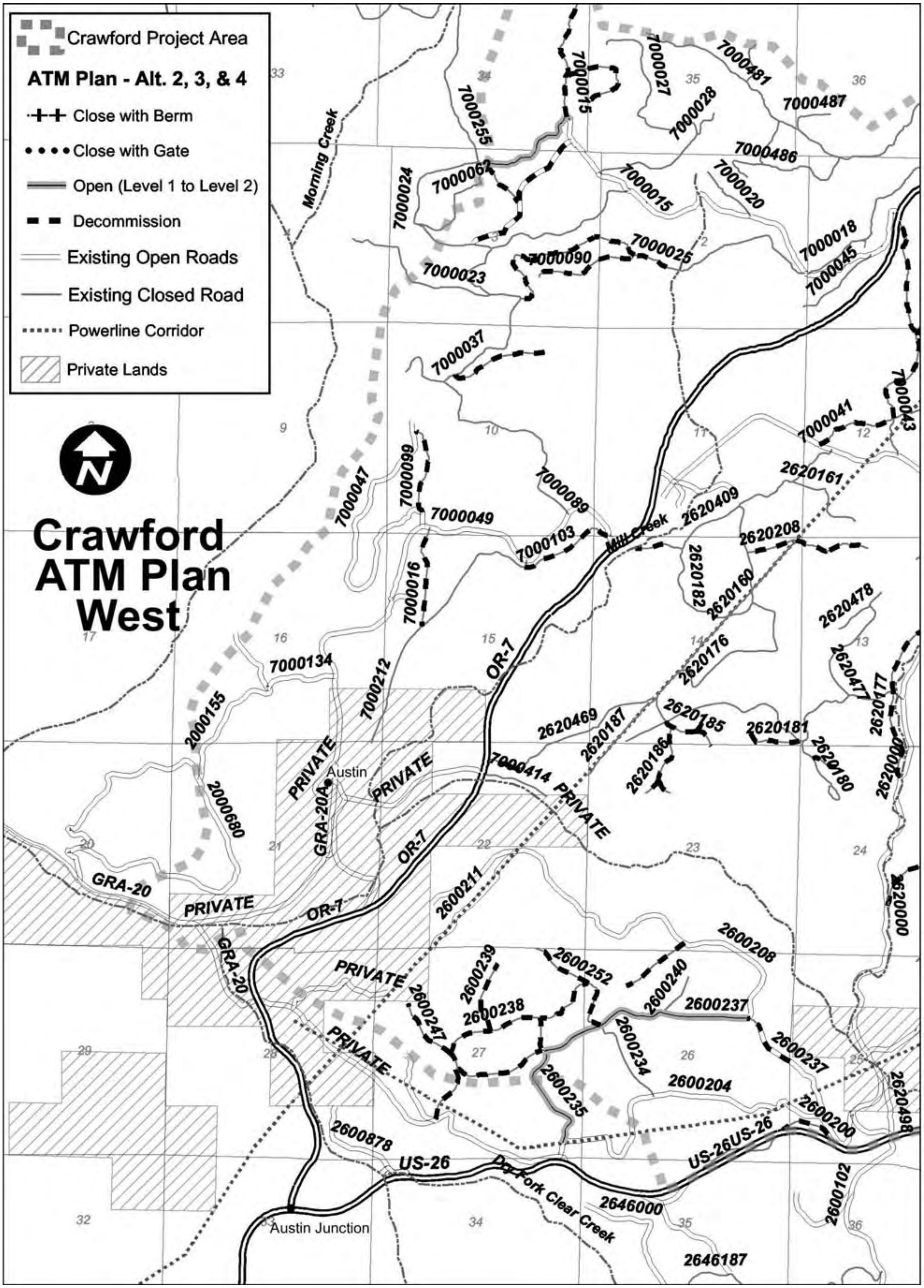
Crawford Project Area
ATM Plan - Alt. 2, 3, & 4
Close with Berm
Close with Gate
Open (Level 1 to Level 2)
Decommission
Existing Open Roads
Existing Closed Road
Powerline Corridor
Private Lands
N
Crawford
ATM Plan
West
Morning Creek
Mill Creek
Austin
Austin Junction
PRIVATE
OR-7
US-26
GRA-20
GRA-20A
Dry Fork Clear Creek
7000015
7000027
7000481
7000487
7000255
7000028
7000486
7000062
7000024
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2620409
2620208
2620182
2620160
2620478
7000134
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2620477
2620177
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2620185
2620181
2620186
2620180
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2600252
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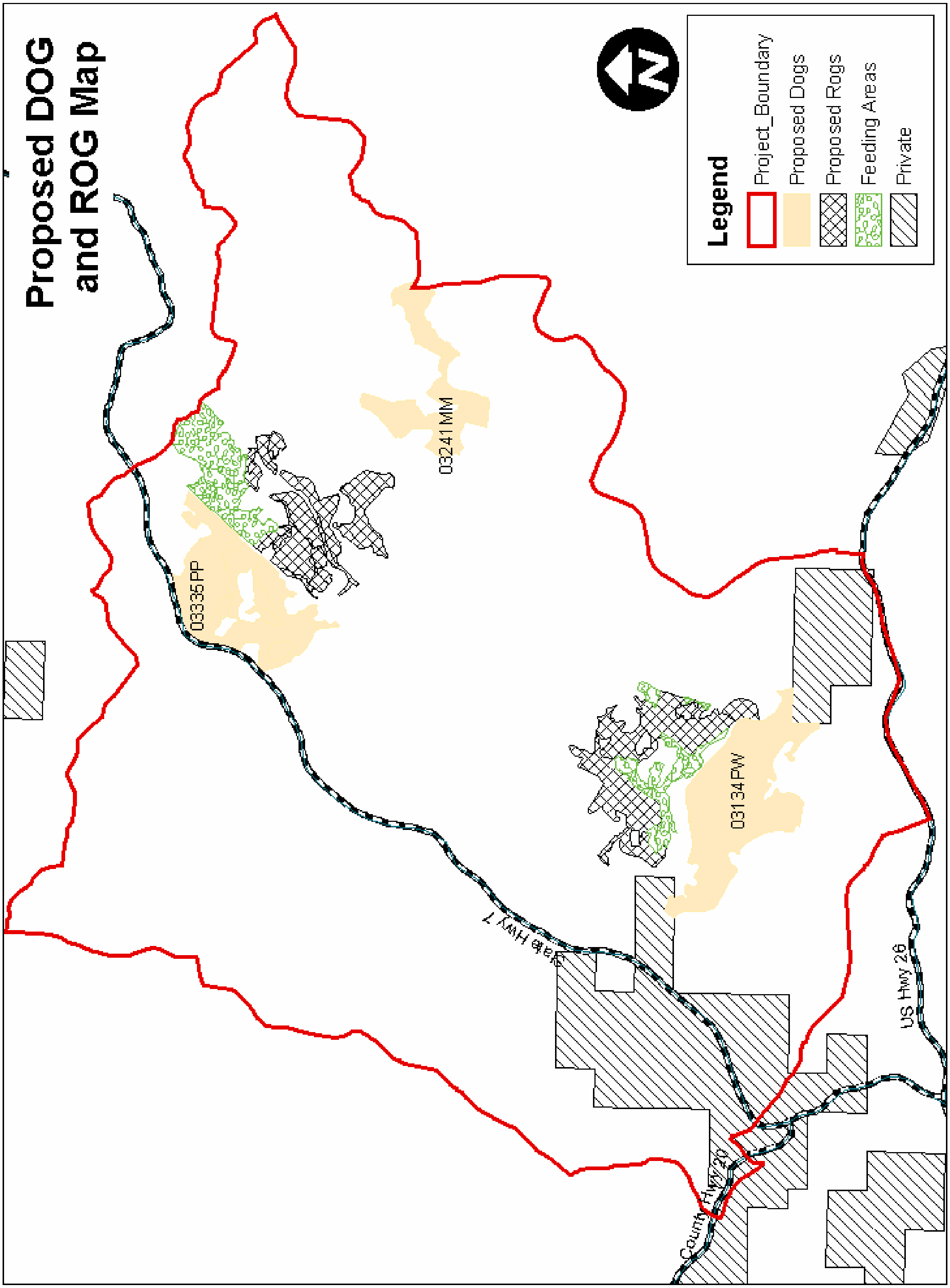
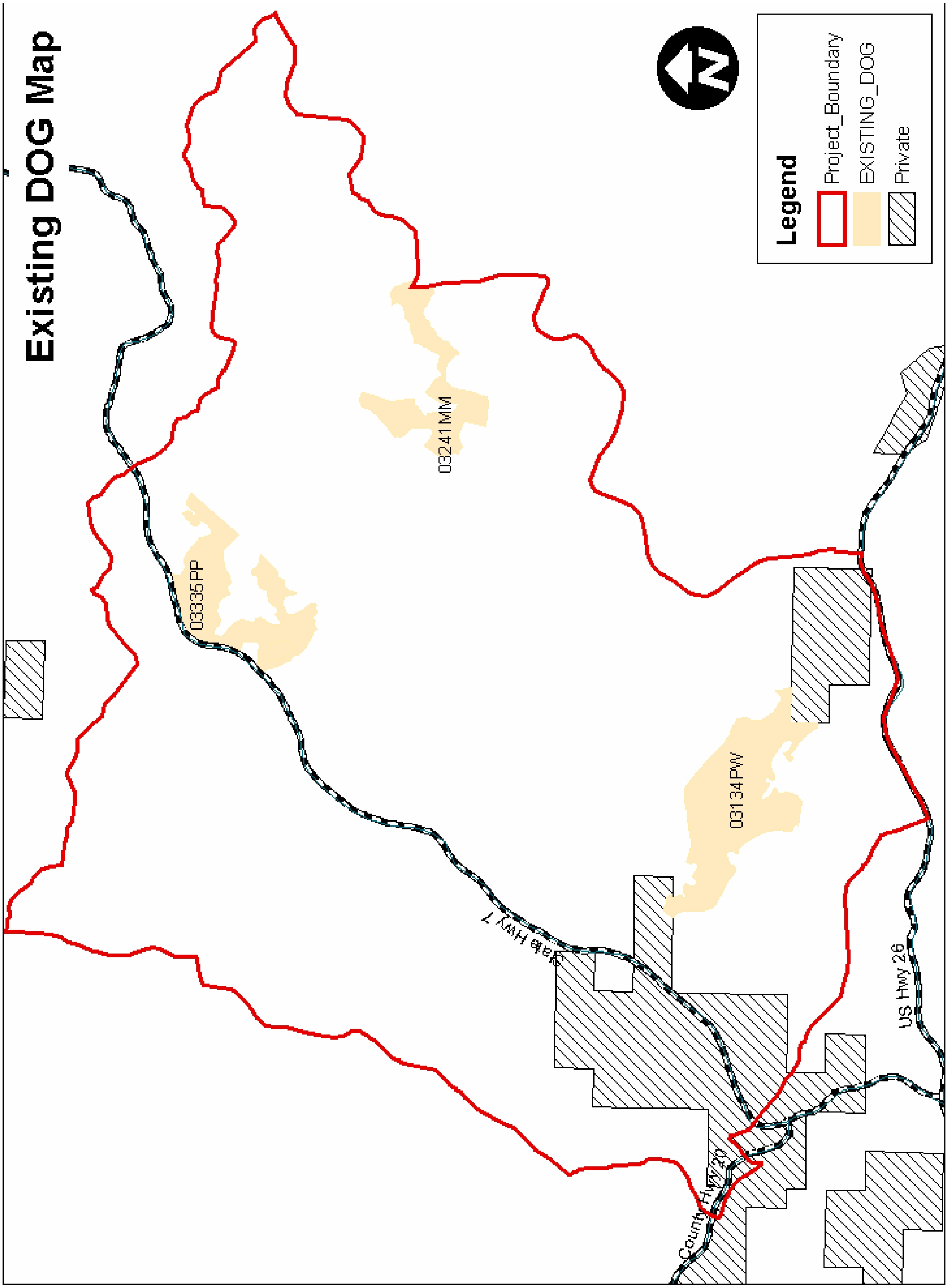
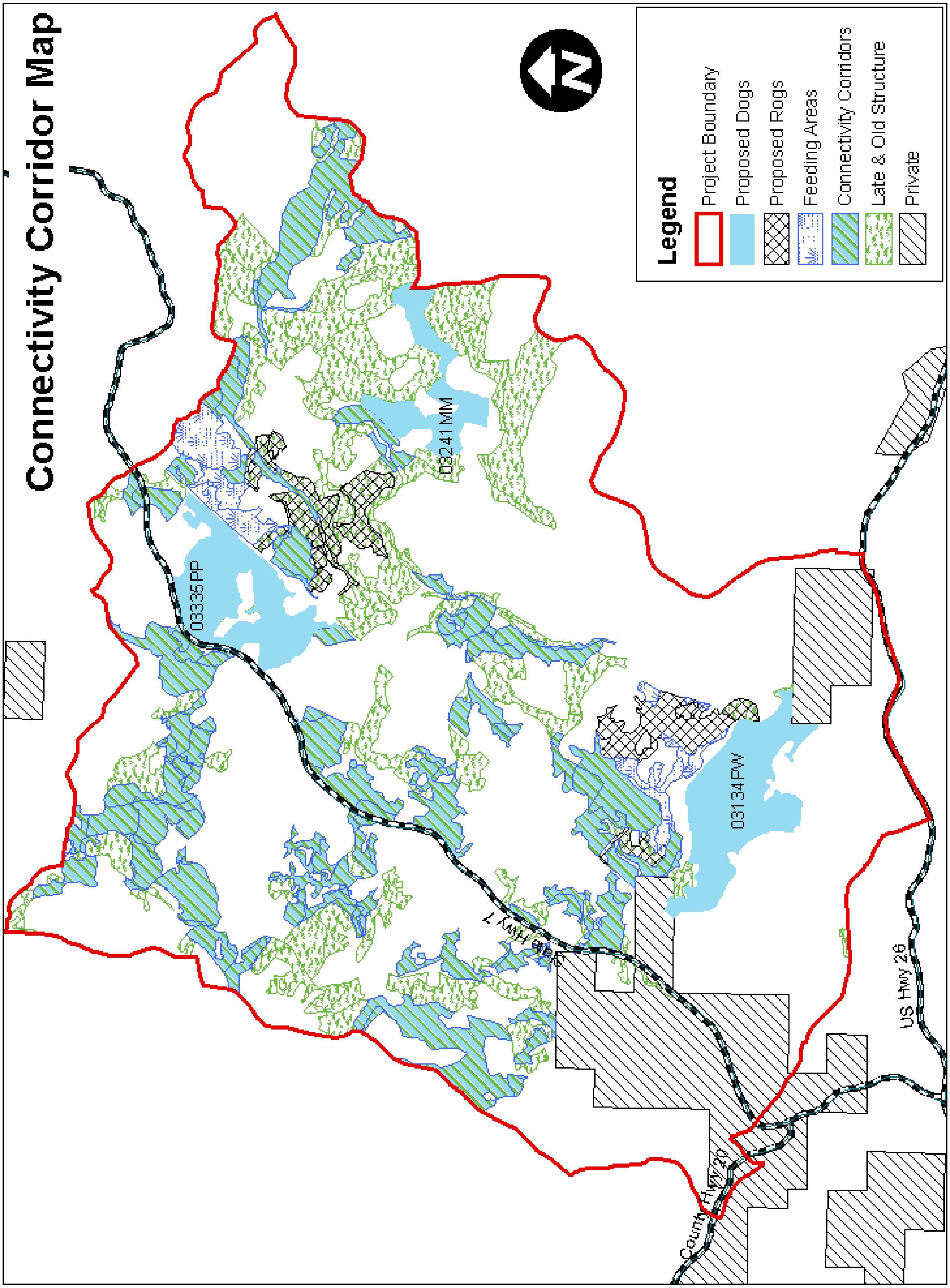
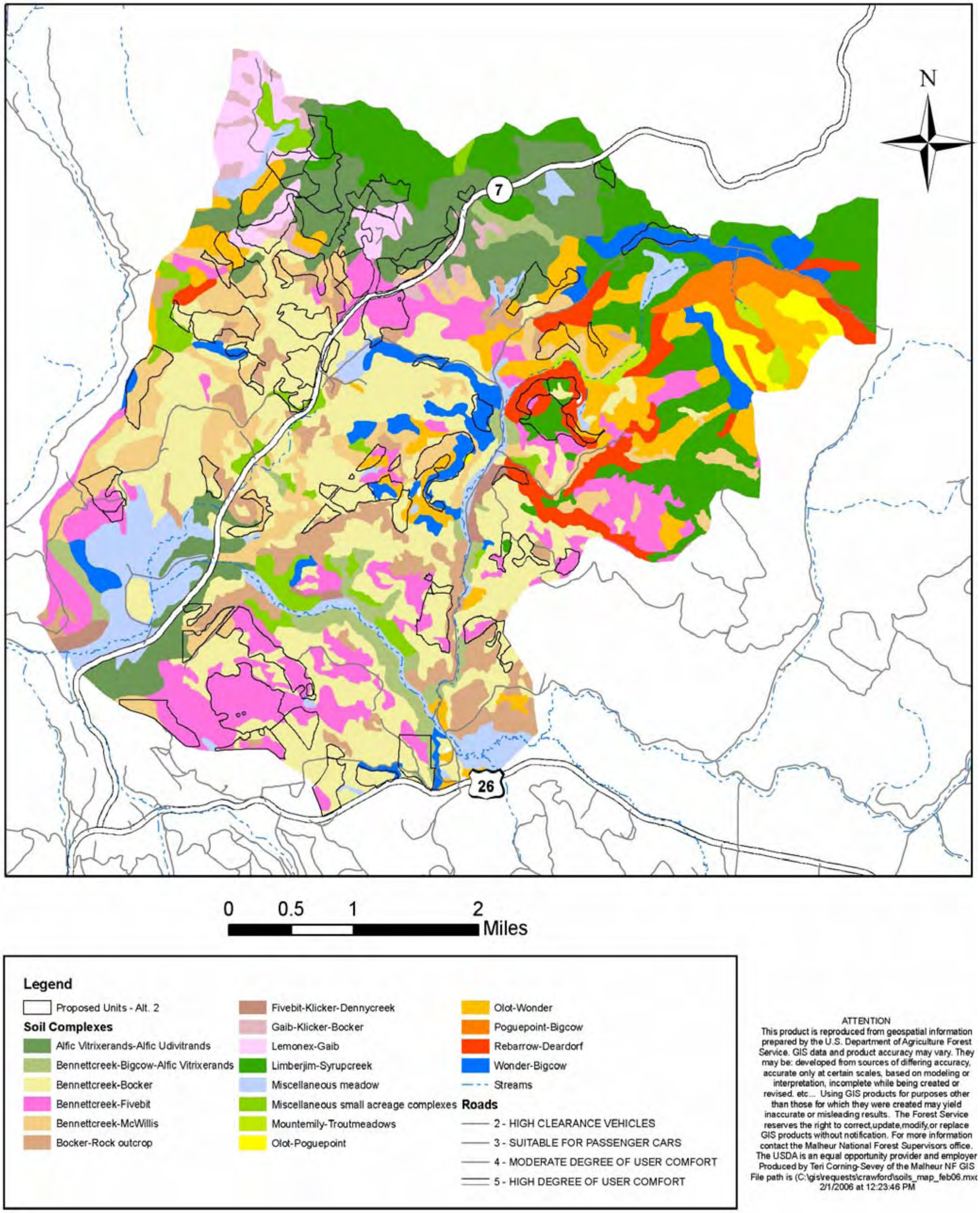
2600102
2646187

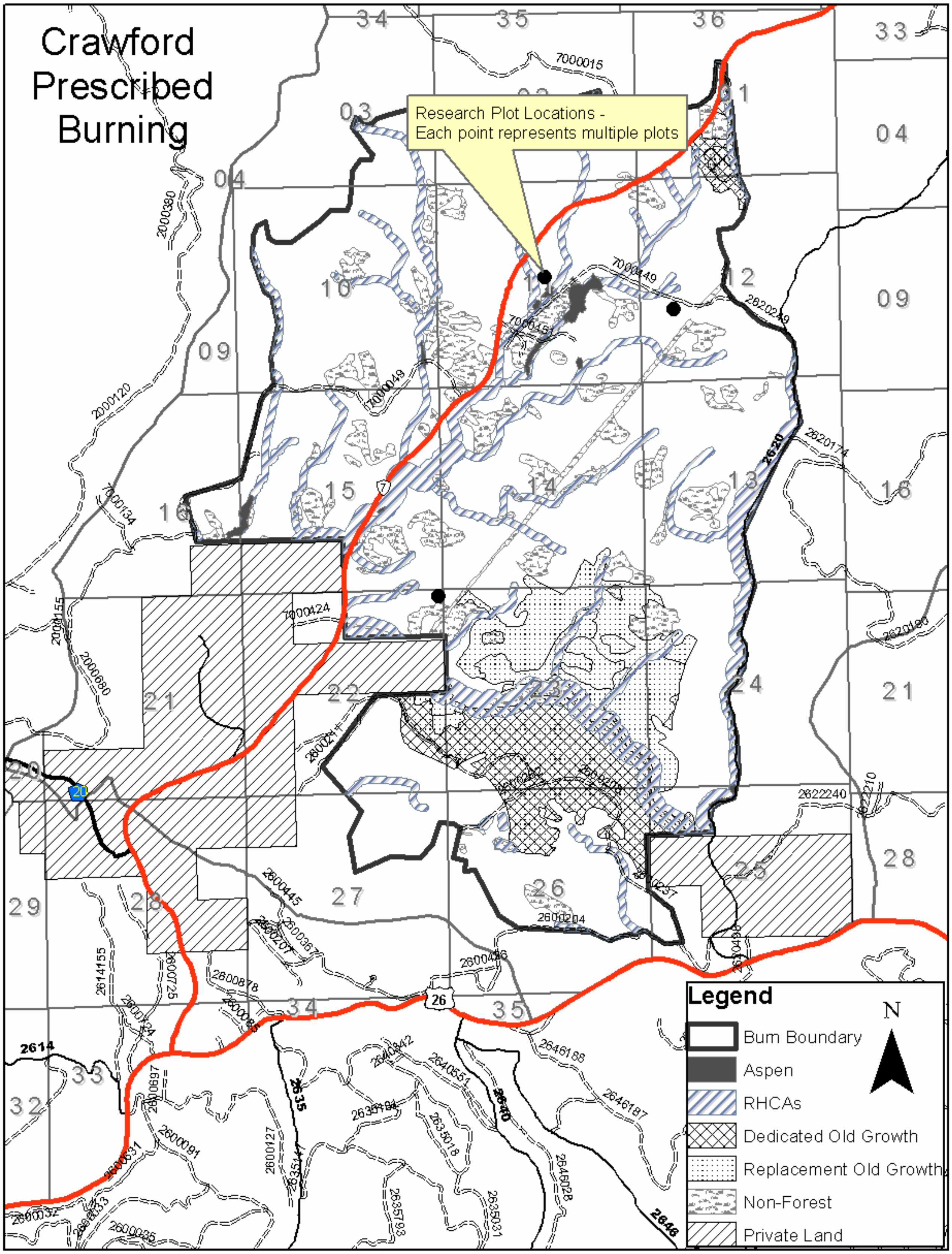

Proposed DOG and ROG Map
Legend
Project_Boundary
Proposed Dogs
Proposed Rogs
Feeding Areas
Private
N
03241 MM
03335 PP
03134 PW
State Hwy 7
US Hwy 26
County Hwy 20


Existing DOG Map
Legend
Project_Boundary
EXISTING_DOG
Private
03241MM
03335PP
03134PW
State Hwy 7
US Hwy 26
County Hwy 20


Connectivity Corridor Map
N
Legend
Project Boundary
Proposed Dogs
Proposed Rogs
Feeding Areas
Connectivity Corridors
Late & Old Structure
Private
03241MM
03335PP
03134PW
State Hwy 7
US Hwy 26
County Hwy 20

Crawford Area Soils Map




Crawford
Prescribed
Burning
Research Plot Locations -
Each point represents multiple plots
Legend
Burn Boundary
Aspen
RHCAs
Dedicated Old Growth
Replacement Old Growth
Non-Forest
Private Land
N

APPENDIX C – ROAD SUMMARY

Road Summary				
	Road Maintenance	**Road Reconstruction**	**Road Closures**	**Road Decommissioning**
Alternative 1	**0**	**0**	**0**	**0**
Alternative 2	32.5	10.9	1.5	18.0
Alternative 3	29.2	10.9	1.5	18.0
Alternative 4	0	0	1.5	18.0

Note: Summary includes activities in the Mill Creek, Dry Fork, Idaho/Summit Creek, and Upper North Fork Burnt River Subwatersheds. See table below for summaries specific to each subwatershed.

Maintenance in Dry Fork Subwatershed						
ID	**OPERATOR MAINT**	**SURFACE TYPE**	**SUBWATERSHED**	**MILES**	**ALT 2**	**ALT 3**
2600204	2	IMP	DRY FORK	0.1	Maint	Maint
2600204	2	IMP	DRY FORK	0.5	Maint	Maint
2600207	2	NAT	DRY FORK	0.8	Maint	Maint
2600237	1	NAT	DRY FORK	0.2	Maint	Maint
2600445	2	NAT	DRY FORK	0.1	Maint	Maint
			Total Miles		**1.7**	**1.7**
Maintenance in Idaho Creek/Summit Creek Subwatershed						
ID	**OPERATOR MAINT**	**SURFACE TYPE**	**SUBWATERSHED**	**MILES**	**ALT 2**	**ALT 3**
2620190	2	NAT	IDAHO CREEK/	0.2	Maint	Maint
2620447	1	NAT	IDAHO CREEK/	0.5	Maint	Maint
2622210	1	NAT	IDAHO CREEK/	0.3	Maint	Maint
2622240	2	IMP	IDAHO CREEK/	0.1	Maint	Maint
			Total Miles		**1.1**	**1.1**
Maintenance in Mill Creek Subwatershed						
ID	**OPERATOR MAINT**	**SURFACE TYPE**	**SUBWATERSHED**	**MILES**	**ALT 2**	**ALT 3**
2600204	2	IMP	MILL CREEK	0.3	Maint	Maint
2600204	2	IMP	MILL CREEK	0.2	Maint	Maint
2600204	2	IMP	MILL CREEK	0.8	Maint	Maint
2600211	2	NAT	MILL CREEK	0.2	Maint	Maint
2600237	1	NAT	MILL CREEK	0.1	Maint	Maint
2600251	1	NAT	MILL CREEK	0.2	Maint	Maint
2600367	2	NAT	MILL CREEK	0.3	Maint	Maint
2620000	3	IMP	MILL CREEK	0.2	Maint	Maint
2620000	3	IMP	MILL CREEK	0.3	Maint	Maint
2620000	3	IMP	MILL CREEK	0.1	Maint	Maint
2620000	3	IMP	MILL CREEK	0.1	Maint	Maint
2620000	3	IMP	MILL CREEK	0.7	Maint	Maint
2620000	3	IMP	MILL CREEK	0.4	Maint	Maint
2620000	3	IMP	MILL CREEK	0.1	Maint	Maint
2620000	3	IMP	MILL CREEK	0.2	Maint	Maint

2620000	3	IMP	MILL CREEK	0.4	Maint	Maint
2620000	3	IMP	MILL CREEK	0.5	Maint	Maint
2620000	3	IMP	MILL CREEK	0.2	Maint	Maint
2620000	3	IMP	MILL CREEK	0.5	Maint	Maint
2620055	1	NAT	MILL CREEK	0.2	Maint	Maint
2620055	1	NAT	MILL CREEK	0.3	Maint	Maint
2620173	2	NAT	MILL CREEK	0.8	Maint	
2620174	2	NAT	MILL CREEK	0.3	Maint	Maint
2620174	2	NAT	MILL CREEK	0.1	Maint	Maint
2620174	2	NAT	MILL CREEK	0.3	Maint	Maint
2620174	2	NAT	MILL CREEK	0.2	Maint	Maint
2620174	2	NAT	MILL CREEK	0.3	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.4	Maint	Maint
2620176	1	NAT	MILL CREEK	0.4	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.2	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.2	Maint	Maint
2620176	1	NAT	MILL CREEK	0.2	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.5	Maint	Maint
2620180	1	NAT	MILL CREEK	0.1	Maint	
2620180	1	NAT	MILL CREEK	0.2	Maint	
2620180	1	NAT	MILL CREEK	0.1	Maint	
2620190	2	NAT	MILL CREEK	0.1	Maint	Maint
2620190	1	NAT	MILL CREEK	0.4	Maint	Maint
2620190	1	NAT	MILL CREEK	0.1	Maint	Maint
2620209	1	NAT	MILL CREEK	0.3	Maint	Maint
2620249	2	NAT	MILL CREEK	0.3	Maint	Maint
2620447	1	NAT	MILL CREEK	0.1	Maint	Maint
2620469	1	NAT	MILL CREEK	0.5	Maint	
2620477	1	NAT	MILL CREEK	0.6	Maint	Maint
2620477	1	NAT	MILL CREEK	0.1	Maint	Maint
2620478	1	NAT	MILL CREEK	0.2	Maint	Maint
2620500	1	NAT	MILL CREEK	0.1	Maint	
2620500	1	NAT	MILL CREEK	0.5	Maint	
2622240	2	IMP	MILL CREEK	0.6	Maint	Maint
2622240	2	IMP	MILL CREEK	0.3	Maint	Maint
7000015	2	IMP	MILL CREEK	0.3	Maint	Maint
7000015	2	IMP	MILL CREEK	0.4	Maint	Maint
7000015	2	IMP	MILL CREEK	0.3	Maint	Maint
7000015	2	IMP	MILL CREEK	0.7	Maint	Maint
7000015	2	IMP	MILL CREEK	0.2	Maint	Maint
7000015	2	IMP	MILL CREEK	0.2	Maint	Maint
7000018	1	NAT	MILL CREEK	0.8	Maint	Maint
7000020	1	NAT	MILL CREEK	0.2	Maint	Maint

7000025	1	NAT	MILL CREEK	0.1	Maint	Maint
7000025	1	NAT	MILL CREEK	0.1	Maint	Maint
7000025	1	NAT	MILL CREEK	0.2	Maint	Maint
7000025	1	NAT	MILL CREEK	0.4	Maint	Maint
7000025	1	NAT	MILL CREEK	0.2	Maint	Maint
7000025	1	NAT	MILL CREEK	0.1	Maint	Maint
7000025	1	NAT	MILL CREEK	0.2	Maint	Maint
7000037	1	NAT	MILL CREEK	0.6	Maint	Maint
7000040	1	NAT	MILL CREEK	0.5	Maint	Maint
7000045	1	NAT	MILL CREEK	0.4	Maint	Maint
7000047	2	NAT	MILL CREEK	1.4	Maint	Maint
7000049	2	NAT	MILL CREEK	0.6	Maint	Maint
7000049	2	NAT	MILL CREEK	0.1	Maint	Maint
7000049	2	NAT	MILL CREEK	0.5	Maint	Maint
7000049	2	NAT	MILL CREEK	0.4	Maint	Maint
7000049	2	NAT	MILL CREEK	0.3	Maint	Maint
7000049	2	NAT	MILL CREEK	0.3	Maint	Maint
7000090	1	NAT	MILL CREEK	0.4	Maint	Maint
7000099	2	NAT	MILL CREEK	0.1	Maint	Maint
7000449	1	NAT	MILL CREEK	0.3	Maint	Maint
7000449	1	NAT	MILL CREEK	0.2	Maint	Maint
7000449	1	NAT	MILL CREEK	0.8	Maint	Maint
7000449	1	NAT	MILL CREEK	0.1	Maint	Maint
7000449	2	NAT	MILL CREEK	0.1	Maint	Maint
7000479	2	NAT	MILL CREEK	0.1	Maint	Maint
7000481	1	NAT	MILL CREEK	0.1	Maint	Maint
7000481	1	NAT	MILL CREEK	0.2	Maint	
7000481	1	NAT	MILL CREEK	0.1	Maint	
7000481	1	NAT	MILL CREEK	0.7	Maint	Maint
7000481	1	NAT	MILL CREEK	0.3	Maint	Maint
7000481	1	NAT	MILL CREEK	0.3	Maint	
7000481	1	NAT	MILL CREEK	0.2	Maint	
7000481	1	NAT	MILL CREEK	0.1	Maint	
7000481	1	NAT	MILL CREEK	0.1	Maint	
7000486	1	NAT	MILL CREEK	0.1	Maint	Maint
7000486	1	NAT	MILL CREEK	0.1	Maint	Maint
7000486	1	NAT	MILL CREEK	0.5	Maint	Maint
			Total Miles		**29.7**	**26.4**

Maintenance in Upper North Fork Burnt River Subwatershed

ID	OPERATOR MAINT	SURFACE TYPE	SUBWATERSHED	MILES	ALT 2	ALT 3
2620000	2	IMP	UPPER NORTH	0.8	Maint	Maint
2620000	2	IMP	UPPER NORTH	0.2	Maint	Maint
2620051	2	NAT	UPPER NORTH	0.5	Maint	Maint
			Total Miles		**1.5**	**1.5**

Reconstruction in Dry Fork Subwatershed						
ID	**OPERATOR MAINT**	**SURFACE TYPE**	**SUBWATERSHED**	**MILES**	**ALT 2**	**ALT 3**
2600235	1	NAT	DRY FORK	0.3	Reconst	Reconst
2600235	1	NAT	DRY FORK	0.1	Reconst	Reconst
			Total Miles		**0.4**	**0.4**

Reconstruction in Mill Creek Subwatershed						
ID	**OPERATOR MAINT**	**SURFACE TYPE**	**SUBWATERSHED**	**MILES**	**ALT 2**	**ALT 3**
2600208	2	NAT	MILL CREEK	0.5	Reconst	Reconst
2600208	2	NAT	MILL CREEK	1.8	Reconst	Reconst
2600234	1	NAT	MILL CREEK	0.5	Reconst	Reconst
2600235	1	NAT	MILL CREEK	0.2	Reconst	Reconst
2600237	1	NAT	MILL CREEK	0.3	Reconst	Reconst
2600237	1	NAT	MILL CREEK	0.4	Reconst	Reconst
2600237	1	NAT	MILL CREEK	0.3	Reconst	Reconst
2600237	2	NAT	MILL CREEK	0.3	Reconst	Reconst
2600238	1	NAT	MILL CREEK	0.3	Reconst	Reconst
2600238	1	NAT	MILL CREEK	0.3	Reconst	Reconst
2600239	1	NAT	MILL CREEK	0.4	Reconst	Reconst
2600252	1	NAT	MILL CREEK	0.2	Reconst	Reconst
2600262	1	NAT	MILL CREEK	0.4	Reconst	Reconst
2620176	1	NAT	MILL CREEK	0.2	Reconst	Reconst
2620182	1	NAT	MILL CREEK	0.1	Reconst	Reconst
7000027	1	NAT	MILL CREEK	0.5	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.1	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.6	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.1	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.3	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.1	Reconst	Reconst
7000089	1	NAT	MILL CREEK	0.6	Reconst	Reconst
7000089	1	NAT	MILL CREEK	0.5	Reconst	Reconst
7000089	1	NAT	MILL CREEK	0.2	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.1	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.3	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.1	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.2	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.4	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.1	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.1	Reconst	Reconst
			Total Miles		**10.5**	**10.5**

Road Closures in Idaho Creek/Summit Creek Subwatershed (All Alternatives)

ID	OPERATOR MAINT	SURFACE TYPE	SUBWATERSHED	MILES	CLOSURE TYPE	
2622201	2	NAT	IDAHO CREEK/	0.1	Gate	
2622200	2	NAT	IDAHO CREEK/	0.6	Gate	
2622200	1	NAT	IDAHO CREEK/	0.1	Gate	
			Total Miles	**0.8**		

Road Closures in Mill Creek Subwatershed (All Alternatives)

ID	OPERATOR MAINT	SURFACE TYPE	SUBWATERSHED	MILES	CLOSURE TYPE	
2622201	2	NAT	MILL CREEK	0.3	Gate	
7000479	2	NAT	MILL CREEK	0.2	Gate	
7000479	2	NAT	MILL CREEK	0.1	Gate	
7000479	2	NAT	MILL CREEK	0.1	Gate	
			Total Miles	**0.7**		

Road Decommissioning in Idaho Creek/Summit Creek Subwatershed (All Alternatives)

ID	OPERATOR MAINT	SURFACE TYPE	SUBWATERSHED	MILES	CLOSURE TYPE	
2600237	1	NAT	DRY FORK	0.2	Decommissioning	
			Total Miles	**0.2**		

Road Decommissioning in Mill Creek Subwatershed (All Alternatives)

ID	OPERATOR MAINT	SURFACE TYPE	SUBWATERSHED	MILES	CLOSURE TYPE
2600200	1	NAT	MILL CREEK	0.3	Decommissioning
2600237	1	NAT	MILL CREEK	0.1	Decommissioning
2600237	1	NAT	MILL CREEK	0.5	Decommissioning
2600237	1	NAT	MILL CREEK	0.1	Decommissioning
2600237	1	NAT	MILL CREEK	0.2	Decommissioning
2600238	1	NAT	MILL CREEK	0.2	Decommissioning
2600238	1	NAT	MILL CREEK	0.3	Decommissioning
2600238	1	NAT	MILL CREEK	0.3	Decommissioning
2600239	1	NAT	MILL CREEK	0.4	Decommissioning
2600247	1	NAT	MILL CREEK	0.1	Decommissioning
2600247	2	NAT	MILL CREEK	0.3	Decommissioning
2600251	1	NAT	MILL CREEK	0.2	Decommissioning
2600252	1	NAT	MILL CREEK	0.3	Decommissioning
2600252	1	NAT	MILL CREEK	0.1	Decommissioning
2600252	1	NAT	MILL CREEK	0.2	Decommissioning
2600262	1	NAT	MILL CREEK	0.4	Decommissioning
2620084	1	NAT	MILL CREEK	0.1	Decommissioning
2620120	1	NAT	MILL CREEK	0.1	Decommissioning
2620142	1	NAT	MILL CREEK	0.4	Decommissioning
2620156	1	NAT	MILL CREEK	0.4	Decommissioning
2620173	2	NAT	MILL CREEK	0.1	Decommissioning
2620173	1	NAT	MILL CREEK	1.1	Decommissioning
2620177	1	NAT	MILL CREEK	0.4	Decommissioning

2620181	1	NAT	MILL CREEK	0.3	Decommissioning
2620185	1	NAT	MILL CREEK	0.1	Decommissioning
2620185	1	NAT	MILL CREEK	0.1	Decommissioning
2620186	1	NAT	MILL CREEK	0.1	Decommissioning
2620186	1	NAT	MILL CREEK	0.3	Decommissioning
2620188	1	NAT	MILL CREEK	0.1	Decommissioning
2620190	1	NAT	MILL CREEK	0.5	Decommissioning
2620208	1	NAT	MILL CREEK	0.2	Decommissioning
2620208	1	NAT	MILL CREEK	0.2	Decommissioning
2620208	1	NAT	MILL CREEK	0.2	Decommissioning
2620212	1	NAT	MILL CREEK	0.1	Decommissioning
2620350	1	NAT	MILL CREEK	0.1	Decommissioning
2620409	1	NAT	MILL CREEK	0.1	Decommissioning
2620469	1	NAT	MILL CREEK	0.1	Decommissioning
2620469	1	NAT	MILL CREEK	0.1	Decommissioning
2622157	1	NAT	MILL CREEK	0.4	Decommissioning
2622200	1	NAT	MILL CREEK	0.1	Decommissioning
2622200	1	NAT	MILL CREEK	0.5	Decommissioning
2622203	1	NAT	MILL CREEK	0.3	Decommissioning
7000015	1	NAT	MILL CREEK	0.2	Decommissioning
7000015	1	NAT	MILL CREEK	0.4	Decommissioning
7000015	1	NAT	MILL CREEK	0.1	Decommissioning
7000016	1	NAT	MILL CREEK	0.5	Decommissioning
7000025	1	NAT	MILL CREEK	0.1	Decommissioning
7000025	1	NAT	MILL CREEK	0.2	Decommissioning
7000025	1	NAT	MILL CREEK	0.1	Decommissioning
7000025	1	NAT	MILL CREEK	0.2	Decommissioning
7000025	1	NAT	MILL CREEK	0.2	Decommissioning
7000025	1	NAT	MILL CREEK	0.3	Decommissioning
7000029	1	NAT	MILL CREEK	0.5	Decommissioning
7000040	1	NAT	MILL CREEK	0.5	Decommissioning
7000041	1	NAT	MILL CREEK	0.4	Decommissioning
7000043	1	NAT	MILL CREEK	0.5	Decommissioning
7000043	1	NAT	MILL CREEK	0.5	Decommissioning
7000043	1	NAT	MILL CREEK	0.1	Decommissioning
7000044	1	NAT	MILL CREEK	0.6	Decommissioning
7000064	1	NAT	MILL CREEK	0.2	Decommissioning
7000090	1	NAT	MILL CREEK	0.1	Decommissioning
7000090	1	NAT	MILL CREEK	0.4	Decommissioning
7000099	1	NAT	MILL CREEK	0.4	Decommissioning
7000103	1	NAT	MILL CREEK	0.5	Decommissioning
7000480	1	NAT	MILL CREEK	0.3	Decommissioning
			Total Miles	**17.8**	

APPENDIX D – CUMULATIVE ACTIVITIES CONSIDERED

Introduction

The following listed activities will be reviewed for cumulative effects within each of the resource sections. These activities are located within the Mill Creek Subwatershed unless otherwise noted. The year listed on the table is the year the activity was implemented or proposed for implementation.

Past Activities

Past Timber Sales (Crawford Project Area)

Year	Sale Name	Harvest Acres	Harvest Type	Crawford Unit	Description
			Tractor/Skyline (Acres)		Soils **Harvest Prescription (Acres)
1910 -1940	Railroad Logging * Area ID	Area			
1978	Meadow LP	202	T/8	12	133 HSH 69 HCC
1978	16 Gulch	334	T/2	39	154 HSH 180 HPR
1980	Gulch Fiber	77	0	0	43 HSH 34 HCC
1980-1983	Mill Thinning	1475	T/437 acres	60,64,69,66,70,68, 72, 120,122,74,124	1475 HTH
1881	Twin Fiber	33	0	0	33 HSH
1981	COGO	28	0	0	28 HCR
1981	Bog	34	0	0	34 HCC
1983-1985	For Thin	421	T/44	53,79,105	421 HTH
1985	WPM	48	0	0	48 HCR
1985	Left Overs	99	0	0	99 HTH
1985	Porky Pole	99	0	0	99 HCC
1985-1987	Tipton	343	T/22	80,142,144	247 HFR 31 HSH 19 HPR 46 HTH
1986	Crawpole	14	T/2	41	14 HCR
1987	Nippon	53	T/16	40	53 HRS
1989	Vincent	66	0	0	66 HPR
1989	Bull II	10	0	0	10 HCC
1989	Post Pole	4	0	0	4 HCC
1989	Tip Thin	319	T/97	96,118,83,95,94,88	319 HTH
1991	Austin Seed Orchard	35	0	0	35 HCC
1991	ITLP	7	0	0	7 HCC
1992	WYE	78	T/2	150	48 HCR 26 HPR 4 HSV

Year	Sale Name	Harvest Acres	Harvest Type	Crawford Unit	Description
1992	Spike	142	T/5	32	82 HSH 36 HCR 24 HTH
1993	DanThin	41	0	0	41 HTH
1997 -1998	Private Lands near Austin	100	Tractor		100 HTH (within Hwy 7 foreground)
1998	POGPOGO	268	T/2	53	151 HRS 117 HTH

* Area ID – These areas are broadly mapped; minimal historical records.

** Harvest Prescription Definition

- (HTH) – Commercial Thinning
- Regeneration Harvest: even aged management; the stands naturally or artificially regenerated.
  (HCC) – Clearcut
  (HSH) – Shelterwood
  (HCR) – Seed tree
- Overstory Removal (HOR) – Harvest overstory removal
- Final Removal (HFR) – Final removal of mature overstory to release established immature crop tree that were not a result of a prescribed regeneration cut.
- Partial Removal (HPR) – Partial removal of mature overstory to release established immature crop tree that were not a result of a prescribed regeneration cut.

Past Wildfires

Year	*Name	Acres	Description
1999	Phipps	43 acres burned in the Upper Middle Fork John Day Watershed. None of these acres are within the Mill Creek Subwatershed.	Fire suppression and rehabilitation
1998	Grouse Knob	23 acres burned in the Upper Middle Fork John Day Watershed. None of these acres are within the Mill Creek Subwatershed.	Fire suppression and rehabilitation
2002	Easy	3,673 acres burned in the Upper Middle Fork John Day Watershed. None of these acres are within the Mill Creek Subwatershed.	Fire suppression and rehabilitation. Salvage logging has been completed.

*Records for larger wildfires (over 20 acres) within the Upper Middle Fork John Day Watershed. Additional small fires have occurred and been suppressed throughout the Watershed and Crawford Project Area.

Other Past Activities

Year	Activity	Description
Early 1800s until 1860	Wagon Trails	One of the wagon trails came from the Baker City area in the general location of Highway 26.
1862 until 1930s	Mining	The major deposits of gold were found downstream of the Upper Middle Fork watershed. Some mining took place on Bridge Creek which is located in the Upper Middle Fork John Day River watershed, but outside the project area.
Late 1800s until present	Water withdrawal for irrigation/ domestic water	Numerous irrigation ditches are located in the Upper Middle Fork John Day Watershed. Three ditches are located off the Middle Fork John Day River. One other diversion comes off Clear Creek. Diversions and ditches were constructed and maintained for either pasture irrigation or livestock watering. Rotary fish bypass screens have been installed and maintained by Oregon Department of Fish and Wildlife (ODFW).
Early 1900s	Firewood Cutting	Firewood cutting throughout Upper Middle Fork Watershed and project area. Firewood cutting access increased in the 1920s as the existing transportation system was established.

Year	Activity	Description
Early1900s until present	Historic livestock grazing.	The entire Middle Fork John Day Watershed was grazed by both sheep and cattle predating the establishment of the Malheur National Forest. The first documented use was in 1909, by sheep. This use was continued until 1950, when grazing allotments where established on the Forest.
Early 1900s until 1948	Sumpter Valley Railroad line and spur lines	In 1905, the Sumpter Valley Railroad laid tracts into Austin. The last Sumpter Valley Railroad train ran in 1948. Historic railroad spur lines are located in the Crawford Project Area.
1900s until present	Summer Recreation	Within the Upper Middle Fork Watershed the probability of recreation use was low prior to 1929. Historic recreation use in the Upper Middle Fork Watershed and Project Area includes hunting, camping, mushroom picking, Christmas tree cutting, and sight-seeing. In recent years recreational use of ATVs has become prevalent.
1917 until 1975	Bates mill constructed and operated	In 1917 the Oregon Lumber Company built the sawmill at Bates and started logging activities on the Middle Fork of the John Day River. The mill remained in full operation until 1975. A few houses remain in the general location of the old mill.
Early 1900s to present	Private Residence Special Use Permits	Three private homes located on Forest Service Land. Homes are located between the Highway 7 and 26 junctions just outside the Crawford Project Area.
1919 to present	Austin House	The original Austin House was constructed around 1919. A 15 year special use permit granting use of approximately 5 acres of NFS lands to operate a restaurant, a café, grocery store, lunge, gas station, and residence for the owners. Permit was issued in July, 2005. Located in the Upper Middle Fork Watershed just outside the project area.
1920s until present	Forest Service road building	First road building was for access for fire fighting. Developing transportation system provided access to miners, loggers, and cattle and sheep ranchers. Old routes were low grade and followed many of the old railroad grades.
1920s until present	Use and maintenance of National Forest Roads	Use and maintenance of approximately open roads on National Forest System lands in the Mill Creek Subwatershed. Road maintenance includes cleaning of culverts, blading of existing roads, brushing of right-of-ways.
1930s until present	Construction of State Highway 26	Highway was constructed in the 1930s. Highway 26 is the southern boundary of the Crawford Project Area.
1950s until present	Construction of State Hwy 7 from Austin Junction to Sumpter	Highway was constructed in 1950s. Highway 7 runs through the Crawford Project Area.
1960s to present	Power line Special Use Permit (OTEC)	Electrical overhead power transmission lines run through the Mill Creek Subwatershed. The section of the power line that runs from Bates to the Forest Boundary is approximately 7.3 miles.
1965 to present	Power line Special Use Permit (Idaho Power)	Electrical overhead power transmission line run through the Mill Creek Subwatershed. The power line was constructed around 1966. Approximately 9 miles of road within the project area are used for power line access and maintenance. Some of these are closed roads.
1965 to present	Buried Phone Cable Special Use Permit (Oregon Telephone)	Approximately 8 miles of buried phone cable from Bates to Blue Mt. Summit. The buried cable is located just north of Highway 26.
1970s until present	Winter Recreation Snowmobiling	Grooming and use of snowmobile trails within the Upper Middle Fork Watershed and Crawford Project Area.
1926 to present	State Hwy. Maintenance Site Special Use Permit	The first buildings for the maintenance site were constructed in 1926. The special use permit site is currently 16.8 acres and contains a sand shed, maintenance building, 5 homes, and several out buildings.
1950s until present	Fire Suppression	Fire suppression activities and rehabilitation.
Early to mid 1990s	Road Closures	Approximately 16.2 miles previously decommissioned.

Year	Activity	Description
1994-1998	Riparian enhance-ment –Crawford Creek Area	Course wood placement in streams, Crawford Creek, Crawford Creek Tributaries, and 16 Gulch.
1995 to present	Fiber Optics Cable Special Use Permit (Oregon Telephone)	Approximately 8 miles of cable from Bates to Blue Mt. Summit. Buried cable is located just north of Highway 26 in the Crawford Project Area.
2000-2003	Riparian enhance-ment at stream cros-sings along Hwy 26	Several culverts/bridges were replaced along Highway 26, and the inlet to these culverts was planted with shrubs/trees and fenced to exclude livestock and big game.
2005-2006	Bridge/Lunch Creek Culvert Replacement	Replacement of culverts on Bridge, Lunch, and South Fork Bridge Creek. A total of five culverts replaced on Bridge Creek, Lunch Creek, and South Fork of Bridge Creek.
2007	ODOT culvert replacement	Fish passage improvement projects. Three bridges in the Upper Middle Fork Watershed were installed on Highway 26 in 2006 and 2007. An additional four arch culverts will be installed in 2008/2009. (See future foreseeable activities).

Present or Ongoing Activities (2008)

Present Activity	Description
Water Withdrawals/Irrigation	Same as in past
Private residence special Use permits	Same as in the past
Firewood cutting	Same as in past
Livestock grazing	Portions of four grazing allotments fall within the Mill Creek subwatershed. This includes portions of two active allotments (Upper Middle Fork C & H and Blue Mountain C & H; and portions of two inactive allotments (Austin On & Off and Sullens C & H). In 2007, decisions were made under Rescission Act Authorities to not graze the Austin On & Off and Sullens C& H allotments. Private lands in the analysis area are also used for livestock grazing. The Middle Fork in the private land portion of Phipps Meadow has been fenced to exclude livestock grazing. This reach of the Middle Fork exhibits stable stream banks with a high proportion of late seral vegetation.
Summer and winter recreation	Same as in past
Use and maintenance of National Forest Roads	Same as in past
Power line/Buried Phone Cable Special Use Permits	Same as in past
Austin House Special Use Permit	Same as in past
State Hwy. Maintenance Site Special Use Permit	Same as in past
Fire Suppression	Same as in past
Oregon Telephone Fiber Optics and Telephone Cable Special Use Permits. Special use permit renewal planned for 2009.	Same as in the past
State Highway Maintenance Site Special Use Permit. Special use permit renewed in 2007.	Same as in the past with some proposed upgrades to water system and heat sources for houses.

Foreseeable Activities

Year	Approved	Foreseeable Activity	Description
Annual	Yes	Water Withdrawals/Irrigation	Same as in the past
Annual	Yes	Private Residence Special Use Permits	Same as in the past
Annual	Yes	Firewood cutting	Same as in the past
Annual	Yes	Summer and winter recreation	Same as in the past
Annual	Yes	Use and maintenance of National Forest Roads	Same as in the past
Annual	Yes	Power line and Phone Cable Special Use permits (Idaho Power, OTEC, Oregon Telephone)	Same as in the past
Annual	Yes	Fire Suppression	Same as in the past
Annual	Yes	Grazing	Same as in the past
Annual	Yes	Road Maintenance	Same as in the past
Annual	Yes	Austin House Special Use Permit	Same as in the past
Annual	Yes	Fire Suppression	Same as in the past
NEPA Complete 2007, Implementation Planned for 2008	Yes	Wrac Lodgepole Thinning Project	Approximately 60 acres of lodgepole commercial thinning located in the Mill Creek Subwatershed in T11S, R35 ½ E, sections 1 and 2.
Record of decision 2008 or 2009	Draft EIS issued	Middle Fork John Day Range EIS	Analysis for grazing allotments in the Middle Fork John Day, Camp Creek, and Galena Watersheds
2008 or 2009	Yes	ODOT culvert replacement	Installation of four fish passage culverts in the Upper Middle Fork Watershed on Highway 26
2009-2010	No	Forest Invasive Plant EIS	Treatment of known and newly discovered invasive plants using herbicide, manual, mechanical, biological, and/or cultural methods.

APPENDIX E – RESPONSE TO COMMENTS

Introduction

The USDA Forest Service, Malheur National Forest, received six written comments on the Crawford Project Draft Environmental Impact Statement. Letters were assigned a number as they arrived. The Interdisciplinary Team thoroughly and objectively analyzed each written letter. All substantive comments were annotated and responses were written.

Annotation Key

1 – John Fullerton

11/20/06 – electronic

- One page letter, no attachments

2 – Preston A. Sleeger, United States Department of the Interior

1/5/07 – electronic

- One page letter, no comments to offer

3 – Doug Heiken, Oregon Wild (formerly Oregon Natural Resources Council)

1/8/07 – electronic

- 28 page letter, no attachments

4 – Asante Riverwind, Sierra Club

1/8/08 – electronic

- 16 page letter, no attachment

5 – Ryan Torland, Oregon Department of Fish and Wildlife

1/8/07- Postmarked

- One page letter

6 – Christine B. Reichgott, United States Environmental Protection Agency

1/9/07- Postmarked, comment period closed

- Two page letter,
- Three page attachment

Comment Letter #1 – John Fullerton	Re-sponse
<JohnFullerton@BoiseBuilding.com> To: <comments-pacificnorthwest-malheur-prairiecity@fs.fed.us> 11/20/2006 11:40 AM Subject: Crawford comments	
I support actively managing our national forests and surrounding areas and generally support the goals of this project. I offer the following comments, concerns and suggestions for your consideration.	
* Many past projects have had similar fuels reduction, forest health and stocking control goals, only to fall short because of the intensity of the thinning of the units. Regardless of whether you use BA, TPA, HRV or crown densities as the scientific guideline, these units need to be managed to insure significantly reduced density (acceptable scientific levels) to accomplish the goals of the project. In the past, it appears that at the operational level of the layout, guideline focus is lost, and the overall goals of the project are compromised.	**1-1**
* Mechanical thinning should be considered first when economically possible, before the use of fire alone or combined with mechanical treatment. Utilizing fiber for local jobs should be a very high priority of these projects as opposed to simply burning the fiber. Proper sale layout (size, quality, saw/non-saw ratio) can economically address the high costs of treating non-commercial fiber and accomplish the goals of the project while being economically positive.	**1-2**
* Riparian areas should not be automatically off limits to treatment when riparian functions can be maintained or improved while accomplishing the broad goals of the project, which the forest plan and PACFISH will allow. In recent past, large buffer zones have been automatically designated around riparian areas excluding treatment. That has essentially placed the highest fire risk and fuel loads in arguably the most sensitive areas in the forest with the most potential for damage. This is not environmentally acceptable.	**1-3**
* The NSFPA's you have in this project are appropriate. Please remember that every acre on the forest does not have to do everything. The reduction of elk cover is insignificant, along with changing DOG boundaries.	**1-4**
* Concerns over logging are road sedimentation are also insignificant, and easily mitigated with proper sale layout and timing.	**1-5**
* I would caution you on road decommissioning. It is much easier to open a gate and drive down the road to put out the fire, than it is to walk in and have the fire get away from you as it has over the past decade on the Malheur. Close the roads with a gate, drainage and grass seed. Have we not already spent enough on the building of the road?	**1-6**
I am cautiously optimistic about this project and applaud your identification of this area for active management, and thank you for the opportunity to comment.	
John Fullerton 67131 End rd. Summerville Or. 97876	

1-1
Tree Densities- Stocking Control

Chapter 2 of the DEIS (pg 65) states that tree marking will be monitored to ensure compliance with the silvicultural prescription and marking guide. There are also monitoring requirements discussed in the Silviculture Prescription.

1-2
Utilizing Fiber- Local Jobs

The Economic Analysis Chapter 3 pgs 3 – 349, discusses the values for saw timber products. It is recognized that the possibility exists for the removal of non-saw material. There is currently not a process available to adequately analyze this material and its benefits in the economic analysis.

1-3
Riparian Areas- Fuel Loads

Treatments within riparian areas, other than road decommissioning and culvert removal, conifer planting, subsoiling, seeding and mulching were not identified as specific needs for this project. In general, riparian areas are not automatically off limits to vegetative treatments; however PACFISH requires a watershed analysis with a level of site specific analysis before proposing certain restorative treatments. While the watershed analysis that encompasses the Crawford Project mentions the need to restore riparian vegetation and levels of stream shading in a general way, the level of site specificity required by PACFISH (i.e., specific mention of the need for vegetative treatments within RHCAs within the Crawford Project Area) was not conducted. PACFISH established interim Riparian Management Objectives (RMOs) that provide the target toward which Agency managers are aiming as they conduct resource management activities across the landscape. Interim RMOs provide measurable benchmarks by which Agency specialists may determine whether aquatic habitat conditions are getting better or worse and which establish a baseline for determining whether potential projects are consistent with the purpose of interim direction. PACFISH also established interim RHCA widths which are thought to be adequate to protect streams from non-channelized sediment inputs from ground disturbing activities and provide other riparian functions. The emerging science is towards a strategy that focuses on protecting aquatic communities in areas where they remain robust while also restoring habitat structure and native species where feasible (Gresswell 1999). That being said the DEIS Chapter 3 pg 193, states that "…streams within the Fisheries Analysis Area already exceed thresholds for adverse impacts to aquatic habitat and salmonids." The DEIS goes on to further state that the proposed action "would permit a natural slow, partial recovery from effects of past grazing, past riparian road construction, and past riparian harvest." This recovery would occur as trees located within RHCAs grow larger and fall into analysis area streams, as channel types change to more stable, narrow configurations, as sediment from past actions is washed out, and as riparian shrubs and herbs recover and contribute to more stable stream banks (pg 207). It is evident that streams within the Crawford Project Area need more time to recover before mechanical vegetative treat-ments would do anything but hamper the long-term recovery of these riparian areas (DEIS Table AW – 5, pg 159 and Upper Middle Fork Watershed Analysis (1998) pgs 4-14 through 4-19). Adhering to interim PACFISH buffer widths is one way to help ensure these areas continue their slow recovery from legacy effects.

1-4
Non-Significant Forest Plan Amendments

We appreciate your support regarding proposed Forest Plan Amendments.

1-5
Logging and Roads – Sedimentation

Roads proposed for decommissioning are no longer needed for future management. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. Decommissioned roads would be removed from the Forest Road Transportation System (DEIS, Chapter 2, pg 45).

1-6
Road Decommissioning- Fire Access

The Roads/Access section in Chapter 3 of the DEIS (pgs 335-341) discusses road decommissioning and fire suppression. Specifically pg 338 states that that the road closures and decommissioning were designed to maintain an adequate transportation system for activities such as fire suppression.

<table>
<tr><th>Comment # 2 – Preston A. Sleeger, United States Department of the Interior</th><th>Response</th></tr>
<tr><td>
United States Department of the Interior
OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
500 NE Multnomah Street, Suite 356
Portland, Oregon 97232-2036

9043.1

IN REPLY REFER TO
ER06/1130

Electronically Filed
January 5, 2006

Ryan Falk
Environmental Coordinator
Prairie City Ranger District
P.O. Box 337
Prairie City, Oregon 97869

Dear Mr. Falk:

The Department of the Interior has reviewed the Draft Environmental Impact Statement for the Crawford Project: Timber Harvest, Fuel Treatments, Road Closure Activities in Malheur National Forest, Grant County, Oregon. The Department does not have any comments to offer.

We appreciate the opportunity to comment.

Sincerely,

Preston A. Sleeger
Regional Environmental Officer
</td><td>2-1</td></tr>
</table>

2-1
No Comments

Thank you for reviewing the DEIS.

<table>
<tr><th>Comment # 3 – Doug Heiken, Oregon Wild</th><th>Response</th></tr>
<tr><td>
Oregon Wild
formerly Oregon Natural Resources Council (ONRC)
PO Box 11648 | Eugene OR 97440 | 541-344-0675 | fax 541-343-0996
dh@oregonwild.org | http://www.oregonwild.org/

8 Jan 2007

TO: comments-pacificnorthwest-malheur-prairiecity@fs.fed.us
Subject: Crawford Project DEIS

Dear Forest Service:
Please accept the following comments from Oregon Wild (formerly Oregon Natural Resources Council) concerning the Crawford Project DEIS dated November 2006. Oregon Wild represents about 5,000 members who support our mission to protect and restore Oregon's wildlands, wildlife, and water as an enduring legacy. Our goal is to protect areas that remain intact while striving to restore areas that have been degraded. This can be accomplished by moving over-represented ecosystem elements (such as logged and roaded areas) toward characteristics that are currently under-represented (such as roadless areas and complex old forest).
Proposed/Preferred Action Alternative 2:

Two plan amendments: one to allow logging in deer cover areas, one to shift old-growth designations
6.8 mmbf

</td><td></td></tr>
</table>

[4] Baker, Veblen, Sherriff. 2006. Fire, fuels, and restoration of ponderosa pine-Douglas fire forests in the Rocky Mountains, USA. J. Biogeography. 2006.

[5] Hessburg, Paul. Evidence for the Extent of Mixed Severity Fires in Pre-Management Era Dry Forests of the Inland Northwest. Proceedings: Mixed Severity Fire Regimes: Ecology and Management. November 17–19, 2004. Spokane, Washington. http://emmps.wsu.edu/fire/secondary/PROCEEDINGS.html#Abstracts/Hessburg.html

[6] Paul Hessburg. Pattern and process interactions of present-day ponderosa pine forest ecosystems: Spatial and temporal patterns matter. Risk Assessment for Decision-Making Related to Uncharacteristic Wildfire Summary notes of a conference held November 17-19, 2003. Portland, OR. http://outreach.cof.orst.edu/riskassessment/RiskAssesSummary.pdf

[7] Paul F. Hessburg, R. Brion Salter, and Kevin M. James. Variable Fire Severity and Non-Equilibrium Dynamics in Pre-Management Era Dry Forests of the Inland Northwest, USA. [pre-publication draft]

[8] Paul F. Hessburg, James K. Agee, Jerry F. Franklin. 2005. Dry forests and wildland fires of the inland Northwest USA: Contrasting the landscape ecology of the pre-settlement and modern eras. Forest Ecology and Management (in press).

[9] P.F. Hessburg, B.G. Smith, R.B. Salter, R.D. Ottmar, E. Alvarado. 2000. Recent changes (1930s-1990s) in spatial patterns of interior northwest forests, USA. Forest Ecology and Management 136 (2000) 53-83.

[10] Hanson and Odion. 2006. FIRE SEVERITY IN MECHANICALLY THINNED VERSUS UNTHINNED FORESTS OF THE SIERRA NEVADA, CALIFORNIA 2006 Fire Congress Proceedings. http://www.emmps.wsu.edu/2006firecongressproceedings/Extended%20Abstracts%20PDf%20Files/Poster/hanson.pdf

• 2073 acres commercial thinning • 199 acres shelterwood harvest • 935 acres PCT • 8.6 miles temporary road construction • 10.9 miles road reconstruction • 35.2 miles road maintenance • 17.8 miles road decommissioning • 1.7 miles road reopening • 5.6 miles of log hauling in RHCAs • fuel treatments: 507 acres yard tops attached, 174 acres hand piling, 877 acres grapple piling • 5300 acres prescribed fire	
One of the objectives of this project is to capture economic value of tree. This objective conflicts with other objectives such as fire hazard reduction (when removing too much canopy makes the resulting stand hotter, dryer, and windier), wildlife habitat (for instance, logging captures mortality and limits future snag habitat), and soil and water quality (logging and log hauling compacts and disturbs soil leading to erosion and sedimentation). The removal of smaller trees is much less likely to conflict because habitat, soil, water, and fire hazard are less affected, but the conflicts increase with increasing size of the trees removed. The EIS fails to disclose and consider all these conflicts.	**3-1**
Another objective of this project is to increase the resilience of the forest stands to disturbance which is a laudable goal but one with very limited probability of actually being realized. The proposed treatments, assuming for the sake of argument that they will actually reduce fire hazard instead of increasing it, will only reduce hazard for a short period (approx. 20 years, until fuels regrow). The treatments will have no benefit in the case of a severe weather driven fire which will be stand replacing in spite of these treatments. The treatments will also have no real effect in the case of a cool, low severity fire that occurs while fuels are moist and never crowns even in unthinned stands. The treatment will only make a significant difference during a moderate severity fire, yet there is a very low probability that a moderate severity fire will occur in any given stand during that period 20 year period of treatment effectiveness, so the Forest Service should carefully consider and balance the impacts of logging on soil, water, and wildlife and compare those impacts to the small probability that the treatments will be subjected to moderate fire. This is a difficult apples-and-oranges comparison, but one the Forest Service must carefully disclose and consider in order to comply with NEPA.	**3-2**
The road building proposed under Alternative 2 is excessive. Alternative 3 appears better in this regard.	**3-3**
This project purports to be moving forests toward the historic range of variability but the EIS does not disclose the extent to which patches of relatively dense forests and stand replacing fires are part of the HRV. There	

is increasing doubt about the wide applicability of the frequent, low severity fire model in dry eastside forests, and increasing evidence[4] that more of these forests were characterized by variable stand density and mixed severity fire. The Forest Service must disclose and consider this new information.	**3-4**
Oregon Wild supports the idea mentioned on pgs 2-50 and 2-51 of the DEIS that variable thinning and leave areas can help mitigate for the adverse effects of tree removal on snag habitat. We urge the Forest Service to more fully develop and embrace this variable approach to thinning. The degree of variability should be even greater than 50% and retention patches should represent 15-25% of units instead of only 5-15% of each unit. Trees in natural forests on the eastside tend to be clumpy and patchy, not uniformly spaced to maximize tree vigor. This is the pattern the Forest Service should be emulating.	**3-5**
The eastside screen requires the FS to enhance LOS components such as dead wood habitat when conducting logging operations. The Forest Service's current snag habitat standards are scientifically invalid. Species associated with dead wood are now thought to need more dead wood than previously assumed. The cumulative effects of fire suppression, salvage logging, clear-cutting, high grading, thinning, hazard tree removal around work areas and along roads, firewood harvest/poaching, all tend to reduce the amount and quality/size of dead wood habitat relative to the natural range of variability. The cumulative effects of past, present and anticipated aggressive fuel reduction programs have not been disclosed. New management techniques have not been developed to adequately mitigate these cumulative effects. New dead wood habitat standards have yet to be adopted in compliance with NEPA and NFMA procedures.	**3-6**
The FS should embark on a more comprehensive restoration program. Restoration of these forests will be furthered if the Forest Service would eliminate or reduce livestock grazing which tends to shift vegetation toward less-palatable species that can become ladder fuels.	**3-7**
Road Decommissioning should be accomplished to assure the exclusion of motorized vehicles including snow machines.	**3-8**
Oregon Wild's recommendations for eastside thinning:	
1. When conducting commercial thinning projects take the opportunity to implement other critical aspects of watershed restoration especially reducing the impacts of the road system and livestock grazing and establishing the ecological processes that will allow streams and fire regimes to recover. 2. Us the historic range of variability as a guide, but don't just focus on seral stage. Consider also the historic abundance of large trees, large snags, roadless areas, etc. all of which have been severely reduced from historic norms. 3. New evidence indicates that far more of the "dry" forests, rather than being typified low severity fire regimes, were in fact dominated by mixed severity fire regimes (including significant areas of stand replacing fire),	**3-9**

so mixed severity fire is an important part of the historic range of variability that should be restored. The goal should not be a uniform low severity fire regime, but rather a wide mix of tree densities in patches of varying sizes. This objective can often be met by reintroducing fire.

4. Prioritize treatment of the dense young stands that are most "plastic" and amenable to restoration. Another priority is to carefully plan and narrowly target treatments to protect specific groves of fire-resistant, old-growth trees that are threatened by ingrowth of small fuels.
5. Thin from below, retaining the largest trees. Retain all large trees and most medium sized trees so they can recruit into the larger classes of trees and snags. Regardless of size, retain all trees with old-growth characteristics such as thick bark, yellowing bark, flat top, asymmetric crown, broken top, forked top, etc. These trees have important habitat value and human values regardless whether they are 21” dbh.
6. Remember diameter caps are a tool in the tool box; don’t reject the tool out of hand. The public likes it a lot because it gives them assurances. It is OK to use different diameter caps for different species, lower limits for fire resistant species, higher limits for fire intolerant species. The exceptional circumstances, in which diameter caps allegedly don’t work, are more rare than the circumstances in which alternative techniques will lead to unintended consequences, including lack of public trust.
7. Recognize that thinning affects fire hazard in complex ways, possibly even making fire hazard worse because thinning: creates slash; moves fine fuels from the canopy to the ground (increasing their availability for combustion); thinning increases ignition risk; thinning makes the forest hotter, dryer, and windier; and makes resources available that could stimulate the growth of future surface and ladder fuels. Fuel reduction must find the sweet spot; remove enough of the small surface and ladder fuels while retaining enough of the medium and large trees to maintain canopy cover for purposes of microclimate, habitat, hydrology, suppression of ingrowth, etc.
8. There is growing evidence that in order to be effective, mechanical treatments must be followed by prescribed fire. But the effects of such fires must also be carefully considered.
9. Don’t thin to uniform spacing. Use variable density thinning techniques to establish a variety of microhabitats, break up fuel continuity, create discontinuities to disrupt the spread of other contagious disturbances such as disease, bugs, weeds, fire, etc.
10. Retain patchy clumps of trees which is the natural pattern for many species.
11. Retain and protect under-represented species of conifer and non-conifer trees and shrubs. Retain patches of dense young stands as wildlife cover and pools for recruitment of future forests.
12. Use your creativity to establish diversity and complexity both within and between stands. Use skips and gaps within units to help achieve diversity. Gaps should be small, while skips should be a little larger. Gaps should not be clearcut but rather should retain some residual

structure in the form of live or dead trees. Landings do not make good gaps because they are clearcut, highly compacted and disturbed, more likely subject to repeated disturbance, and directly associated with roads.

13. Thin heavy enough to stimulate development of some understory vegetation, but don't thin so heavy that future development of the understory become s more significant problem than the one being solved with the current project.
14. The scale of patches in variable density thinning regimes is important. Ideally variability should be implemented at numerous scales ranging from small to large, including: the scale of tree fall events; pockets of variably contagious disturbance from insects, disease, and mixed-severity fire; soil-property heterogeneity; topo-graphic discontinuities; the imprint of natural historical events; etc.
15. Recognize that thinning captures mortality and that plantation stands are already lacking critical values from dead wood due to the unnatural stand history of all clearcut and planted stands.[1]
16. Retain abundant snags and course wood and green trees for future recruitment of snags and wood. Retention should be both distributed and in clumps so that thinning mimics natural disturbance. Retention of dead wood should generally be proportional to the intensity of the thinning, e.g., heavy thinning should leave behind more snags not less. Retain wildlife trees such as hollows, forked tops, broken tops, leaning trees, etc.
17. If using techniques such as whole tree yarding or yarding with tops attached to control fuels, the agency should top a portion of the trees and leave the greens in the forest in order to retain nutrients on site.
18. Avoid impacts to raptor nests and enhance habitat for diverse prey species. Train marking crews and cutting crews to look up and avoid cutting trees with nests of any sort and trees with defects.
19. Take proactive steps to avoid the spread of weeds. Avoid and minimize soil disturbance. Use canopy cover and native ground cover to suppress weeds.
20. Buffer streams from the effects of heavy equipment and loss of bank trees and trees that shade streams. Mitigate for the loss of LWD input by retaining extra snags and wood in riparian areas. Recognize that thinning captures mortality that is not necessarily compensated by future growth.[2]
21. Protect soils by avoiding road construction and machine-piling, minimizing ground-based logging, and avoiding numerous, large, burn piles. Where road building is necessary, ensure that the realized restoration benefits far outweigh the adverse impacts of the road, build the roads to the absolute minimum standard necessary to accomplish the job, and remove the road as soon as possible to avoid firewood theft and certainly before the next rainy season to avoid storm water pollution.

Many in the timber industry and political circles like to pretend that virtually all historic fires were low intensity fires, and that low intensity fire reinforced an equilibrium pattern of park-like forests maintained by recurrent low-intensity fire. Many people then argue that fire suppression and lack of

management have set the state for unnaturally intense fires. While there are grains of truth in this description, recent research is pointing to a much more complex picture of forest and fire regimes– one where eastside forests are dominated, not by an equilibrium pattern of low-intensity fire, but by a non-equilibrium pattern of mixed-severity fire. While the self-reinforcing low-intensity fire feedback mechanism does operate in certain forests, it rarely dominates. There are several destabilizing forces at play, among them drought and high wind. Even dry ponderosa pine forests experienced a wide continuum of mixed fire intensities, and canopy replacing fire was not an uncommon occurrence. (Hessburg, Barrett, Jones) It is likely that the view of dry forest types tightly coupled with low severity fire regimes is oversimplified. Mixed severity fire was in fact much more common than many people believe, especially in mixed-conifer forests. "We found that mixed severity fires were dominant in forests of all three ecoregions and more common than expected in the dry forests."[5] But that's not to say that nothing has changed: This much is true; fire suppression and fuel build up have increased the spatial connectivity of relatively high fuel conditions, possibly leading to larger average sized patches of stand replacing fire events. > In landscapes, the spatial and temporal patterning of dry forest structure and composition that resulted from frequent fires reinforced low- or mixed-severity fires because frequent burning spatially isolating conditions that supported high-severity fires. These spatial patterns reduced the likelihood of severe fire behavior and effects at each episode of fire. Rarely, dry forest landscapes were synchronous in their conditions and affected by more severe climate-driven events. > Dry forests of the present day no longer appear or function as they once did. Large landscapes are homogeneous in their composition and structure, and the regional landscape is synchronized with a bias for severe, large fire events. At risk is the resumption of forest pattern and disturbance process interactions that are more characteristic of the actual interplay between the current climate and biophysical environments, and there is high uncertainty as to future trajectories for these ecosystems if characteristic pattern and process interactions are not restored.[6] Hessburg 2005 says "… we theorize: 1) that present-day fire event areas may be larger on average, but individual event areas are not unprecedented; 2) that patches by fire severity class may be larger on average, but individual patches by severity class are not unprecedented in size; 3) that patches of mixed and high severity fire may be more abundant in environments that formerly supported more frequent low severity fire."[7] > Over long-time frames, fires, insect outbreaks, disease epidemics, and weather events historically created and maintained patterns of dry forest structure and composition that supported an exceptional variety of plant and animal species, and a host of critical processes. The interplay between patterns and processes created a metastable patch dynamic. …	**3-10**

[P]atches of isolated stand replacement fire were common in historical dry forest landscapes, but today, entire landscapes are claimed by severe fires. Furthermore, present day large wildfires synchronize landscapes by creating very large patches with corresponding forest regeneration, species composition, structure, fuel beds, and size and age class distribution, thereby facilitating very large future wildfires. … To create fire regimes that are more predictable and more consistent with environmental settings under the current climatic regime, we suggest that landscape patterns of fuel, forest structure, and composition will need to be created that are characteristically associated with those regimes. We further suggest, that to improve assurances that native species and processes will persist, it will also be important to restore forest landscapes that reflect some semblance of the spatial and temporal variation in patterns that species evolved with. … once restored, dry forests should not only support the fire regime of interest, but also viable populations of native species in functional habitat networks across space and through time.[8] Our management objective therefore should NOT be to impose uniform low intensity fire regime by treating virtually every acre out there. To restore characteristic landscape patterns we should recognize the value of a great diversity of fire intensities. This may be accomplished by among other things, "desynchronizing" forest patches where fuel has built up. "A reasonable target of restoration would be to restore a more typical pattern of isolation to affected landscapes."[9]	
Prescribed fire can be helpful but make sure that it's done right. We support prescribed fire as a fuel management technique but fire management must be carefully planned so as to minimize effects on wildlife, soil, site productivity, and large trees, down woody debris, and snags. Fall burning should be considered because that is when nature would have done most of the burning. The effects of spring burning on the life-cycles of plants and wildlife must be fully considered in the NEPA process. Arthur R. Tiedemann, James O. Klemmedson, Evelyn L. Bull recently suggested — that a broader array of resource questions be considered before prescribed burning is implemented. We think the objectives of prescribed burning must be clearly defined and realistic estimates stated for out- comes for all affected resources. If the objective is to restore forest health, then we suggest that forest productivity, wildlife, biodiversity, and other resources and values are as much a part of the forest health equation as are the structure of a forest stand and its tolerance to fire. Thus, management aimed at returning forests to an open, seral condition should be carefully evaluated from the perspective of all the key resources and values. [W]e question how well presettlement forest conditions are understood. How pervasive was the influence of fire throughout forests of the Blue Mountains? Hall (1976) indicates that the ponderosa pine/ pinegrass (*Calamagrostis rubescens* Buckl.) association was burned by surface fires at 7±10-year interva Of 22 habitats now dominated by grand fir and sub-alpine fir (*Abies lasiocarpa*	**3-11**

(Hook.) Nutt.) listed by Johnson and Clausnitzer (1992), however, only three were historically seral ponderosa pine that were burned by periodic surface fire (personal communication, Dr. F.C. Hall, Pacific Northwest Region, USDA Forest Service). * * * A primary concern whenever prescribed fire is used in forest manage-ment is loss of nutrients and impaired site productivity. . . . If sites are harvested and residues are burned, not only will nutrients removed in trees be lost, but also –potentially- much of the nutrient pool in slash and forest floor, depending on burning conditions. Thus, the potential to adversely affect long-term site productivity is always present. * * * The consequences of large-scale prescribed burning on wildlife in the Pacific Northwest are largely unknown because studies have been limited to investigating the effects of small prescribed burns on specific species for a relatively short time after burning. The potential effects of prescribed burning on a landscape scale should be examined carefully to determine if the changes caused by prescribed burning are compatible with other management objective for wildlife. Tiedemann, A.R., Klemmedson, J. O., and Evelyn L. Bull, *Solution of forest health problems with prescribed Fire: Are forest productivity and wildlife at risk?*, Forest Ecology and Management 127 (2000) 1±18 3, http://147.46.94.112/forestfire/f14_20001271301.pdf Moreover, it has long been recognized that prescribed fire can increase the subsequent combustibility of forests where shrub vegetation is stimulated (Show and Kotok 1924). In fact, the common practice of "light-burning" is credited with causing a widespread conversion of forest vegetation to shrub vegetation in large areas of California (e.g. The Klamath and Sierra Nevada) during the early 1900s, resulting in admonitions against the practice by Aldo Leopold (1920), as well as foresters (summarized in Show and Kotok (1924)). Dennis Odion. 2004 Declaration in NWEA v. Forest Service *citing* Show, S. B., and E. I. Kotok. 1924. The role of fire in California pine forests. U.S. Department of Agriculture Bulletin 1294. Moreover, fire may be the type of disturbance that promotes colonization for *C. biebersteinii* [spotted knapweed] (Sheley et al. 1999). Adding nitrogen to a system, which may occur the first year after burning (Deluca and Zouhar 2000), has been shown to shift the competitive advantage to *C. biebersteinii* (Blicker et al. 2002). … [P]rescribed burns increase seedling recruitment in *P. recta* [sulphur cinquefoil] (Lesica and Martin 2003). … *Cirsium arvense* [Canada thistle] … has been shown to increase in abundance following fire (Scherer et al. 2000; Tu et al. 2000). …	

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> *Carduus nutans* [musk thistle]… In this study there was consistently evidence of treatment differences in the abundance of *C. nutans*. The thin/burn had the greatest abundance, while the control showed no change in either frequency or cover.
>
> …
>
> *Cirsium vulgare* [bull thistle]… has been shown to decrease Pinus ponderosa seedling growth (Randall and Rejmánek 1993). *Cirsium vulgare* showed no change in frequency or cover in the control, while consistently having the highest levels of cover and frequency in the thin/burn. These differences were always significant among treatments. In fact, *C. vulgare* was a significant indicator of the thin/burn treatment. Other studies demonstrated that this species responds strongly after fire and other disturbances (Scherer et al. 2000; Beck 1999; Petyrna et al. 2002).
>
> …
>
> *Verbascum thapsus* [common mullein] showed some of the most significant differences among treatments in cover and frequency. It was also a significant indicator species of the thin/burn treatment.

Dodson, Erich. Monitoring change in exotic plant abundance after fuel reduction/ restoration treatments in ponderosa pine forests of Western Montana. Masters Thesis University of Montana. May 2004. http://www.fs.fed.us/ffs/docs/lubrecht/Dodson%20Final%20thesis.pdf

New information on Snags

An unavoidable impact of all commercial logging is to “capture mortality” reduces valuable snag habitat in the short-term (via hazard tree felling) and in the long-term (via delayed recruitment and reduced overall recruitment).

The federal forest agencies now recognize that current methods and assumptions concerning snag habitat standards are outdated, and the old snag standards do not ensure enough snags to meet the intent of the standard, yet the agencies have not adjusted their management plans to account for this new information nor have they developed new standards that are consistent with the latest scientific information. The agencies need to prepare an EIS to consider a replacement methodology for maintaining species and other values associated with dead wood. This is especially critical because adequate dead wood is recognized as an essential feature of healthy forests and the Forest Service has identified lots of “management indicator species” associated with dead wood habitat.

Back in the early 1990s the Forest Service recognized that their forest plans were not adequate to maintain populations of spotted owls and they tried to develop plans to conserve spotted owl without following NEPA and NFMA procedures. The courts said they had to stop cutting owl habitat until they had complied with environmental laws. This is the same situation we find ourselves in today with dead-wood associated species. The agencies should stop harming dead wood habitat until they have a legal plan to conserve

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associated species over the long-term. Bull et al. states that the current direction for providing wildlife habitat on public forest lands does not reflect the new information that is available which suggests that to fully meet the needs of wildlife, additional snags and habitat are required for foraging, denning, nesting, and roosting (1997). Johnson and O'Neil (2001) and Rose et al. (2001) also state that several major lessons have been learned in the period 1979 to 1999 that have tested critical assumptions of earlier management advisory models (2001), including some of the assumptions used to develop the current recommendations in the LRMP Standards and Guidelines, as amended by the Regional Forester's Amendment 2. Some assumptions include: • calculation of numbers of snags required by woodpeckers based on assessing their "biological (population) potential" is a flawed technique (Johnson and O'Neil 2001). Empirical studies are suggesting that snag numbers in areas used and selected by some wildlife species are far higher that those calculated by this technique (Johnson and O'Neil 2001). • numbers and sizes (dbh) of snags used and selected by secondary cavity nesters often exceed those of primary excavators (Johnson and O'Neil 2001). This suggests the current direction of managing for 100 percent population potential levels of primary excavators may not represent the most meaningful measure of managing for cavity-nesters and that these snag levels, under certain conditions, may not be adequate for some species. http://www.fs.fed.us/r6/frewin/projects/analyses/barneslong/ea/appb.pdf **Lessons Learned During the Last Fifteen Years** … Several major lessons have been learned in the period 1979-1999 that have tested critical assumptions of these earlier management advisory models: . Calculations of numbers of snags required by woodpeckers based on assessing their .biological potential. (that is, summing numbers of snags used per pair, accounting for unused snags, and extrapolating snag numbers based on population density) is a flawed technique. Empirical studies are suggesting that snag numbers in areas used and selected by some wildlife species are far higher than those calculated by this technique.[226] . Setting a goal of 40% of habitat capability for primary excavators, mainly woodpeckers, [369] is likely to be insufficient for maintaining viable populations. . Numbers and sizes (dbh) of snags used and selected by secondary cavity-nesters often exceed those of primary cavity excavators. . Clumping of snags and down wood may be a natural pattern, and	

clumps may be selected by some species, so that providing only even distributions may be insufficient to meet all species needs. . Other forms of decaying wood, including hollow trees, natural tree cavities, peeling bark, and dead parts of live trees, as well as fungi and mistletoe associated with wood decay, all provide resources for wildlife, and should be considered along with snags and down wood in management guidelines. . The ecological roles played by wildlife associated with decaying wood extend well beyond those structures per se, and can be significant factors influencing community diversity and ecosystem processes. Rose, C.L., Marcot, B.G., Mellen, T.K., Ohmann, J.L., Waddell, K.L., Lindely, D.L., and B. Schrieber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management, Chapter 24 *in* ***Wildlife-Habitat Relationships in Oregon and Washington*** (Johnson, D. H. and T. A. O'Neil. OSU Press. 2001) http://www.nwhi.org/nhi/whrow/chapter24cwb.pdf The potential population models are based on the number of trees needed for nesting cavity-excavator birds, however, “[t]he high value of large, thick-barked snags in severely burned forests has as much to do with feeding opportunities as it does with nesting opportunities they provide birds.” (Hutto. ConBio 20(4). 2006). The number of snags needed to support bird feeding, escape from predators, and other life functions, is different than, and likely higher than, the number of snags needed to support nesting, so the agencies’ existing “potential population” snag standards are arbitrary and capricious. There is evidence that retaining more than the minimum number of snags has significant benefits for cavity dependent species. Comparing two sites in Northern California, Blacks Mountain Experimental Forest (BMEF) with little past logging and lots of snags, and Goosenest Adaptive Management Area (GAMA) with lots of logging and fewer snags, the author’s found “… three times as many snags (6.38/acre vs. 2.04/acre, respectively) … The use of snags by cavity-nesting bird species was dramatically different between the sites. Thirty-one cavity-nesting pairs from 10 species were detected at BMEF, while only one pair each of two species were detected at GAMA…. This fifteenfold difference is much greater than any measure of snags or cavities reported. …” We feel that forest managers may well be asking a misleading question. “Snags per acre” requirements implicitly assume an equilibrium condition and reflect only one ecological requirement for a given cavity-nesting species. … [C]onsideration of foraging habitat and other ecological requirements must be part of the “snags per acre” management considerations. This is an important, but somewhat daunting proposition, as potential cavity-nesting species are diverse, and each species likely has very different foraging ecologies, as well as other differences in habitat requirements. … [C]avity nesters at BMEF used larger snags on average … [T]he loss of large trees due to logging in eastside pine and other	

> forests, over the past century has major implications for cavity-nesting birds. … [F]orest managers must have a sense of snag recruitment in relationship to snag fall, and the patterns and processes that underlie them, when addressing wildlife needs. …We view the understanding of these complexities to be of primary importance in forest management for wildlife.

Steve Zack, T. Luke George, and William F. Laudenslayer, Jr. 2002. Are There Snags in the System? Comparing Cavity Use among Nesting Birds in "Snag-rich" and "Snag-poor" Eastside Pine Forests. USDA Forest Service Gen. Tech. Rep. PSW-GTR-181. http://www.fs.fed.us/psw/publications/documents/gtr-181/017_Zack.pdf

Another recent science publication asked that the agencies salvage polices be brought up to date with current science.

> **Inadequacy of Current Snag Guidelines**
> Current snag-retention guidelines for most North American plant community types fall between 1 and 8 snags/ha. These guidelines emerged primarily from a consideration of the nesting requirements of cavity-nesting vertebrate species in the now classic Blue Mountains book (Thomas 1979). The retention of 8 snags/ha was judged to support 100% of the maximum population density of any of the woodpecker species that occur in the Blue Mountains area (Thomas 1979: Appendix 22). Bull et al. (1997) concluded that about 10 snags/ha in ponderosa pine and mixed-conifer forests should support viable populations of cavity-nesting birds. Thus, most current U.S. National Forest guidelines generally converge on the recommendation to retain 6–10 trees/ha, as do guidelines for Washington State, the Ontario Ministry of Natural Resources, the U.S. Army Corps of Engineers, and many other land management agencies.
>
> It has been acknowledged that snag guidelines should be sensitive to forest type and forest age because "the wildlife species that use snags are influenced by the stage of forest succession in which the snag occurs" and by the breakdown stage of the snag (Thomas et al. 1979). Moreover, snag types, sizes, and densities vary significantly with vegetation type (Harris 1999; Harmon 2002; White et al. 2002). Therefore, it follows necessarily that the desired snag types and densities will differ with both plant community type and successional stage and that we need as great a variety of guidelines as there are community types and successional stages (Bull et al. 1997; Everett et al. 1999; Rose et al. 2001; Kotliar et al. 2002; Lehmkuhl et al. 2003). Unfortunately, we have generally failed to adjust snag-retention recommendations to specific forest age, and nowhere is that failure more serious than for those special plant community types that were ignored in the development of the generic guidelines—recently burned conifer forests. Such forests are characterized by uniquely high densities of snags (Angelstam & Mikusinski 1994; Hutto 1995; Agee 2002; Drapeau et al. 2002), and snag use by most woodpeckers in burned forests requires high snag densities

because they nest in and feed from burned snags. These facts have been overlooked in the development and implement-tation of meaningful snag-management guidelines. Indeed, these guidelines have generally converged toward an average of 6–7 trees/ ha because that number was deemed more than adequate to meet the nesting requirements of cavity-nesting wildlife species (Thomas et al. 1979:69). Snag guidelines were not originally developed with an eye toward non-nesting uses of snags or from an attempt to mirror snag densities that typically occur on unmanaged reference stands. Snag guidelines are still much narrower than numerous authors have suggested they ought to be, and we currently run the risk of managing coarse woody debris with uniform standards across historically variable landscapes, which is entirely inappropriate. Instead, we should be managing for levels of coarse woody debris that more accurately mirror levels characteristic of the natural disturbance regime (Agee 2002). Clearly, we need more data on what might constitute meaningful snag targets for all forest types and success-sional stages, and those targets should be set on the basis of reference conditions from natural post disturbance forests, not from managed forest stands and certainly not from consideration of only a single aspect of an organism's life history. Newer guidelines that are appropriate for snag dependent species that occupy standing dead forests at the earliest stage of succession are beginning to trickle in (Saab & Dudley 1998; Haggard & Gaines 2001; Saab et al. 2002; Kotliar et al. 2002), and authors suggest that 200–300 snags/ha may better address the needs of wildlife in burned forests. The issue has yet to receive the serious management attention it deserves, but the comprehensive review of habitat needs of vertebrates in the Columbia River Basin (Wisdom et al. 2000) and the recently developed DecAID modeling effort in Washington and Oregon represent important efforts toward providing that kind of management guidance (Marcot et al. 2002). **Current Postfire Management Decisions Related to Snag Retention** The following points regarding management decisions apply to western forest types that experience crown fire as at least a minor component of their fire regimes (and that is virtually all western forest types). (1) The USFS uses fire as a motivation to harvest trees. This is evident because in most cases where postfire logging is proposed they had not already sold green-tree harvests in those particular areas prior to the time of fire disturbance. Even though land managers are becoming more aware of the overwhelmingly negative ecological impacts of postfire salvage logging, the management has not shifted correspondingly toward less salvage harvesting. Instead, the most common justification for such harvests seems to have shifted recently from "salvaging" what economic value there might be to preventing another catastrophic fire (McIver & Starr 2000). Recent modifications of legislation and regulations by provincial	

governments in Canada (cited in Nappi et al. 2003) and by the U.S. government as well (Healthy Forests Restoration Act) expedite or even provide incentives for salvage logging. Such legislation provides no commitment to meaningful snag retention on burned forest lands. This failure to appreciate the value of burned forests to ecosystem sustainability is exacerbated by the fact that industrial lands (and most state lands) are, and probably always will be, completely salvage logged after fire because the value of those lands to those landowners lies entirely with the potential for short-term economic gain. The onus lies squarely on public land managers to provide the necessary protection of snag resources on burned forest land, and that has yet to happen. (2) The usual agency response to questions about the amount or kind of burned trees to leave is that it does not really matter because they propose taking only a small proportion of what burned, so there must be plenty left for wildlife. Although that could be true, there is no scientific basis for such a conclusion. The volume of burned timber needed to enable populations to expand enough so that they can weather the next hiatus without fire in a particular area is unknown. (3) If a partial salvage is proposed, the level of snag retention is generally based on a gross misapplication of current snag guidelines. In short, meaningful snag management guidelines for burned forests are lacking because the general public and the land management agencies that act on behalf of the public do not recognize the biological value of snags in burned conifer forests. Hutto, R.L., 2006. Toward Meaningful Snag-Management Guidelines for Postfire Salvage Logging in North American Conifer Forests. Conservation Biology Volume 20, No. 4, 984–993. The bottom line is that current management at both the plan and project level does not reflect all this new information about the value of abundant snags and down wood. The agency must avoid any reduction of existing or future large snags and logs (including as part of this project) until the applicable management plans are rewritten to update the snag retention standards. <u>See also</u> PNW Research Station, "Dead and Dying Trees: Essential for Life in the Forest," Science Findings, Nov. 1999 (http://www.fs.fed.us/pnw/sciencef/scifi20.pdf) ("Management implications: Current direction for providing wildlife habitat on public forest lands does not reflect findings from research since 1979; more snags and dead wood structures are required for foraging, denning, nesting, and roosting than previously thought.") <u>and</u> Jennifer M. Weikel and John P. Hayes, HABITAT USE BY SNAG-ASSOCIATED SPECIES: A BIBLIOGRAPHY FOR SPECIES OCCURRING IN OREGON AND WASHINGTON, Research Contribution 33 April 2001, http://www.fsl.orst.edu/cfer/snags/bibliography.pdf.	
Consider the following before relying on DecAID The agency often tries to use DecAID as a substitute for the outmoded potential population methodology. DecAID, the Decayed Wood Advisor for	**3-13**

Managing Snags, Partially Dead Trees, and Down Wood for Biodiversity in Forests of Washington and Oregon, http://www.notes.fs.fed.us:81/pnw/DecAID/DecAID.nsf Although DecAID helps bring together lots of useful information about snag associated species, the agency must recognize and account for the short-comings of DecAID and cannot rely on DecAID to provide the project-level snag standards because: DecAID is a tool designed for plan level evaluations, because DecAID itself has not been subjected to NEPA analysis and comparison to alternatives, and because DecAID is an inadequate tool for the purpose. 1. Before relying on DecAID, the agency must prepare a comprehensive NEPA analysis to consider alternative ways of ensuring viability of all species dependent upon snags and dead wood. While it is true that the "potential population" or "habitat capability" method is no longer considered scientifically valid, the agency has not yet considered a full range of alternative methods to replace the habitat capability method mandated in the forest plans. 2. Before using DecAID, the agency must establish a rational link between the tolerance levels in DecAID and the relevant management requirements in the applicable resource management plan. For instance, since the Northwest Forest Plan and the Eastside Screens require maintenance of 100% potential population of at least some cavity-dependent species, the agency must explain why that does not translate into maintaining *100% of the potential tolerance level*. If the site is capable of supporting 80% tolerance levels, the agency should not be able to manage for 30-50% tolerance levels and still meet the 100% potential population requirement. 3. Blind reliance on DecAID is inappropriate. DecAID does not pick the management objective. The agency must specify the management objective based on RMP objectives for the land allocation or based on natural "range of variation." Since large snags are outside the natural range of variability across the landscape, the agency must retain all large snags to start moving the landscape toward the natural range of variability, or the agency must carefully justify in the NEPA analysis every large snag it proposes to remove. See Jerome J. Korol, Miles A. Hemstrom, Wendel J. Hann, and Rebecca A. Gravenmier. 2002. *Snags and Down Wood in the Interior Columbia Basin Ecosystem Management Project.* PNW-GTR-181. http://www.fs.fed.us/psw/publications/documents/gtr-181/049_Korol.pdf. This paper estimates that even if we apply enlightened forest management on federal lands for the next 100 years, we will still reach only 75% of the historic large snag abundance measured across the interior Columbia Basin, and most of the increase in large snags will occur in roadless and wilderness areas. 4. The agency cannot use "average" snag levels (e.g. 50% tolerance level) as a management objective within treatment areas, because treatments are essentially displacing natural disturbance events which would normally create and retain large numbers of snags, so disturbance areas should have abundant snags, not average levels of snags. It would be	

inconsistent with current science and current management direction to manage only for the mid-points and low points. The agency should manage for the full natural range dead wood levels, including the peaks of snag abundance that follow disturbance. 5. Be sure to use the DecAID tool appropriately. The agency must address the dynamics of snag habitat over time, by ensuring that recommended snag levels are maintained over time given typically high rates of snag fall and low rates of snag recruitment following fire. These dynamics are not accounted for in the DecAID advisor. The agency often misuses the DecAID decision support tool by looking at only a snap-shot in time. The agency relies on DecAID to analyze impacts on snag dependent species, but the agency fails to recognize that "DecAID is NOT: … a snag and down wood decay simulator or recruitment model [or] a wildlife population simulator or analysis of wildlife population viability. … Because DecAID is not a time-dynamic simulator … it does not account for potential temporal changes in vegetation and other environmental conditions, … DecAID could be consulted to review potential conditions at specific time intervals and for a specific set of conditions, but dynamic changes in forest and landscape conditions would have to be modeled or evaluated outside the confines of the DecAID Advisor." Marcot, B. G., K. Mellen, J. L. Ohmann, K. L. Waddell, E. A. Willhite, B. B. Hostetler, S. A. Livingston, C. Ogden, and T. Dreisbach. In prep. "DecAID -- work in progress on a decayed wood advisor for Washington and Oregon forests." Research Note PNW-RN-XXX. USDA Forest Service, Pacific Northwest Region, Portland OR. (pre-print) http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf/HomePageLinks/44C813BC574BDFCC88256B3E006C63DF To clearly and explicitly address the issue of "snag dynamics" the can start by reading and responding to the snag dynamics white paper on the DecAID website which says "To achieve desired amounts and characteristics of snags and down wood, managers require analytical tools for projecting changes in dead wood over time, and for comparing those changes to management objectives such as providing dead wood for wildlife and ecosystem processes" and includes "key findings" and "management implications" including "The high fall rate (almost half) of recent mortality trees needs to be considered when planning for future recruitment of snags and down wood. Trees that fall soon after death provide snag habitat only for very short periods of time or not at all, but do contribute down wood habitat. In fact, these trees are a desirable source of down wood as they will often begin as mostly undecayed wood and, if left on the forest floor, will proceed through the entire wood decay cycle with its associated ecological organisms and processes that are beneficial to soil conditions and site productivity." http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf/HomePageLinks/863EEA66F39752C088256C02007DF2C0?OpenDocument 6. The tolerance levels from DecAID may be too low to support viable	

populations of wildlife associated with dead wood, because anthropogenic factors that tend to reduce snags (e.g., firewood cutting, hazard tree felling, fire suppression, and salvage logging) may have biased the baseline data that DecAID relies upon to describe "natural" conditions. See Kim Mellen, Bruce G. Marcot, Janet L. Ohmann, Karen L. Waddell, Elizabeth A. Willhite, Bruce B. Hostetler, Susan A. Livingston, and Cay Ogden. *DecAID: A Decaying Wood Advisory Model for Oregon and Washington* in PNW-GTR-181, *citing* Harrod, Richy J.; Gaines, William L.; Hartl, William E.; Camp, Ann. 1998. *Estimating historical snag density in dry forests east of the Cascade Range.* PNW-GTR-428. http://www.fs.fed.us/pnw/pubs/gtr_428.pdf 7. DecAID is still an untested new tool. The agencies must conduct effectiveness monitoring to determine whether the snag and down wood retention recommendations in the DecAID advisor will meet management objectives for wildlife and other resource values. 8. The "unharvested" inventory data used in DecAID may represent but a snapshot in time, and fail to capture the variability of dead wood over time, including the pulses of abundant dead wood that follow disturbances and may prove essential for many wildlife species. 9. DecAID must be used with extreme caution in post-fire landscapes because the data supporting DecAID does not include natural post-fire landscapes. ("The inventory data likely do not represent recent post-fire conditions very well … young stands originating after recent wildfire are not well represented because they are an extremely small proportion of the current landscape … The dead wood summaries cannot be assumed to apply to areas that are not represented in the inventory data." "Dec-AID caveats" http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf). 10. DecAID relies on a wide range of sources in the literature, some of which recommend much higher levels of snag retention than reflected in the advisor. The agency NEPA analysis should disclose the published literature with higher levels of snag and wood retention and discuss their potential relevance for the project. ("the agency must disclose responsible opposing scientific opinion and indicate its response in the text of the final statement itself. 40 C.F.R. § 1502.9(b)." Center for Biological Diversity v. United States Forest Service, No. 02-16481 (9th Cir., Nov. 18, 2003).) 11. DecAID tolerance levels need careful explanation. These tolerance levels are very difficult to put in terms that are understandable by the general public, but if the Forest Service is going to use this tool they must make it understandable. The NEPA analysis should provide cumulative species curves for each habitat type and each forest structural stage and should explain the studies and publications that support the data points on the curves. What kind of habitat were the studies located in? What was the management history of the site? Was the study investigated nesting/denning, or roosting and foraging too? 12. DecAID does not account for the unique habitat features associated with some types of snags. DecAID primarily just counts snags and assumes	

that all snags of approximately the same size have equal habitat value, but this fails to account for the fact that certain types of snags and dead wood features are unique, such as: hardwood snags, hollow trees and logs, different decay classes, etc. The NEPA analysis must account for these features and the agency should disproportionately retain dead wood likely to serve these unique habitat functions. 13. DecAID authors caution that "it is imperative, however, to not average snag and down wood densities and sizes across too broad an area, such as across entire watersheds, leaving large areas within watersheds with snags or down wood elements that are too scarce or too small" Kim Mellen, Bruce G. Marcot, Janet L. Ohmann, Karen L. Waddell, Elizabeth A. Willhite, Bruce B. Hostetler, Susan A. Livingston, and Cay Ogden. *DecAID: A Decaying Wood Advisory Model for Oregon and Washington* in PNW-GTR-181. http://www.fs.fed.us/psw/publications/documents/gtr-181/042_MellenDec.pdf While we agree that snags and down wood must not be averaged over wide areas, we also must emphasize that snags and down wood are far below historic levels on non-federal lands, so in order to ensure viable populations of wildlife and avoid trends toward ESA listing, federal lands must be managed to compensate for the lack of down wood on non-federal lands. 14. DecAID appears to be based on the idea that the habitat needs of certain key wildlife species represent the best determinant of how much dead wood to retain, and this may in fact be true, but DecAID should also include cumulative curves for other ecological functions provided by dead wood, including: site productivity, nutrient storage and release, erosion control, sediment storage, water storage, water infiltration and percolation, post-fire micro-site maintenance, biological substrate, thermal mass, etc. How much dead wood is needed for thee functions? 15. DecAID may be best used for program level planning rather than project level planning. See Dallas Emch and Gary Larson, 2006. Review & Analysis of Remainder of Comments on EA Supplements for Multiple Timber Sales on Mt. Hood & Willamette National Forests on Remand in ONRCA v. Forest Service CV-03-613-KI (D.Or.). 4-10-06.	
Concerns about Fuels Management Effectiveness Oregon Wild supports use of prescribed fire, and, if necessary, careful thinning and removal of small diameter material and flammable brush in ecologically appropriate locations in order to help restore fire regimes. We urge the agency to avoid road building and prioritize such activities in the wildland-urban interface. We support efforts to limit the initiation and spread of crown fires through the reduction of fine surface fuels and (partial) treatment of ladder fuels to increase the crown base height, but we oppose efforts to heavily thin the overstory canopy in an effort control crown-to-crown fire spread. The most significant effect of this type of heavy thinning is to increase the warming and drying of ground fuels and to increase the growth of ladder fuels, both of	**3-14**

which significantly detract of the risk reduction objectives and are expensive to treat. The NEPA analysis must address the complex effects of thinning including tendencies to reduce and increase fire hazard.

The Report to the President that forms the foundation for the National Fire Plan recommends that we "Invest in Projects to Reduce Fire Risk. **Addressing the brush, small trees, and downed material** that have accumulated in many forests because of past management activities, especially a century of suppressing wildland fires, **will require significant investments** to treat landscapes through thinning and prescribed fire." Whitehouse. Managing the Impact of Wildfires on Communities and the Environment. A Report to the President In Response to the Wildfires of 2000. September 8, 2000. http://199.134.225.81/Documents/Managing_Impact.pdf The main point here is that the fuels that need to be removed are small fuels, including brush and down wood that will require "investments" as opposed to commercial sized material.

The NEPA document must address the fact that there is very little scientific support for aggressive thinning to reduce fire hazard. In fact, there is building scientific evidence that thinning can make the fuel hazard worse instead of better. Thinning makes forests "Hotter, Drier and Winder." Science still has a long way to go to be able to confidently predict the consequences of various combinations of thinning and other treatments. "Detailed site-specific data on anything beyond basic forest structure and fuel properties are rare, limiting our analytical capability to prescribe management actions to achieve desired conditions for altering fuels and fire hazard." Graham, Russell T.; McCaffrey, Sarah; Jain, Theresa B. (tech. eds.) 2004. Science basis for changing forest structure to modify wildfire behavior and severity. Gen. Tech. Rep. RMRS-GTR-120. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 43 p. http://www.fs.fed.us/rm/pubs/rmrs_gtr120.html

In a mixed-conifer, mixed-severity fire regime study area in SW Oregon, Crystal Raymond found that "Fire severity was greater in thinned treatments than untreated. … The additional fine wood left from the thinning operation (despite whole-tree yarding) most likely caused higher fire intensity and severity in the thinned treatments."
… [T]he presence of activity fuels increased potential surface fire intensity, sc increases in canopy base height did not decrease the potential for crown fire initiation. … [C]rown fire is not a prerequisite for high fire severity; damage and mortality of overstory trees in the wildfire was extensive despite the absen of crown fire, and the low predicted crown fire potential before and after the fu treatment. Damage to and mortality of overstory trees were most severe in thinned treatments (80 – 100% mortality), least severe in the thinned and unde burned treatment (5% mortality), and moderate in untreated stands (53-54% mortality) following a wildfire in 2002. Fine fuel loading was the only fuel structure variable significantly correlated with crown scorch of overstory trees. Percentage crown scorch was the best predictor of mortality 2 years post-fire. Efforts to reduce canopy fuels through thinning treatments may be rendered

ineffective if not accompanied by adequate reduction in surface fuels. Crystal L. Raymond. 2004. The Effects of Fuel Treatments on Fire Severity in a Mixed-Evergreen Forest of Southwestern Oregon. MS Thesis. http://depts.washington.edu/nwfire/publication/Raymond_2004.pdf Raymond also found that "A greater percentage of pre-fire fine wood was consumed in the thinned plots than in the unthinned plots during the Biscuit fire suggesting that fine fuel moisture may have been lower in the thinned plots." And "the Biscuit Fire was observed to have more moderate fire behavior in stands with a sub-canopy tree layer compared to more open stands, suggesting that the sub-canopy trees did not function as ladder fuels. … Higher foliar moisture of broad-leaved species could have dampened fire behavior, inhibiting rather than aiding crown fire initiation." Similarly, Hanson and Odion (2006)[10] compared wildfire behavior in seven previously thinned mixed-conifer forests vs. adjacent unthinned forest in the Sierra Nevada and found — Contrary to our hypothesis, the mechanically thinned areas had significantly higher fire-induced mortality (p = .016, df = 6) and combined mortality (p = .008, df = 6) than the adjacent unthinned areas. Thinned areas predominantly burned at high severity, while unthinned areas burned predominantly at low and moderate severity … Possible explanations for the increased severity in thinned areas include persistence of activity fuels, enhanced growth of combustible brush post-logging, desiccation and heating of surface fuels from increased insulation, and increased mid-flame windspeeds. Given that sampling transects in thinned versus unthinned areas were only 100 m apart in each experimental unit, fire weather should have been the same for the thinned and unthinned areas sampled in each site. Thus, mechanical thinning on these sites appears to have effectively lowered the fire weather threshold necessary for high severity fire occurrence. A study in mixed-conifer forests in California showed that forest reserves were more effective than logging in terms of reducing fire hazard. [T]he efficacy of seven traditional silvicultural systems and two types of reserves used in the Sierra Nevada mixed conifer forests is evaluated in terms of vegetation structure, fuel bed characteristics, modeled fire behavior, and potential wildfire related mortality. The systems include old-growth reserve, young-growth reserve, thinning from below, individual tree selection, overstory removal, and four types of plantations. These are the most commonly used silvicultural systems and reserves on federal, state, and private lands in the western United States. Each silvicultural system or reserve had three replicates and varied in size from 15 to 25 ha; a systematic design of plots was used to collect tree and fuel information. The majority of the traditional silvicultural systems examined in this work (all plantation treatments, overstory removal, individual tree selection) did not effectively reduce potential fire behavior and effects, especially wildfire induced tree mortality at high and extreme fire weather conditions. Overall, thinning from below and old-growth and young-growth reserves were more	

effective at reducing predicted tree mortality. Scott L. Stephens and Jason J. Moghaddas. 2005. Silvicultural and reserve impacts on potential fire behavior and forest conservation: Twenty-five years of experience from Sierra Nevada mixed conifer forests. Biological Conservation 125 (2005) 369–379. Thinning opens stands to greater solar radiation and wind movement, resulting in warmer temperatures and drier fuels throughout the fire season. [T]his openness can encourage a surface fire to spread, … USDA Forest Service; Influence of Forest Structure on Wildfire Behavior and the Severity of Its Effects, November 2003. http://www.fs.fed.us/projects/hfi/2003/november/documents/forest-structure-wildfire.pdf Opening up closed forests through selective logging can accelerate the spread of fire through them because a physical principle of combustion is that reducing the bulk density of potential fuel increases the velocity of the combustion reaction. Wind can flow more rapidly through the flaming zone. Thinned stands have more sun exposure in the understory, and a warmer microclimate, which facilitates fire (Countryman 1955). … [F]uel reduction activities – particularly mechanized treatments – inevitably function to disturb soils and promote the invasion and establishment of non-native species. Pile burned areas associated with the treatments are also prone to invasion (Korb et al. 2004). Annual grasses can invade treated areas if light levels are high enough, leading to increased likelihood of ignition, and more rapid spread of fire, which can further favor annual grasses (Mack and D'Antonio 1998). This type of feedback loop following the establishment of non-native plants may result in an altered fire regime for an impacted region, requiring extensive (and expensive) remedial action by land managers (Brooks et al. 2004). dion, Dennis. 2004. Declaration in NWEA v. Forest Service. *citing* Countryman, C. M. 1955. Old-growth conversion also converts fire climate. U.S. Forest Service Fire Control Notes 17: 15-19. Theoretically, fuel treatments have the potential to exacerbate fire behavior. Crown fuel reduction exposes surface fuels to increased solar radiation, which would be expected to lower fuel moisture content and promote production of fine herbaceous fuels. Surface fuels may also be exposed to intensified wind fields, accelerating both desiccation and heat transfer. Treatments that include prescribed burning will increase nutrient availability and further stimulate production of fuels with high surface-area-to-volume ratios. All these factors facilitate the combustion process, increase rates of heat release, and intensify surface fire behavior. … Thus, treatments that reduce canopy fuels increase and decrease fire hazard simultaneously. …. Still unanswered are questions regarding	

necessary treatment intensities … more information is clearly needed. Omi, P.N., and Martinson, E. J. 2002. Effect of fuels treatment on wildfire severity. Final report. Western Forest Fire Research Center. Submitted to the Joint Fire Science Program Governing Board http://www.cnr.colostate.edu/frws/research/westfire/FinalReport.pdf

EPA also recognizes that unmaintained fuel management zones can "increase the risk of fire as slopes are opened up to sunlight and undergrowth is stimulated." See EPA 2-18-04 comments on the Biscuit Fire Salvage Project.
"Accelerating the development of multi-storied stands may increase the risk of wildfire." Andrews, Perkins, Thrailkill, Poage, Tappeneiner. 2005. Silvicultural Approaches to Develop Northern Spotted Owl Nesting Sites, Central Coast Ranges, Oregon. West. J. Appl. For. 20(1):13-27.

The Forest Trust conducted a thorough literature review and found that:

- Although the assertion is frequently made that simply reducing tree density can reduce wildfire hazard, the scientific literature provides tenuous support for this hypothesis.
- The literature leaves little doubt, however, that fuel treatments can modify fire behavior. Thus**, factors other than tree density, such as the distance from the ground to the base of the tree crown, surface vegetation and dead materials play a key role. Research has not yet fully developed the relationship among these factors in changing fire behavior.**
- The specifics of how treatments are to be carried out and the relative effectiveness of alternative prescriptions in changing wildfire behavior are not supported by a significant consensus of scientific research at this point in time.
- Substantial evidence **supports the effectiveness of prescribed fire**, a treatment that addresses all of the factors mentioned above. Significantly, several empirical studies demonstrated the effectiveness of prescribed fire in altering wildfire behavior.
- By contrast, we found a limited number of papers on the effects of mechanical thinning alone on wildfire behavior. The most extensive research involved mathematical simulation of the impact of mechanical thinning on wildfire behavior. However, the results of this research are highly variable.
- A more limited number of studies addressed the effectiveness of a **combination of thinning and burning** in moderating wildfire behavior. The impacts varied, depending on the treatment of thinning slash prior to burning. Again, **crown base height appeared as important a factor as tree density. The research community is still building a scientific basis for this combination of treatments.**
- **The proposal that commercial logging can reduce the incidence of canopy fire was untested in the scientific literature. Com-mercial logging focuses on large diameter trees and does not address crown base height – the branches, seedlings and saplings which contribute**

so significantly to the "ladder effect" in wildfire behavior. • Much of the research on the effectiveness of fuel treatments uses dramatically different methodology, making a comparison of results difficult. To provide a basis for analysis, we structured our review of the literature into four general groupings: observations, case studies, simulation models and empirical studies. Empirical studies provide the strongest basis for evaluating treatments whereas personal observations are the least reliable. • **We found the fewest studies in the most reliable class – empirical research. We found the greatest number of studies in the least reliable class of research – reports of personal observation. Several other reviews of the literature confirm this finding, stating that the evidence of the efficacy of fuel treatment for reducing wildfire damage is largely anecdotal.** • The **results of simulation studies are highly variable**, in terms of such factors as fire spread, intensity and the occurrence of spotting and crowning. • Scientists recognize that large scale prescribed burning and mechan-ical thinning are still experimental and may yet reveal unanticipated effects on biodiversity, wildlife populations and ecosystem function. Henry Carey and Martha Schumann. Modifying WildFire Behavior – The Effectiveness of Fuel Treatments — The Status of Our Knowledge. April 2003; http://www.theforesttrust.org/images/swcenter/pdf/WorkingPaper2.pdf This report also said: Stephens [1998. "Evaluation of the effects of silvicultural and fuels treatments on potential fire behavior in Sierra Nevada mixed-conifer forests." *Forest Ecology and Management* 105(1):21-35.] used FARSITE to investigate the interaction between slash from logging and fire behavior. When silvicultural treatments were conducted without reducing slash, the simulated fire behavior appeared more extreme than in the area that had not been harvested at all. … We did not find any empirical studies that evaluated commercial harvesting as a means of altering fire behavior. … studies suggest that slash resulting from logging is a key factor in predicting subsequent fire risk and that removal of large diameter trees alone may contribute to increased fire severity. … A report prepared for Congress stated: "We do not presume that there is a broad scientific consensus surrounding appropriate methods or techniques for dealing with fuel build-up or agreement on the size of areas where, and the time frames when, such methods or techniques should be applied" (US GAO RCED-99-65. 1999:56). A research report by Omi and Martinson (2002:1) stated: "Evidence of fuel treatment efficacy for reducing wildfire damages is largely restricted to anecdotal observations and simulations."	

Duke University issued an "expert advisory" May 24, 2004 with Professor Norm Christensen saying: "…the practice of suppressing wildfires has allowed debris to accumulate to dangerous levels on the forest floor." Indiscriminate logging aggravates the problem by thinning a fire-prone forest's canopy and littering its floor with sawdust and other combustible debris. "Loss of canopy increases wind speed and air temperatures and decreases humidity in the forest," Christensen notes. "As a result, ground fuel fires that break out can spread faster and farther than they would normally." http://www.ascribe.org/cgi-bin/spew4th.pl?ascribeid=20040524.081406 Studies have shown that thinned stands are warmer and windier than unthinned stands. Trevor D. Hindmarch and Mary L. Reid. Effects of Commercial Thinning on Bark Beetle Diversity and Abundance. PROJECT REPORT 1999-13. May 1999. http://sfm-1.biology.ualberta.ca/english/pubs/PDF/PR_1999-13.pdf (see figures 2&3, pp 14-15). The 9th Circuit recently admonished the Forest Service to ensure the effectiveness of treatments before embarking on potentially irreversible treatment programs. Just as it would be arbitrary and capricious for a pharmaceutical company to market a drug to the general population without first conducting a clinical trial to verify that the drug is safe and effective, it is arbitrary and capricious for the Forest Service to irreversibly "treat" more and more old-growth forest without first determining that such treatment is safe and effective for dependent species. ... The EIS discusses in detail only the Service's own reasons for proposing treatment, and it treats the prediction that treatment will benefit old-growth dependent species as a fact instead of an untested and debated hypothesis." Ecology Center v. Austin, 9th Circuit. Dec 8, 2005. http://tinyurl.com/b37k4 The NEPA document must acknowledge the paucity of scientific support for commercial logging to reduce fuels and reduce fire effects and fails to recognize that logging often increases fine fuel loads while removing the large logs that are relatively less prone to burn. Thinning also increases wind and light penetration of the canopy and causes fuels to dry out which make them more prone to burn and increases the time it takes woody material to decompose. Removing medium and large trees also removes shade and resource competition that helps suppress the growth of small trees and brush known as "ladder fuels." In a challenge to a timber sale in the Sierra Nevada Mountains, U.S. District	

Judge Morrison C. England Jr. found on July 1, 2003 that John Muir Project and Earth Island Institute had made a strong case that logging slash could fuel future fires and that logging would harm wildlife habitat by increasing the risk of fire. A stay to halt the fuels reduction project was granted. Judge England issued a temporary restraining order (TRO) in Earth Island Institute v. USDA Civ. No. S-03-1242 MCE DAD (Eastern District of California 2003) because logging would create "extreme levels of flammable slash." Consider these words from Mike Dombeck, former Chief of the Forest Service: "Some argue that more commercial timber harvest is needed to remove small-diameter trees and brush that are fueling our worst wildlands fires in the interior West. However, small-diameter trees and brush typically have little or no commercial value. To offset losses from their removal, a commercial operator would have to remove large, merchantable trees in the overstory. Overstory removal lets more light reach the forest floor, promoting vigorous forest regeneration. Where the overstory has been entirely removed, regeneration produces thickets of 2,000 to 10,000 small trees per acre, precisely the small diameter materials that are causing our worst fire problems. In fact, many large fires in 2000 burned in previously logged areas laced with roads. It seems unlikely that commercial timber harvest can solve our forest health problems." Dombeck on Fires in 2001 - How Can We Reduce the Fire Danger in the Interior West (Fire Management Today, Winter 2001, pg 11). As eloquently stated by Neil Lawrence: We're a long way from a model that accounts for the drying affect of insulation and increased wind penetration, the loss of water from run-off on machine compacted soil, the increased availability of residual fine fuels post-thinning, the morbidity and mortality associated with diseases and pests imported by logging equipment, and all the other real world phenomena that cut against the ivory tower view that large fuel structure and crown bulk density are the sole significant drivers of fire occurrence, intensity, and spread. Logging very likely will have little effect on the severity or controllability of large intense canopy fires that are of most concern both environmentally and economically. If proposed logging has any effect it will likely lead to increased controllability of low intensity surface fires, but these lower intensity fires are precisely the fires that are beneficial ecologically and should probably not be controlled. So logging will help control fires which should remain wild and free, while logging will fail to control that which is most destructive. Logging also has many effects that fires do not have. Soil compaction, roads, weeds, etc. It would be better to just do a controlled prescribed burn at the right time of year without logging. The EA should have considered such an alternative.	

Landscape fire	3-15
We lack the resources to treat the landscape so we must be smart about it. Large fires are largely driven by weather conditions, and the behavior of wind-driven fires is not meaningfully affected by arbitrarily located fuel treatments. In such cases, commercial logging is highly unlikely to affect fire behavior at a landscape scale and will therefore fail to achieve this project's purpose and need. In order to conserve scarce resources, we must endeavor to treat the fewest acres yet protect the most acres. The NEPA analysis must disclose and analyze spatial priorities for fuel treatments. Credible but highly theoretical simulation work by the Forest Service's Mark Finney shows that effective fuel reduction requires that we carefully consider how fire moves across landscape and spatially prioritize treatments to interrupt likely fire travel routes. The NEPA analysis must acknowledge that random/arbitrary placement of fuel treatments will have little effect on large fires unless high proportions of landscape are treated. The agency does not have the resources to treat a high proportion of the landscape and even if they did the ecological consequences would be unacceptable. Here are some recommendations adapted from Finney: • Identify main fire travel routes and block them. Using known topography and relatively predictable wind patterns, the likely travel routes of fire can be somewhat readily predicted. With this as a starting point the agencies can identify treatment locations that have a high chance of forcing fire into a flanking pattern which reduces rate of spread and the intensity of the flame front which increases the chances of control. • Treatments will be more effective if they partially "overlap" in the linear wind heading direction. Overlapping patterns should help split intense flame fronts into smaller units because the head of the fire would be split into smaller pieces as it crossed treated areas (and therefore would be forced to flank). See Figures 1, 5, and 7 *in* Mark A. Finney. 2001. Design of Regular Landscape Fuel Treatment Patterns for Modifying Fire Growth and Behavior. Forest Science 47(2): 219–228. http://www.cnr.berkeley.edu/wfrg/main/lecture01/Finney.pdf • The pattern of effective treatments are theoretically scale-independent but the scale of treatment patterns should probably be finer than the scale of fire sizes. • Recognize the tradeoffs between intensive and extensive treatment strategies. Prescribed fire would be an example of a treatment that is low intensity but could be applied relatively broadly, whereas commercial thinning can only be done on a small fraction of the landscape before the adverse effects (soil, water, wildlife, weeds, etc.) become unacceptable. • Be flexible with spatial constraints. Choosing treatment locations will require consideration of many factors, fire travel routes being just one of them. The agency must not ignore and run rough-shod over other critical environmental considerations such as soil, wildlife habitat, water quality, recreation, roadless areas, etc.	

The NEPA analysis must address this very important CAVEAT: "Spotting was excluded in the analysis. Spotting would create large fires regardless of treatment pattern if fire brands landed in untreated areas. Therefore spotting fires behave independent of treatment pattern unless whole-area treatment was utilized." AND "Spotting was excluded from this analysis but would likely result in large fires, independently of any landscape fuel pattern except wholesale treatment." "The federal government reports that 70 million acres of federal lands need immediate thinning and another 140 million acres must be thinned soon. The president's plan to thin 25 million acres in the next 10 years will cost as much as $4 billion yet leave nearly 90 percent of those acres untreated," according to Jerry Taylor, the CATO Institute's Director of Natural Resource Studies, "A recent Forest Service report estimates there are just 1.9 million high-risk acres with homes and other structures near federal lands. To defend homes and communities, we should treat those acres and fireproof the homes. That could be done in just one or two years at a tiny fraction of the cost of the president's plan." (Administration's Forest Plan Doomed to Fail, *"Forests Initiative" Will Leave 90 Percent of Acres Vulnerable to Fires, 5/20/03;* http://www.cato.org/new/05-03/05-20-03r-2.html, http://www.cato.org/dailys/09-07-02.html) It is arbitrary and capricious to spend billions on a program that essentially fails to address the problem. This timber sale project is a microcosm of the larger issue identified here. Until the larger issue is dealt with, this significant issue requires an EIS. Given limited resources the agencies must focus on using the most cost-effective tools. Prescribed fire is typically the cheapest and most effective method of fuel reduction. Prescribed burning affects potential fire behavior by reducing fuel continuity on the forest floor, thereby slowing fire spread rate, reducing fire intensity, and reducing the likelihood of fire spreading into ladder fuel and the crown. Prescribed fire is typically cheaper per unit area than thinning and in some cases can be used to reduce stem density and ladder fuel by killing (mostly) smaller trees. This has proven to be effective as the sole means of fuel treatment in the mixed-conifer forest of the southern Sierra Nevada, California (Kilgore and Sando 1975, McCandliss 2002, Stephenson et al. 1991), and may be effective in other western forests if carefully applied, particularly in stands with large, fire-resistant trees. Peterson, David L.; Johnson, Morris C.; Agee, James K.; Jain, Theresa B.; McKenzie, Donald; Reinhardt, Elizabeth D. 2005. Forest structure and fire hazard in dry forests of the Western United States. Gen. Tech. Rep. PNW-GTR-628. http://www.treesearch.fs.fed.us/pubs/viewpub.jsp?index=8572 Effective fuel treatment programs must consider the spatial pattern of fuel across large landscapes (e.g., Hessburg et al. 2000). … Treating small or isolated stands without assessing the broader landscape may be	

ineffective in reducing large-scale crown fire. *Id*. Fuel treatments are not likely to influence fire behavior at a landscape scale. The proposed action proposes to treat fuels at a landscape scale and cause significant soil damage, wildlife habitat disturbance, and hydrological effects, yet only reduce extreme fire hazard by a small degree across the project area. This fuel reduction benefit will only be realized during ideal weather conditions but will have virtually no effect during the most extreme fire conditions. This level of fire hazard reduction is a drop in the bucket, and the NEPA analysis fails to balance the minute level of benefit in terms of fire risk reduction against the great level of soil, water, and wildlife impacts. The small amount of fuel reduction benefits from this project are also short-lived and will last only about 10-15 years at which point another entry will be required. So all the soil, wildlife, and watershed impacts will be repeated again and again and probably still not stop the big fire from burning it all down during extreme weather conditions that humans cannot control. We have to stop kidding ourselves. On the day of the big fire (and it will come), the difference between the action alternative and the no action alternative is almost nothing, but if the agency instead focused on careful and conscientious treatment in the community zone, maybe the homes and communities can be saved. The agency should focus fuel reduction efforts within 1/4 mile of the homes and communities and prepare an EIS to more carefully balance the competing interests here (soils, fuels, etc). Jack Cohen's work clearly shows that the most important steps to be taken to protect home and communities are not at the landscape level but at the homesite and immediately adjacent to the homesite. See USDA Forest Service Gen. Tech. Rep. PSW-GTR-1731999 and the publications listed here: http://www.firelab.org/fbp/fbresearch/wui/pubs.htm Outside the community zone the Forest Service should focus on restoration using non-commercial treatment using hand crews and prescribed fire. The Forest Service must focus on treatment that can be maintained, and do not required repeated entries with heavy equipment that will violate soil standards and exacerbate concerns about hydrology, wildlife, weeds and water quality. The agency also seems to forget that much of the project area is made up of plant communities that naturally burn at high intensity. No amount of thinning is going to radically alter this natural phenomena over the scale of the next 50-100 years. Since the benefits of fuel reduction will not be realized during the most extreme fire conditions. The agency must consider what is the likelihood that sometime during the next 20 years, there will be a large fire during extreme conditions. If there is a significant risk of that occurrence, then all the soil damage, hydrologic degradation, weed infestations, and wildlife disturbance (of this project and many that will be needed in the future) will be for naught. This is a very significant issue, not only for this project but	

for many others as well. The agency should do an EIS to consider these weighty issues. The agencies are frequently citing the work of Mark Finney to justify fuel treatments but there are some significant caveats that must be considered: 1. Some fuel treatments actually make fire hazard worse instead of better. (Finney says "some treatments in certain vegetation types have actually increased rate of spread by encouraging the growth of fine fuels."); and 2. Finney's modeling does not account for spotting. (Finney says, "Spotting was excluded in the analysis. [Spotting] would create large fires regardless of treatment pattern if fire brands landed in untreated areas. Therefore spotting fires behave independent of treatment pattern unless whole-area treatment was utilized." Mark Finney, Fire Behavior Modeling— Outline of the paper: "Design of Regular Landscape Fuel Treatment Patterns for Modifying Fire Growth and Behavior" http://www.cnr.berkeley.edu/wfrg/main/lecture01/Finney-Canright-Casey.doc Sincerely, Doug Heiken for Oregon Wild	

3-1
Fire Hazard- Tree Size Removed

Chapter 1 of the DEIS (pg 17) and Chapter 2 (pg 40) describe that the commercial thinning is thinning from below, meaning the smaller trees within a unit would be the ones removed. Chapter 3 of the DEIS discusses the effects of thinning on various resources such as fuels, soil, water, and habitat.

3-2
Fire Severity- Proposed Treatment

We agree that during extreme weather events, fire may consume many acres during one burning period. Fires that escape initial containment usually have ignitions that occur when fuel moistures and atmospheric conditions allow for extreme fire behavior, they occur in areas of high contiguous fuel loads, are not quickly or easily accessible, and are in areas that don't allow suppression resources to safely work in close proximity to the fire (no escape route and/or safely zone), or a combination of the above. The DEIS discusses fire risk and common weather patterns for the project area in Chapter 3 pgs 110-111. Also, the need for future prescribed fire to maintain low levels of ladder and surface fuels is identified in Chapter 3 pgs 96, 123, 127, and 131.

3-3
Excessive Road Building

We appreciate your concerns regarding road building. A concern was identified during scoping regarding proposed ground disturbing activities associated with road construction and commercial timber harvest and the potential effect on water quality and soil productivity. This concern was elevated to a significant issue (key issue) and used as the basis for alternative development. To address this issue a range of alternatives was developed and analyzed in Chapter 3. To summarize, no new system road construction is proposed in Alternatives 2, 3, or 4. Alternatives 2 and 3 propose temporary road construction (8.6 miles and 1.5 miles respectively) to support timber harvest. All temporary roads proposed for construction are located outside of RHCAs and would be decommissioned after use. The objectives of decommissioning are to eliminate future used of the road and restoration of the hydrological function. This would include subsoiling, installation of drainage, and seeding as necessary. Alternative 4 does not propose commercial harvest or temporary road construction.

3-4
Fire Regimes- New Science

The DEIS discloses fire regimes with the fire frequency and the percent of any fire that may be mixed severity of stand replacing (pg 113). The Forest Vegetation section in Chapter 3 of the DEIS (pgs 75-81) discusses species composition, successional development, and disturbance processes acknowledging that areas of denser forest patches occurred within low intensity, high frequency fire regimes.

3-5
Variable Thinning – Increase Degree of Variability

As disclosed in the DEIS (Chapter 1 pg 17-18, Chapter 2 pg 40, Chapter 3 pg 96) the objective of the thinning is to increase resiliency and increase growth in order that stands reach old forest structure sooner. The variable spacing (Chapter 2 pgs 50-51) will result in a clumpy and patchy stand, not a uniformly spaced stand.

3-6
Dead Wood Habitats

The DEIS addresses effects to dead wood habitats in Chapter 3 pgs 216-235 and 249-262. Forest Plan Standards are discussed at pg 250. The commenter contends that the basis for the Forest Plan standards for dead wood habitats are invalid based upon more recent study and assessment of habitat needs and the individual species. Assessment of the direct, indirect, and cumulative effects to species dependent upon dead wood habitats (primary cavity excavators) is provided in the pages referenced above. Due to the use of whole tree yarding in the project area, the vast majority of project fuels will be located at landings. Due to the activities and location of landings, it is unlikely that snags or downed wood would be consumed. The area around landings would generally be made snag free in order to ensure the safety of workers at the sites. Prescribed underburning can alter or remove vertical and horizontal stand structure including snags and down wood. Snags can be both lost and recruited during prescribed burning. The level of loss and replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load. In the Crawford Project Area, effects to existing dead wood habitats would be expected to be minimal. This proposed project used DecAID 2.0 analysis tool (Mellen et al. 2006) to evaluate alternative effects on dead wood habitats. DecAID is an internet based computer program developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use snags and large downed-logs. The tool synthesis published literature, research data, wildlife databases, and expert judgment experience. Based on the analysis of stand exams in the forest GIS database, many of the multi-strata stands are deficient in large diameter snags and downed wood. The number of snags felled for safety reasons during logging would be considered incidental; felled snags would be retained on site as downed logs. Past management activities have reduced snags and down wood in old-growth habitats. Design measures for the action alternatives would minimize additional loss of these habitats. The Forest's firewood cutting policy prohibits the cutting of firewood in DOG/ROG areas, so prescribed and down wood levels should be retained.

3-7
Livestock Grazing

Cumulative effects of grazing were analyzed in the various resource sections in Chapter 3. Changes in livestock grazing are not within the scope of the EIS.

3-8
Road Decommissioning- Snowmobile Use

The goal of road decommissioning is to eliminate future use of the road. The decommissioned roads would be gated at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, drainage provided for the road surface, and existing culverts would be removed (DEIS, Chapter 2, pg 45). Proposed road closures and decommissioning in Alternatives 2, 3, and 4 will not affect existing designated snowmobile trails in the project area (DEIS, Chapter 3, Recreation Section).

3-9
Thinning Recommendation

In addition to the specifics addressed for the points below, additional information on thinning and fire hazard are discussed in the DEIS Chapter 1 – Activity Description and Objectives (pgs 17-21), and in Chapter 2 – Alternative Descriptions, (pgs 40-48), Management Requirements, Constraints, and Design Measures (pgs 50-65). Additional information is discussed in Chapter 3 of the DEIS in the sections for Fire and Fuels (pgs 108-134), Terrestrial Wildlife (pgs 212-283), and Forest Vegetation (pgs 71-107).

3. We agree that mixed severity fire was a component of the fire regime in the "dry" forests. The DEIS discloses fire regimes with the fire frequency and the percent of any fire that may be mixed severity of stand replacing (pg 113). The Forest Vegetation section in Chapter 3 of the DEIS (pgs 75-81) discusses species composition, successional development, and disturbance processes acknowledging that areas of denser forest patches occurred within low intensity, high frequency fire regimes.

4. Units were prioritized for treatment based on stand stocking and composition.

5. This project proposes thinning from below and retaining the largest trees. Chapter 2 of the DEIS described thinning as removing the smaller diameter trees with variable density thinning, emphasizing retaining early seral species of pine and larch, and retaining the larger diameter trees. Pg 51 of the DEIS describe the variable density thinning. See also Response to Comment 3-5.

6. This project does not use a diameter cap however; thinning from below (see response to comment above) removes the smaller diameter trees and retains the larger diameter trees. Chapter 2 of the DEIS described thinning as removing the smaller diameter trees with variable density thinning, emphasizing retaining early seral species of pine and larch, and retaining the larger diameter trees.

7. The effects of thinning including tendencies to reduce and increase fire hazard and the components of fire hazard are discussed in the DEIS on pgs 111, 116, 122-133. The DEIS

acknowledges that open stands generally have a warmer, drier microenvironment that closed, denser stands (pgs 112, 122). See also Response to Comment 3-14.

8. Agree, the DEIS (pg 122) states that observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Effects of prescribed fire are discussed in Chapter 3 of the DEIS in the sections for Fire and Fuels (pgs 108-134).

9. The project is using variable spacing thinning. Chapter 2 of the DEIS, Management Requirements, Constraints, and Design Measures, (pgs 50-51) describes the variable density, including unthinned patches, that would be retained in both ponderosa pine forested sites and dry mixed conifer forested sites. Additional guidance is in the draft Silvicultural Prescription and Marking Guides.

10. Chapter 2 of the DEIS, Management Requirements, Constraints, and Design Measures, (pgs 50-51) describes the variable density thinning, including unthinned patches, that would be retained in both ponderosa pine forested sites and dry mixed conifer forested sites.

11. Chapter 2 of the DEIS, Management Requirements, Constraints, and Design Measures, (pgs 50-51) describes the variable density thinning, including unthinned patches, that would be retained in both ponderosa pine forested sites and dry mixed conifer forested sites. Guidance is in the draft Silvicultural Prescription and Marking Guides includes retention of under-represented conifer species when appropriate. No non-conifer species or shrubs are being treated with this project. Chapter 2 of the DEIS, Management Requirements, Constraints, and Design Measures, (pg 52) describes protection during prescribed burning.

12 - 14. These 3 points all address the variability in thinning, including skips and gaps, areas being open enough to stimulate understory development, and scale of patches. Chapter 2 of the DEIS, Management Requirements, Constraints, and Design Measures, (pgs 50-51) describes the variable density thinning, including unthinned patches, that would reflect the skips and gaps within units described in this comment. Pg 93 of the DEIS, describes understory development. Additional information is discussed in Chapter 3 of the DEIS in the sections for Terrestrial Wildlife (pgs 212-283), and Forest Vegetation (pgs 71-107).

15. Variable density thinning and unthinned patches would have varying degrees of capturing mortality. The DEIS address effects to snags and snag-dependent species in Chapter 3, pgs 216-235 and 249-262. The DEIS identifies Forest Plan standards in Chapter 3, pg 250.

16. Chapter 2 of the DEIS, Management Requirements, Constraints, and Design Measures, (pgs 50-52) describes snags and down wood retention.

17. Yard tops attached is described on pg 43 of the DEIS. Although it brings tops out of a harvest units, some amount of limbs are left on the forest floor.

18. Chapter 2 of the DEIS, Management Requirements, Constraints, and Design Measures, (pg 52) describes timing restrictions to avoid impacts to raptors.

3-10
Fire Regimes

The DEIS discloses fire regimes with the fire frequency and the percent of any fire that may be mixed severity of stand replacing (pg 113). Over half of the Mill Creek Subwatershed is characterized as having a 22 year mean fire interval with 24% of any one fire being mixed severity to stand replacing. The objectives and design of prescribed fire with this project are discussed in Chapter 2 (pgs 43-45, 50-65) and Chapter 3 (pgs 124-125) of the DEIS. Prescribed fire is proposed on 5,300 acres of the 14,950 acre project area.

3-11
Prescribed Fire- Spring/Fall Burning

The objectives of utilizing prescribed fire with this project are to reduce surface fuels, reduce litter depth, and increase canopy base height. Design measures for prescribed fire were developed to minimize adverse effects on other resources. These measures are disclosed in the DEIS in Chapter 2 (pgs 44-45, 50-65). The effects of prescribed fire on other resources is disclosed in Chapter 3 of the DEIS, including disclosures on invasive plants (pgs 300-303) and soil nutrients and productivity (pgs 137-144).

3-12
Snag Habitat

The DEIS addresses effects to snags on pgs 253 and 254. The DEIS identifies the Forest Plan Standards on pg 253. During harvest operations, it is expected that individual snags and pieces of downed wood would be lost through felling of snags that pose a hazard to workers and equipment. Snags felled to provide access to units, within treatment units, adjacent to landing or haul roads to address safety concerns would be left on site to provide downed wood. Snag concentrations would be avoided when possible during harvest operations. Downed wood could be directly affected by ground based (skidder/tractor) harvest operations. It is assumed that some level of direct impact would occur, as OSHA regulations requirements and the realities of ground based operations and activities would inevitably result in those impacts. The degree of the impact that these activities would have is expected to be low and negligible at the subwatershed scale. Project design criteria, such as retaining clumps of live trees around snags and locating landings and temporary roads where there are few or no snags, would help minimize losses and will provide areas for future snag recruitment. Forest Plan Standards for green tree replacements would be met following treatment. Sufficient snag replacement trees would be available to meet future needs in all treatment units. Prescribed underburning can alter or remove vertical and horizontal stand structure including snags and down wood. Snags can be both lost and recruited during prescribed burning. The level of loss and replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load. In the Crawford Project Area, effects to existing dead wood habitats would be expected to be minimal.

The Forest Plan establishes standards and guidelines for dead standing and downed wood for various levels of biological potential in each management area for Primary Cavity Excavators (PCEs). The plan was amended in 1995 by the Regional Forester's Eastside Forest Plan Amendment 2, also known as the "Eastside Screens." This amendment requires the retention of snags and green replacement trees greater than or equal to 21 inches diameter breast height (or the representative diameter in the overstory) at 100 percent potential population levels for PCEs or the best available science. The Forest Plan, as amended, requires that an average 2.39 snags per acre, 21 inches dbh and greater, be maintained within forested stands. It is assumed that these snag and down log levels will provide the minimum level required for 100% of potential population levels of primary cavity excavators (USDA 1990). The project is currently below Forest Plan standards for large diameter snags. Project designs stated for the action alternatives would minimize additional loss of these habitats during harvest and prescribed burning operations; additional losses would be considered incidental. Snags created during prescribed burning will offset snag losses. The Forest's firewood policy prohibits the cutting of firewood in DOG/ROG and riparian areas, so prescribed snag and downed wood levels should be maintained in these areas. In OFMS and OFSS outside the DOG/ROG network, snags along roads would continue to be removed as firewood, reducing habitat for pileated woodpeckers, pine martens, white-headed woodpeckers, three-toed woodpeckers and other species that use deadwood habitats. The low road density (1.8 miles/sq. mile) in the subwatershed will help balance loses from future firewood cutting.

3-13
DecAID

DecAID is discussed in Chapter 3, pg 251, identifying its use and some of the restrictions or limitations of its use in an analysis of snags and snag-dependent species. Snag densities and sizes were estimated using data obtained through stand exams, most similar neighbor analysis and field reconnaissance. This EIS uses the DecAID 2.0 analysis tool (Mellen et al. 2006) to evaluate alternative effects on dead wood habitats. DecAID is an internet-based computer program developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use snags and large, down logs. The tool synthesizes published literature, research data, wildlife databases, and expert judgment and experience. Woodpecker use data was utilized in this analysis. Existing snag data was also compared to wildlife data in DecAID 2.0 (Mellen 2006). DecAID is an internet-based computer program developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use dead wood habitats. The tool synthesizes published literature, research data, wildlife databases, and expert judgment and experience. DecAID provides both wildlife use and forest inventory data; this analysis will focus on the wildlife use data. DecAID is not intended to be prescriptive; i.e., it is not used to establish standards for snags or down logs. Information is used primarily as a comparison tool.

Data provided in DecAID allows the user to relate the abundance of deadwood habitat for both snags and logs to the frequency of occurrence of selected wildlife species that require deadwood habitat for some part of their life cycle. Tolerance levels (30%, 50%, & and 80%) are used to describe the percent of the population that utilizes a particular habitat characteristic (e.g. snag density, downed wood density, etc.). Essentially, the lower the tolerance level, the fewer individuals will likely use the area (landscape, watershed, etc.). For example, at the 30% tolerance level for any given species, it would be expected that 30% of a population would find suitable or usable habitat at the specified snag density. Consequently, 70% of a population would not find suitable habitat conditions at that snag density. It should not be assumed the highest tolerance level (80% +) is always the goal for management. In many instances, historic conditions, particularly in the dry forest types did not support the density of snags at the 80% level. In the analysis area, existing snag levels correlate to the lower tolerances levels for various PCE species, primarily at the 30 to 50% tolerance levels or lower. The 1927 local data (Matz 1927) suggest that historic conditions could only provide for dead wood conditions at these lower tolerance levels.

While DecAID provides data on wildlife use of snags and down wood, it does not measure the biological potential of wildlife populations. There is no direct relationship between tolerances, snag densities and snag sizes used in DecAID and snag densities and sizes that measure potential population levels (Mellen et al. 2006). Therefore, DecAID wildlife tolerance levels are only one component used to evaluate the effects of this project on dead wood habitats and associated species. This analysis also used species' ecology, project design features, Forest Plan Standards, local historic snag data and projected snag levels to analyze effects.

DecAID was not used to analyze the effects of treatment on downed wood in the analysis area for several reasons. DecAID provides estimates of percent cover of downed wood. Available data for the analysis area could be converted to percent cover; however, without the length of each piece of wood counted (data which was unavailable), this analysis would likely under-estimate percent cover. It is expected that current levels of downed wood provide habitat between the 30% and 50% tolerance level.

3-14
Fuels Management

The effects of thinning including tendencies to reduce and increase fire hazard and the components of fire hazard are discussed in the DEIS on pgs 111, 116, 122-133. The DEIS acknowledges that open stands generally have a warmer, drier microenvironment that closed, denser stands (pg 112, 122). We acknowledge that there is some conflicting scientific literature concerning fuels reduction. There are many sources to support fuels reduction to modify fire behavior. In The Effects of Thinning and Similar Stand Treatments on Fire Behavior (Graham et al. 1999), the authors reviewed numerous studies and concluded that the best general approach for lowering wildfire intensities, damage, and mortality was combining a mix of thinning (managing tree density by thinning from below and altering species composition), surface fuel treatment, and use of prescribed fire at a landscape scale.

In Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity (Graham et al. 2004), thinning is noted as an important element of a forest fuel reduction strategy. The report states that the most appropriate fuel treatment strategy is often thinning (removing ladder fuels and decreasing tree crown density) followed by prescribed fire, piling and burning of fuels, or other mechanical treatments that reduce surface fuel amounts. This approach reduces all three fuel layers (canopy, ladder, and surface), thereby reducing both the intensity and severity of potential wildfires.

The study, Final Report: Effect of Fuels Treatment on Wildfire Severity (Omi and Martinson 2002) investigated the severity of wildfires that burned into existing fuel treatments areas. Treatments included repeated use of prescribed fire, single prescribed fires, debris/slash removal, and mechanical thinning with and without slash removal. All of the reduction treatments had been conducted less than 10 years prior to being burned in wildfires. The authors concluded that treated stands burned less severely than untreated areas, and that it was important to treat the entire fuel profile, including thinning of the canopy. Crown density, which is reduced through thinning, significantly affected the stand damage rating in the study.

Thinning and prescribed fire can be useful tools to mitigate fire hazard in dry forests. In Basic Principles of Forest Fuel Reduction Treatment (Agee and Skinner 2005) the authors reviewed numerous studies, modeled effects of fire behavior, and evaluated the effects of fuel reduction projects on five empirical examples. The article "summarized a set of simple principles to address in fuel reduction treatments: reduction of surface fuels, increasing the height to live crowns, decreasing crown density, and retaining large trees of fire resistant species."

Cram et al. (2006) examined whether forest stands in New Mexico and Arizona treated recently using silvicultural practices would be less susceptible to stand-replacing crown fires, and more ecologically and functionally resilient compared to untreated stands following extreme wildland fire. Results indicated fire severity in pine-grassland forests was lowered when surface and aerial fuel loads were reduced. Specifically, as density (stems/ac) and basal area (ft2/ac) decreased and mean tree diameter (in) increased, fire severity and fire line intensity decreased. The more aggressive the treatment (i.e., where the canopy bulk density was reduced), the less susceptible forest stands were to crown fire. However, mechanical treatments where slash was scattered rendered stands susceptible to near stand-replacement type damage when wildfire occurred within 4 years of treatment. On their study sites, mechanical treatment followed by prescribed fire had the greatest impact toward mitigating fire severity (i.e., both aerial and surface fuels were reduced).

In support of thinning making fuel hazard worse, Modifying Wildfire Behavior-The Effectiveness of Fuel Treatments-The Status of Our Knowledge by Carey and Schumann (2003) of the organization The Forest Trust was cited. The review by Carey and Schumann listed literature that explored the reduction in fire behavior accomplished by prescribed burning alone, mechanical thinning, combined thinning and burning, and commercial timber harvest alone. The study reviewed several papers that supported the fuel reduction effectiveness of thinning, to remove trees from below and reduce crown density, reduce fuel ladders, and raise crown base height. Many of the papers reviewed as negative toward thinning were on studies that left thinning slash in place. There were also supporting papers that described wildfires that dropped from the crowns to the ground and causing less mortality in thinned stands than in unthinned areas. Carey and Schumann found few studies relating fire reduction strictly to commercial timber harvest. Most concerned the effects of treating vs. not treating created logging slash, with lower fire severity when slash is treated.

Another citation used in support of thinning making the fuel hazard worse was Hanson and Odion (2006). This study compared fire severity in thinned and unthinned stands. Although their results found higher fire severity in the thinned stands, they concluded that more study is needed to determine which factors explain the occurrence.

It is important to note that studies showing an increase in fire behavior after logging often do not include logging slash treatment. Studies show that to effectively reduce fire hazard the slash created by logging and precommercial thinning need to be treated. The fuels created by activities in this project are planned to be treated, therefore, the studies that incorporate slash treatment are more representative of the type of treatments in the proposed action.

3-15
Landscape Fire

Reducing fuels is one of the purposes of the project as listed in pg 7 of Chapter 1 in the DEIS. The units were identified to primarily address the Forest Composition and Density Reduction Need (Chapter 1 pg 7, Chapter 3 pg 118). Landscape fire is being used to reduce surface fuels on 5,300 acres within the project area. Recognition and discussion of treatments to reduce fuels and the effects of different treatments is discussed in Chapter 3 of the DEIS (pgs 110-133). Spotting is addressed in the Fire and Fuels section of Chapter 3 of the DEIS. See also response to comment 3-14 in regards to making fuel conditions worse and response to 3-2 for hazard reduction being for a short period of time. Chapter 3 of the DEIS discusses effects of other resources such as soil, water, and wildlife. Pgs 112-113 in Chapter 3 of the DEIS discuss the fire regime of the project area.

Comment # 4 – Asante Riverwind, Sierra Club	Response
Asante Riverwind **Eastern Oregon Forest Organizer** **Sierra Club - Juniper Group** **P.O. Box 963** **Sisters, Oregon 97759** **(541) 549-1782** **asante.riverwind@sierraclub.org** Comments on the Crawford Project **January 5, 2007** Gary Stan Benes, Forest Supervisor, Malheur National Forest, Ryan Falk, Planner, Prairie City Ranger District, The Juniper Group of the Sierra Club and the League Of Wilderness Defenders-Blue Mountains Biodiversity Project have reviewed the Draft EIS for the Crawford Project dated Nov., 2006. The Sierra Club represents over 23,000 members throughout Oregon, including the Juniper Group's 1,000-plus members throughout central and eastern Oregon. LOWD-Blue Mountains Biodiversity Project has many members and volunteers throughout the Northwest. Sierra Club members feel strongly about nature, wilderness, wildlife and the environment. Our members regularly enjoy hiking, camping, birding and wildlife watching within the national forests of central and eastern Oregon, including the project area within the Malheur National Forest. Members and volunteers of the LOWD-Blue Mountains Biodiversity Project regularly use the Malheur National Forest, including the project area, for hiking, ecological study, watching wildlife, viewing forest native botanical diversity, and avian species study. The Crawford Project Area shares both similarities as well as geographic proximity with the nearby Dads Creek Area. Both were extensively railroad logged early in the 1900s, altering much of the area's forest by the removal of many of their old-growth trees. Decades of subsequent road building and additional logging have degraded forest habitat throughout, leaving a mix of dense young forests, scattered small and isolated patches of mature and old trees, open areas, and a network of poorly located and maintained roads. Many native forest wildlife species populations are deficient from their historical numbers and territories. Similar to the planned Dads Creek Restoration Project, the proposed Crawford Project could have potential to restore the area's forests, enhancing ecological integrity and moving the area more towards its natural range of variability. However, if project design is based more upon timber volume goals, as evidenced in alternative 2, implementation could result in degradation to the wildlife habitat and ecological integrity of the project area. The mere inclusion of an ecologically and scientifically more sound recovery and wildlife alternative (4) means little if the agency is in reality already predisposed towards choosing alternative 2 due to its higher timber volume, utilizing alternative 4 only as a ruse to assist legally gliding alternative 2 through the NEPA legal process, with no sincere intent to realistically choose this alternative. To some extent alternative 3 appears to be an attempt to bridge the chasm between alternatives 2 and 4, and while	

less damaging that alternative 3 in environmental impacts, it is not without unwaryranted harms of its own. Hopefully the final EIS and record of decision will correct erroneous assessments and provide the flexibility to allow reasonable "common sense" changes, leading to a working combination of appropriate components of all four alternatives as the final decision on this project. It is clear from reviewing the EIS that alternatives 1, 2, and portions of 3 – if selected as presented - would irretrievably harm the interests of both Sierra Club and LOWD-BMBP members, volunteers and supporters. It is also evident to us that the selection of alternative 4 as presented is highly unlikely. As we are engaged in the process of creating a restoration project addressing similar ecological needs in the Dads Creek Area, the more readily the Crawford Project's selected alternative embodies the concepts and methods being developed in the Dads Creek collaborative project, the more potential it will meet conservation goals and objectives towards recovering ecological integrity across this greater forest area.

As the Crawford project is not a new proposal, but instead is an EIS rooted in the previous Crawford EA proposal that was appealed by the League Of Wilderness Defenders – Blue Mountains Biodiversity Project in June, 2002, we herein incorporate by reference the entirety of LOWD-BMBP's comments, appeal, and accompanying photo, survey, and other exhibits submitted previously on the Crawford Vegetative Management Environmental Assessment, Decision Notice, and FONSI. Jointly our two organizations have the following comments, concerns, and suggestions regarding the proposed Crawford Project Draft EIS and timber sale:

Changes Necessary to Protect Ecological Integrity, Wildlife, Aquatic, and Botanical Species, and Accomplish Restoration and Fire Risk Reduction Goals

Reviewing LOWD-BMBP's comments, appeal, and survey documentation on the Crawford Project, the following changes are essential to accomplishing project goals. Some of these points were raised previously during appeal negotiations on Crawford, some are similar to those negotiated in the Canyon Creek project, many are associated with current conservation concerns in the Dads Creek project:

1. Eliminate from the purpose and need the "need" to provide timber products (see below for elaboration on NEPA illegalities of this contrived and unreasonable "need." If timber products are to be provided through this project, they result from ecologically-sound, non-timber driven, restoration methods. **4-1**
2. Develop Alternative 4 as a viable alternative fully capable of achieving all purpose and need goals, with funding feasibility identified and provided for. **4-2**
3. Modify Alternatives 2 and 3 to better accomplish conservation objectives in the area:
   - In addition to the units dropped from the original Crawford proposal (units 34, 44, 46, 21, 81, 200, etc. - assuming unit numbers remain the same – if not please disclose unit number changes and correlate appropriately), drop or change to pct/Alternative 4 restoration thinning the following units:
     - For old-growth and wildlife: 40, 41, 78, 136, 142, 144;
     - For road construction and steep slopes issues: 32, 38, 49, 58, west half 68, 82, 100, 102, 134, 135, 136, 142;
     - For soil quality issues: 126, 128, 132, 133, 138, 142, 146, 148, 149, 150
4. Retain all trees of all species with old-growth characteristics regardless of diameter size. **4-3**

5. Use variable thinning to match site-specific ecosystem HRV conditions.	
6. Employ diameter limits varying from 12” to 16” dbh as appropriate, above which trees may not be cut. If some larger diameter trees must be felled – instead girdle these and leave standing as snag habitat for wildlife.	
7. Thin to retain/restore the areas natural mix of tree clumps interspersed with small openings where this occurred historically.	
8. No new road construction (except that needed to relocate roads out of RHCAs), or temporary road construction.	
9. Soils must not be degraded beyond LRMP standards. Where soil quality already fails to meet such standards plans must be incorporated to recover soil quality.	**4-4**
10. Satisfactory and marginal cover for elk must not be reduced. As current conditions fail to meet LRMP standards, plans must be incorporated to comply with standards in the project area.	**4-5** **4-6**
11. Water quality for 303(d) listed streams must be further impaired. Plans must be incorporated to bring these waterways into compliance with Oregon State and federal water system goals – resulting in the eventual de-listing of these water-systems.	**4-7**
12. Modify the project to protect and recover habitat for all listed species, species of concern, and management indicator species that have potential to utilize this area. Develop recovery plans for these species and their associated habitat throughout the project area.	**4-8**
13. Avoid burning during early spring through nesting and fledging periods for avian species. Protect habitat resources, including large downed logs, middens, burrows, dens, nests and other wildlife dwellings during burning as feasible.	**4-9** **4-10**
14. Avoid soil disturbance and the spread and/or introduction of exotic invasive plants.	
15. Decommissioned roads must effectively prevent use of these former roadways by OHVs, including snowmobiles.	**4-11** **4-12**
16. Augment fire risk reduction by reducing livestock grazing across the area, prohibiting livestock grazing in or near riparian areas, reducing or eliminating water diversions – returning water to area streams, and by maintaining adequate shading to area soils to enhance soil water retention, avoid increased peak flows and excessive solar exposure and consequent soil moisture loss.	**4-13**
Incorporating the above changes will enhance the potential of this proposed project to achieve the restoration and fire risk reduction goals of the EIS purpose and need. This project has the potential to help pioneer restoration methods. Its success – or failure – will have significant influence on collaborative restoration projects being considered across the region.	
Walking the Talk of Restoration & Collaboration	
• The Crawford Project occurs during a transitional period in the region, when the pattern of attempting to disguise timber sales as “forest health” recovery has been repeatedly exposed through appeals, litigation, and public awareness as the initial environmentally bankrupt “timber wolves in ecological sheep’s clothing” ruse it first was. After nearly two decades of incessant timber sales and consequent litigation, all parties are beginning to realize this pattern leads only to a frustrating, resource-wasting stagnation – at the expense of both the restoration needs of the forest and the ecological and economic well-being of the region’s forest area communities. Recent successful negotiations resolving issues on contentious projects across the region, and	**4-14**

newly emerging collaborative projects bringing diverse "sides" together working to develop needed restoration projects, herald the cooperative potentials inherent in the path ahead towards ecological recovery and community sustainability. However, as this is still just the beginning of this transition process, it is readily apparent in reviewing the proposed Crawford Project, that it yet repeats many of the same egregious errors of preceding Malheur NF timber sale projects. With some notable exceptions Crawford appears to be based more upon the same erroneous and ecologically harmful logging-driven formulas, than the environmental recovery process.

- If the agency is truly sincere about helping to usher in "a new era of collaboration between conservationists, area citizens, and the USFS in developing NEPA projects," it is essential that the agency work towards exemplary projects that are not "timber sales in disguise," but that enhance the agency's integrity by actually becoming the ecologically sound projects the agency currently alludes them to be. The decades long wake of timber sale destruction wreaked by the agency upon public lands forests has resulted in the need for restoration – not just of the damaged forest ecosystems, but of public trust and the agency's tattered and tarnished integrity as well. In the absence of such common sense honesty, and ecologically sound proposals, it is difficult to become involved in meaningful attempts to create collaborative restoration projects – such as Dads Creek, while nearby the agency is busily moving ahead with "alternative 2" style logging fiascos in the Crawford area. In other words, the Malheur needs to begin "walking its talk" – not just in Dads Creek, but in all its current and future projects. As the agency increases its logging proposals across the area (including Thorn, Chrome, Black Rock Fire, and others) to the detriment of the environment, it continues to undermine the possibility of collaboration – and the potential to reclaim public trust and integrity. Unless this change is met, as resources and time are limited, it is likely the resources involved in working to prevent harms at Crawford and elsewhere will preclude the Dads project from reaching fruition. Crawford's cumulative impacts to the area's forest alone are sufficiently significant to necessitate halting the nearby Dads project, due to the excessive loss of cover across the greater area. Within forest ecosystems, nothing occurs in isolation. Collaboration, such as Dads Creek, likewise cannot occur in isolation. Instead, it is affected by whether trees in surrounding forests are falling needlessly, degrading the environment – akin to attempting a peace accord while bombs are still falling. Together we must begin to explore new areas of common ground, based upon ecologically achievable, scientifically and legally sound, objectives which can modify and guide Crawford and other area projects, including Thorn and Chrome, etc. If the agency is truly interested in bringing in a new era of cooperation, the time to "walk the talk" of these changes is Now.
- The recent negotiations on the Canyon Creek project, and ongoing discussions during the Malheur collaborative process, have begun to clarify issues and the potential inherent in a more cooperative and inclusive NEPA process. However, such cooperation must be incorporated into project analysis – resulting in meaningful alternatives that are actually likely to be chosen. Crawford's current proposed alternative 2 instead only jeopardizes the project's chances of ever being implemented, as it jeopardizes regional collaborative possibilities. Choosing it as is, without significant modifications, will only head the agency once again into the gauntlet of appeals and/or litigation, as has occurred too often in the recent past.

- Woven into the strange mix of Crawford's alternatives - excluding the ecologically unsound logging proposed in Alt. 2 and some of 3 - are objectives, concerns and one alternative (4) that evidence a latent yet meaningful possibility towards collaboration and at least some common ground concerning conservation issues. As there exists no imminent "emergency" to hastily implement this project, especially since it was withdrawn under appeal once already, Crawford presents us a new opportunity to exercise and further develop common conservation ground – producing an ecologically better restoration project in the end. As wise ancient proverbs advise, inherent within crisis and controversy is the opportunity for cooperation, awareness, and learned wisdoms.
- Unlike past projects, Crawford is not yet "water under the bridge" (sawdust in the winds/logs through the mills – or verdicts in the courts) – but is an ongoing NEPA process subject to public participation. It is required to be in compliance with ecologically sound scientific research, regional conservation goals and objectives, and federal environmental policy laws. We herein reiterate our offer to work with the agency ecologically and ethically to co-create an ecologically beneficial and legally sound project capable of achieving conservation goals in the Crawford area.
- The many conservation and legal issues we have with the proposed project follow.

- **The Crawford Project**

- The Crawford Project area comprises about 14,950 acres within the Malheur National Forest boundary in the Mill Creek subwatershed, comprising "83% of the subwatershed." Three major drainages are located within the project area, including the Middle Fork John Day River, Crawford Creek, and Mill Creek. Area waterways provide habitat for summer steelhead, Chinook salmon, and redband trout, and contain historic habitat for bull trout. All major waterways above, as well as Clear Creek, are on the Oregon State 303(d) list as water quality impaired due to high summer temperatures.

The proposed action alternative 2 involves:

- 2,192 acres commercial thinning (not variable)
  - including 119 acres of "shelterwood harvest"
  - 70 acres in big game winter range (currently satisfactory cover exists in only 2.7% of the Mill Creek subwatershed – already below the LRMP standard of 12%. The proposed thinning would reduce this even further below this standard to only 2.3%, and marginal cover would be reduced from 47.1% to 42%, instead of maintaining and endeavoring to increase both satisfactory and marginal cover to meet LRMP standards).
- 6.8 mmbf timber volume removed
- 8.6 miles of temporary road construction
- 5.6 miles of haul routes in RHCAs
- 1.7 miles of closed roads reopened
- 10.9 miles of road reconstruction
- 35.2 miles of road maintenance
- 1.8 miles of "open road" density per mile
- 4.03 miles of system road density per mile (approx. & undisclosed by the EIS)
- 935 acres non-commercial thinning
- 5,300 acres prescribed burning over 5 years

- 2 forest plan amendments – the first to permit satisfactory big game cover to fall below forest plan standards, the second to change dedicated old-growth areas.
- There has been extensive past logging throughout the area subwatershed.

ESA, regionally sensitive listed species, and management species of concern with potential habitat within the project area include: **4-15**

- Northern Bald Eagle, American Peregrine Falcon, Upland Sandpiper, Pygmy Rabbit, Gray Flycatcher, Gray Wolf, California Wolverine, Canada Lynx, Western Sage Grouse, Bobolink, Tricolored Blackbird, Bufflehead, Pacific Fisher, Summer Steelhead, Chinook Salmon, Redband Trout, Bull Trout
- Additional species of concern that may occur in the project area include numerous neotropical migrant birds; Goshawk; Golden Eagle; Pygmy Nuthatch; Brewer's Sparrow, Pygmy, Flammulated, and Great Gray Owls; Townsends Big-eared Bat and other undisclosed bats; White-headed, Black-backed, Three-toed, Hairy, and Pileated Woodpeckers; Williamson's and Red-naped Sapsuckers; Flying Squirrels, American Marten; several rare forest plants, and potentially rare lepidoptera species, among undisclosed others, etc. **4-16**

The EIS for this proposed project has identified several significant issues. Among these are: project size and scope, impacts to ESA and state listed species and other species of concern, significant cumulative impacts across many resource areas, violations of LRMP standards for big game cover and soil quality, the need for two Forest Plan amendments, violations of state and federal water quality standards, and the inclusion of critically important subwatersheds. **4-17** This litany of significant concerns and impacts warrants substantial care and restraint in developing and selecting action alternatives for this project. While there have been substantial alternative design changes between the original Crawford EA and this EIS, ecologically and legally problematic errors remain, including undisclosed and inaccurately assessed impacts. These errors violate NEPA's requirements for scientific accuracy and high quality information, preventing the decision-maker from reaching a legal decision for this project. While the EIS does contain a plethora of information about many aspects of the project area and alternative impacts, overall its serious omissions; unsubstantiated assumptions; deficient assessment of impacts to wildlife, aquatic species, soils, forest ecological integrity, and water quality; selective science disclosures; and inaccurate information violate the requirements of the NEPA, and the proposed logging alternatives if selected and implemented as currently designed would violate the NFMA, CWA, ESA, and the APA – in whole or part.

Failure of the Purpose and Need to Meet the Requirements of the NEPA **4-18**

The Forest Service's inclusion of a "Timber Production Need" as a foundational goal of this EIS project analysis violates the NEPA on several points:

1. NEPA prohibits predisposing project analysis towards the selection of one action alternative and/or method over others. Including timber production as a need undermines the selection of alternative 1 or 4 entirely, and favors the selection of the alternative with the highest board foot volume over those of lesser volume. This "need" illegally predisposes the decision maker towards the selection of harmful logging alternatives over alternatives that are clearly more ecologically and legally appropriate.

2. Timber production is only one component of economic viability in the region. Over the past decade timber has diminished in its importance to the economic well-being of communities across the region. Recreation, dependent upon ecologically intact and recovering forest ecosystems, has become a significant growing part of area communities economic viability, and is predicted to become even more so. Biasing the analysis towards the selection of a logging alternative over other ecologically and economically viable alternatives violates the NEPA.
3. Restoration absent commercial timber volume, or with reduced volume, still provides significant benefits to the area communities, creating income earning employment and economic opportunities in the area to many associated businesses and individuals. The "need" as presented fails to objectively and reasonably disclose and assess these facts.
4. Commercial logging is the major cause of the current need to restore the areas forests. Including additional timber harvest as a predetermined "need" is in violation to the requirements of the NEPA and in contravention to the ecologically reasonable needs and goals listed for this proposed project.

The purpose and need as presented must be corrected in a new supplemental EIS, and the analysis in the EIS corrected accordingly.

The purpose and need is in contravention with itself, including mutually excludable goals, making the accomplishment of these unlikely and predisposing the project towards the likelihood of inflicting significant additional adverse impacts upon the ecosystems and native species of this project area. **4-19**

The project goals are illusory and the analysis in the EIS is unsound. The "forest health" justification for this project is inherently flawed due to the belief that logging and burning an already over-logged landscape that is recovering from decades of poor management abuses can correct past bad management practices, including fire suppression. The underlying assumption that a forest is generally healthier if properly functioning parts of the forest are removed is similarly unsupported by fact. **4-20**

The degradation of forest habitat and watersheds has caused the precipitous decline of many species dependent on large areas of interior old-growth forest habitat and the healthy watersheds they provide such as the Northern Goshawk, American marten, Pacific fisher (according to historic trapping records for this area this species was once found here), salmon, steelhead, bull trout, and numerous vascular and non-vascular plants. Species that also require large areas of intact, undisturbed forest habitat – including Lynx, Wolf, and Wolverine – are also at risk.

Numerous other wildlife species that require LOS forest with canopy-closure are also at risk and experiencing downward population trends, including woodpeckers and other cavity nesters and neotropical migrant and native birds, as well as flying squirrels, bats, and other species. These species continue to be extirpated from essential habitat and pushed closer towards extinction by additional cutting and fragmentation of mature and old-growth forest.

Since the Malheur National Forest has done insufficient surveys and monitoring of **4-21**
sensitive and rare species on the forest, there are almost no credible ground-truthed recent studies on which the USFS or the public can rely for decision-making about resource use and allocation. The wildlife assessment conclusions, and project alternative design, rely upon only minimum habitat needs, failing to disclose scientific research to the public and decision-maker that recommends managing for optimum

levels of habitat needs for listed and species of concern – at least until these species begin to evidence a trend towards recovery. The EIS fails to inform specific information on what constitutes optimum habitat, assess the differences in impacts to affected species resulting from managing for minimum and optimum habitat levels, or to disclose any information indicating the current population trends for species of concern in the area. These omissions, errors, and deficiencies violate the NEPA, and if implemented the project will violate the NFMA, CWA, and the ESA. Additionally, without disclosing any surveys or survey methodology for species of concern the wildlife report arbitrarily and capriciously dismisses the likelihood that the area may serve as suitable and/or essential habitat for a number of wildlife species - including dispersal, travel, foraging, nesting, refuge, and denning habitat. This error-ridden capricious terrestrial report, and the proposed action alternatives and "analysis" based upon its inaccuracies and failure to conduct meaningful surveys violates NEPA's most basic requirements for site-specific professional analysis and expert accuracy. The EIS is once again indicative of a continuing legally flawed propensity of Forest Service personnel to spend far too much time in their offices as appendages to their computers and far too little time actually within the forests they propose to manage. As had been repeatedly told to the agency before, in previous comments by our organizations as well as by federal court rulings, the agency must first conduct site-specific surveys for all ESA and state listed species, management indicator species, and species of concern within proposed project areas to comply with the NEPA and ensure that their proposed projects will not extirpate nor adversely impact these and other wildlife species. Research has shown that the dictates of survival force wildlife species to adapt to diverse localized variations in habitat, and utilize a range of habitat types beyond documented "preferred" habitat within over-logged and poorly managed forests such as the stands within the proposed project area. To conduct the meaningful and accurate analysis required by the NEPA for this project, it is essential that agency wildlife biologists remove their mesmerized eyes from the computer screens and actually spend significant periods of time familiarizing themselves with the wildlife species inhabiting the proposed project area by conducting surveys and disclosing the survey results and methodology within their biological evaluations and analysis. As such, one of the requirements to conducting a legally compliant EIS is the necessity of attaining this missing site-specific survey information. Proposing yet more logging impacts in the absence of this necessary information (further exacerbated by a harmful forest plan amendment that weakens wildlife cover standards), will only result in the violations of existing federal environmental policy laws. The EIS, Terrestrial Report (TR), and BE fail the legal requirements of the NEPA. As such a legally and scientifically credible NEPA process must be initiated and the EIS, TR, and BE must be redone. While the agency does not seem to dispute that the impacts of logging have been significant, the MNF has failed to adequately quantify and qualify the impacts of the current proposal to log the critical threads of mature and old-growth forest habitat connecting the planning area, adjacent inventoried roadless areas, uninventoried roadless areas, and LOS areas. The EIS insufficiently identifies the impacts of the project and does not justify the proposed logging. That the planning area is experiencing the effects of past management and logging-caused degradation neither justifies commercial logging elimination of this area's vital habitat components, nor	**4-22**

negates its critical importance for wildlife. Given both the significant impacts of this project and the lack of evidence supporting the purportedly minimal effects from the Crawford Project, the proposal to select logging action alternatives and implement this project is unfounded. A decision to log this area based upon such flawed "analysis" would be arbitrary and capricious and in violation of the Administrative Procedures Act. The Crawford Project as proposed would also violate the Clean Water Act, the Endangered Species Act, the National Environmental Policy Act, the National Forest Management Act, and the amended Malheur National Forest Land and Resource Management Plan (MNF LRMP).	**4-23**
The Crawford Project Does Not Meet the Stated Purpose and Need	
The EIS states that the purpose of the Crawford Project is to improve the health and vigor of the areas forests and begin to return these towards historical LOS compositions and ecological conditions, while reducing the potential for future severe fires. While these purported purpose and need goals sound laudable, the proposed logging alternatives are in contravention to attaining these goals and are unsupported by credible conservation biology scientific research, in violation of the NEPA. As with all NEPA projects, analysis for the Crawford Project is not exempt from federal legal requirements, but must comply with all applicable environmental policy laws. As demonstrated *infra*, the project's EIS "analysis" fails to comply with the most basic tents of the NEPA and applicable laws and must be corrected before this flawed project may go forward.	**4-24**
The Crawford Project will not achieve the purpose and need goals nor desired future conditions. As stated previously, the majority of the purpose and need of the proposed sale is to rectify forest health concerns within the subwatershed. Abundant credible scientific research has clearly proven that logging vast amounts of forest does nothing to contribute to species and structural diversity that the Forest Service is seeking to obtain. Given the significantly degraded condition of the subwatershed due to logging, roading, and livestock grazing, the proposed timber sale units in this area's forested stands provide some of the area's *only* viable wildlife habitat.	
The USFS also claims that this project will reduce the risk of severe fire. Despite a reduction in small diameter trees and a program of prescriptive burning, at least some slash from timber extraction will remain a fire risk on the project site. The EIS fails to accurately disclose how many tons of ground fuels will be left on site. Ground fuels and slash contribute significantly to fire risk. Logging itself is a documented fire risk. USFS has failed to show that fire risk will actually be decreased after the project is implemented. *See generally, Modifying Wildfire Behavior – The Effectiveness of Fuel Treatments (Forest Trust, 2003).* Until the Forest Service accurately discloses and analyzes the effect of logging on hazardous fuels creation and/or reduction, the MNF has failed to demonstrate that the project alternatives are capable of meeting the purpose and need claimed by the agency.	**4-25**
When developing the EIS, the agency failed to devise alternatives that are capable of meeting the purpose and need's LOS and HRV goals - directing the project's focus towards rehabilitating the forest's ecosystems. Sustainability and HRV rehabilitation must go far beyond the proposed folly of reopening closed roads, constructing so-called "temporary" roads without effective plans to obliterate and restore these roadbeds, creating additional skid trails, and proposing unsubstantiated	**4-26**

post-project mitigation that may never actually occur for damage which may result from the project. Much of the forest has been intensively and poorly over-managed in the past, with a primary focus of this management being timber commodity extraction. Many of these areas need to have systematic and intensive rehabilitative activities to ensure the forest ecosystem recovers from past management practices. There is a strong need to prevent further irreparable harms to the area's ecosystems by avoiding commercial logging and eliminating all new, reconstructive, and temporary road **4-27**
building, as well as additional skid trail impacts, from the project. Therefore, a central purpose of this project should be to rehabilitate the areas in which the Forest Service had previously conducted logging operations – without compounding past ecological problems with the harmful impacts of yet more logging. Many such places exist within the project area which sorely need restoration from past management abuse. This would be consistent with the Forest Service's mandate under the National Forest Management Act, the Multiple Use, Sustained Yield Act, and other laws. This approach would also be consistent with credible conservation biology science.

Apparently the Forest Service may be attempting to achieve a range of conditions that may not comport with the historical conditions of the planning area. Cyclic fluctuations in the distribution and range of seral species, including firs; and fluctuating patterns in insect populations and impacts, forest diseases, and fire intervals and patterns are natural essential components inherent in forest ecosystems, especially in drier forests in eastern Oregon. The USFS must develop long-term management plans that provide for these forces to play their historical roles in the region's ever changing and evolving forests. To restore forest health, ecological **4-28**
functioning, sustainability, fire resiliency and patterns, and wildlife and aquatic species viability and population levels, management provisions must include allowing some areas of the planning area to undergo the cyclic fluctuations and impacts which naturally change and sculpt the forests over time. As so much of the district's forests suffer from decades of excessive logging, and in particular the Crawford area suffers from these impacts wherein it is deficient in necessary wildlife cover, the agency should refrain from commercially logging these areas. These habitats are important to a host of forest-dependent species, and the area can serve as a locus point from which many species may find suitable habitat and forage, and replenish depleted population levels (including neotropical migrant birds as well as cavity excavators). In so doing, the numerous species will be able to help return and help bring the area's ecological functioning back within the check and balance systems of nature. We do recognize that some areas of the planning area may be overstocked as a result of fire suppers- **4-29**
sion, and may benefit from carefully tailored thinning of trees less than 12" dbh, as well as seasonally appropriate (no early/mid spring or late fall/winter burning) carefully reintroduced periodic fires.

As the agency has a poor track record of actually enhancing the forest's ecological functioning anywhere through any of its extensive logging projects, we request that the USFS refrain from tampering with the existing condition of the planning area absent scientific findings that timber harvest is *required* to aid the development of **4-30**
forest habitat. It is clear that a Supplemental EIS process for all the interrelated Crawford area projects must be conducted and present alternatives capable of actually being selected, as well as capable of achieving sound ecological goals.

LRMP Satisfactory Cover Standards, Wildlife Viability & Forest Cover

Under the EIS two action alternatives would remove canopy and hiding cover. Two action alternatives, including the FS "proposed alternative" would reduce satisfactory and marginal cover for elk in the area, decreasing habitat quality in violation of Forest Plan standards. This area is already in violation of Forest Plan standards and the proposed logging would require the FS to issue a Forest Plan amendment to lower those standards yet further. It is unclear how the Forest Service can propose to remove more cover in an area that is currently violating LRMP standards for cover, and thus in violation of NFMA' s requirement that projects meet Forest Plan standards. 16 U.S.C. § 1604(i); 36 C.F.R. § 219.10(e). The agency has decided to remedy to this situation—not by conducting restoration work aimed at increasing forest cover, nor by effectively removing all excessive roads which riddle the area and expose wildlife to additional risks of harm (though some are indeed proposed for removal – and we support this direction), or by prohibiting timber sales within the area until it can meet or exceed minimum forest plan standards—instead the agency proposes to write away their standards, which could otherwise impede plans to log this area, by issuing an amendment excepting the project area from compliance with these standards. Yet, of what use are such standards if the agency is not held to their compliance? The standards, such as they are, were derived based upon the minimum cover level required by elk and deer, among other wildlife species, to ensure minimal viability. For the agency to propose to wipe this requirement away with the stroke of a forest plan amendment is both illegal and unconscionable. This proposal underscores an apparent archaic "log-at-all-costs" attitude of the agency that has resulted in downward population trends for numerous wildlife species, and degraded countless thousands of acres of forest ecosystems across the national forest. This irresponsible action raises a series of as yet unanswered questions: 1. Satisfactory and marginal standards are based in part on stand densities and cover. The agency admits that the proposed logging would result in a further decrease of the area's satisfactory and marginal cover. Logging would remove some of the trees providing this cover, tractor over vegetation, introduce new open skid trails as well as utilize a network of logging access roads, and burning would further reduce ground cover in the short-term as well. Yet despite these disclosures, the agency proposes to remove these standards so logging may occur. This calls into question how standards are derived, their veracity and accuracy, and raises the question of what an independent analysis of the standards and site-specific conditions would determine.	**4-31**
2. The project area already violates the LRMP, in large part as a result of the cumulative impacts of extensive past timber harvest and associated roads. Since this project would make a bad situation worse by reducing cover, the FS *must* address the issue by closing additional roads, prohibiting new or temporary roads, and maintaining more canopy and cover. We urge the FS to responsibly take these necessary measures. An SEIS is needed to discuss this significant issue. Cover can and should be retained. Roads can and should be removed. Every road that is used to implement this project is "connected" to the LRMP violation. As such, this proposed project fails the requirements of the NEPA, and implementation of alternative 2 would violate the NFMA. 3. The EIS fails to disclose when the most recent update to the standards occurred,	**4-32**

and upon what research these standards are based. Such information is crucial to understanding both short and long-term potential impacts of weakening these standards by amending them, as well as logging impacts to the project area.	
4. The EIS fails to disclose if any new scientific research has come to light since the incorporation of these standards into the LRMP, and/or if this new research has been incorporated into these standards either as a forest plan amendment or by additional analysis. [If not, how is it that an amendment to exempt a logging project from Forest Plan standard compliance takes priority over updating standards for scientific effectiveness and accuracy?]	**4-33**
5. The EIS fails to disclose if any other wildlife species are also addressed by FP standards, and if there may be any adverse impacts to these species (mule deer, wild turkeys, quail, grouse, terrestrial mammals, native and neotropical birds, etc.) from the proposed Forest Plan amendment for this timber sale project. The EIS also fails to disclose which - if any - wildlife species are not addressed adequately by these standards, and if any plans exist to amend the forest plan to make provisions for the viability needs of these other wildlife species, and if not, why not?	**4-34**
Finally, the USFS continues to fail to address the cumulative impacts to deer and elk as a result of several timber projects adjacent to the planning area (recent and past sales-with their still overly abundant logging-cuts riddling the area). The Malheur National Forest repeatedly offers timber projects that remove deer and elk habitat, but fails to adequately address cumulative habitat loss and how it will impact deer, elk, and other wildlife species dependent upon forest vegetative cover and harmed by increased road densities. Until the USFS conducts this analysis, it is in violation of NEPA's requirement that the agency accurately disclose and assess the cumulative impacts of its proposed, ongoing, and past actions. 40 C.F.R. § 1508.7. Amending the LRMP to reduce satisfactory cover standards for this area would violate wildlife management goals, credible science, and federal legal requirements, including the National Forest Management Act.	**4-35**
Additional Roads Issues The EIS fails to fully and accurately disclose the current road density within and near the planning area or sufficiently address bringing into compliance the total current road density of the project area with LRMP standards. Closed roads, skid trails, snowmobile and OHV routes all function ecologically as active roads – fragmenting habitat, adding sediment to water systems, and disturbing ecological integrity and numerous wildlife species. The EIS also fails to accurately disclose the road density post-project, including all roads as well as closed roads, skid trails and other areas that effectively function as roads. Ecologically, in many ways logging skid trails, including past skid trails that currently fragment the area's forests, function the same as inventoried roads, and must be disclosed and counted as such. The EIS also fails to assess the potential and existing use of skid trails by off road vehicles in its analysis of the impacts to wildlife resulting from the use of the network of road systems and trails. Such information is imperative to an accurate assessment of the cumulative impacts of this project upon wildlife habitat and aquatic systems. These disclosures and assessment are required as part of the NEPA analysis before the agency can reach a legally tenable decision on this project. The EIS also fails to disclose the Forest Service's success rate in closing roads, or	**4-36**

any reports or studies that have been conducted to provide this information. The EIS does not disclose the success rate of proposed methods to close new or "temporary" roads, or if the effectiveness of these types of road closures have been monitored elsewhere (rock placements, berms and earthen barriers, water bars, subsoiling, scattered woody debris, gates with locks, etc.) The EIS does not adequately address impacts from this proposed project to uninventoried or inventoried roadless areas adjacent to the project area, or cumulative impacts to these areas by this and other known and foreseeable management projects. Many of these concerns remain unaddressed, either wholly or in part. A supplemental EIS process must analyze and disclose this information adequately and accurately.

Peak Flows Will Increase because of the Proposed Project **4-37**

The EIS fails to adequately address peak flow increases in the project area. This information should have been disclosed and addressed in the EIS. A SEIS must be conducted for this proposed project that sufficiently addresses this significant issue.

Failure to adequately address likely adverse impacts to numerous wildlife species:

Lynx **4-38**

Among our many concerns is that of this proposed project's effect on lynx. Based on data from the U.S. Fish and Wildlife Service's (USFWS) Portland office, there have been several sightings of lynx in the Blue Mountains region. Historic evidence of lynx in these areas include positive occurrence records, lynx bounty claims, and Forest Service Wildlife Statistical Reports. Positive reports of lynx occur as far south as Modoc County, California. A few years ago, the Forest Service Prairie City RD wildlife biologist stated that he grew up in the area, had seen lynx in the area forests frequently during his younger years, and felt that while their numbers had diminished they were still in the area. The BE for this project notes that lynx may be found within the Malheur NF. As such it is reasonable to assume that lynx could occasionally occur in the project area and this area is likely important to lynx recovery. It is plausible that lynx are rare in the project area (and in Oregon on the whole) due to bounties, aerial poisonings, and other efforts to eliminate them (and other predators) that were performed systematically for decades, and not due to a lack of habitat, as is the current situation with wolves as well.

The USFS should have addressed how further fragmentation of the planning area will affect lynx. It is clear that lynx habitat is very fragmented, and that large blocks of intact forest are required to maintain viable populations of the species. Without these large blocks, lynx may need larger ranges to survive. The proposed logging in the planning area will adversely affect whatever lynx recovery is occurring, as lynx may use portions of this area for both nocturnal foraging as well as migratory and dispersal routes and refuge. Continuing to squeeze lynx out of their habitat range by intensively managing the land runs afoul of NFMA's requirement that the agency maintain viable populations of wildlife that are well distributed across the landscape. 36 C.F.R. § 219.19. The USFS has an obligation to accurately assess the impacts of its project on lynx.

Next, it is clear that data is lacking on the food habits of lynx in Oregon's forests, which represents a critical research need. Ruggiero, 1999b; Aubry, 1999. It is well accepted that lynx are dependant on snowshoe hares as a prey base, but in the southern

portions of lynx range squirrels, other rabbits, small rodents, birds and other wildlife may always be an important part of lynx diet. It is critical to understanding how this project may impact lynx to examine how it will impact lynx prey. Snowshoe hares, squirrels, and other mammals have different habitat needs, but many of these species could be negatively impacted by the fragmentation, logging, road building, and other actions associated with this project. Most of these prey species require adequate cover (USFWS, 1999), especially conifer cover in winter (GTR-RM-254), and foliage that is accessible during winter snowpack conditions. Hares, squirrels, and forest-dependent species are typically associated with dense forest cover, including shrubs and “dog hair” thickets of small trees. McKelevey, 1999a. Many of these prey species also perform important roles in the recovery of forest habitat, helping to spread seeds of forest plants and trees, distributing nutrients throughout area soils, and loosening compacted soil areas- none of which was disclosed or addressed in the EIS. Edge areas within and adjacent to overlogged forests provide viable habitat for many species, including potential prey species for lynx. The project’s unroaded areas area also provide potential habitat, and the project area likely serves as dispersal and migration corridors, as well as supplemental habitat for lynx which may occur within, or traverse through, the project area. The proposed action alternatives which would excessively thin essential forest habitat, resulting in significantly further reducing needed cover for wildlife, jeopardizes both lynx and their prey species viability across the area—and thus violates the NEPA, NFMA, and the ESA. Different timber harvest methods can have detrimental impacts on many of these species, including squirrels, rabbits, rodents, and birds, as well as snowshoe hares. Koehler and Brittell (1988) predict that it may take up to seven years after clear cutting an area for hares to recolonize the site and up to 25 years before they reach their highest densities. Bull (1999) examined the results of a variety of harvest prescriptions on hares and found that in lodgepole stands, the number of snowshoe hares decreased in all types of harvest. She reports that mixed conifer stands appear to be “no longer suitable for hares after harvesting.” This same is also true for many of the other forest-dependent species which comprise the lynx’s diet. Squirrels have different habitat needs than snowshoe hares and are associated with mature, cone-producing forests. Ruggiero, 1999a; Buskirk, 1999b; McKelvey, 1999a. They tend to reach their highest densities in late-successional, closed-canopy forests with substantial quantities of course woody debris. The EIS fails to address potential impacts this project may have on squirrels, and ignores an important component of lynx diet. The EIS failed to provide a thorough examination of how the project will impact prey species including and in addition to hares and squirrels, as well as other wildlife species which are potential lynx prey. Without complete analysis of how these prey species will be impacted, it is impossible to quantify and qualify the impacts to lynx. The EIS should analyze the cumulative impacts of this project on lynx prey in association with other projects on the District, Forest, and surrounding lands. In sum, The Lynx Conservation Assessment and Strategy (LCAS) clearly asks that the Forest Service perform project specific analysis for each project. The lack of project specific analysis has been a long-standing problem with the Forest Service. The USDA Office of the Inspector General in its January 1999 report (No. 088001-10-	

At.) tries to correct this problem but the Forest Service has ignored the recommendations of this report. The LCAS executive summary states:

> Plans that incorporate the conservation measures, and projects that implement them, are not generally expected to have adverse effects on lynx…. However, because it is impossible to provide standards and guidelines that will address all possible actions, in all locations across the broad range of the lynx, project specific analysis must be completed.

It is clear that the Forest Service has not completed such analysis and therefore is in violation of the LCAS, as well as the ESA and NFMA. Thus far the agency has failed to supply consultation agencies, in particular the FWS, with the necessary information to make a comprehensive determination regarding this proposed project's impacts to lynx and other listed species, rendering any potential FWS's "signing off" on this proposed project not in compliance with federal laws, and thus illegal. It is also clear that the agency's BE conclusions that there would be no direct, indirect or cumulative effects to the Canada lynx are unfounded. The EIS makes inadequate mention as to how this determination has been arrived at, fails to disclose surveys or survey protocol, methodology, areas or frequency. As such, this determination is arbitrary and capricious and therefore illegal. The EIS must be withdrawn and a new SEIS conducted which addresses and corrects these glaring deficiencies and illegalities. **4-39**

Wolf

The EIS fails to credibly, comprehensively and adequately address the project's impacts to wolves, to historic wolf habitat, and to wolves that are known to be returning to the Blue Mountains region of Oregon. Its conclusion that since a few random aerial attempts to locate wolves did not succeed, there are no wolves in the area – defies common sense. It also defies reality. Recent wolf sightings in NE Oregon also were followed with intensive flyovers searching for wolves. These noisy, transient flyovers were unsuccessful, yet ODFW responsibly and reasonably did not misuse these failures as pretense to conclude that no wolves are present in the region. A new SEIS must be conducted, with a new credible comprehensive BE. The USFS must join with the USFWS in developing a comprehensive recovery plan for wolf populations returning, and potentially remaining in Oregon. In the absence of a clear plan for wolves in Oregon, and because of their known potential occurrence, future options providing for wolf re-habitation of Oregon's forests, unroaded, and wilderness areas must not be precluded by proposals such as Crawford. The failure of the agency to adequately address this issue necessitates that this EIS be withdrawn and a new SEIS conducted. **4-40**

Wolverine

It is suspected that wolverine may use the planning area as part of their seasonal and nocturnal foraging and territorial wandering patterns. Winter season surveys by BMBP over the past decade have found likely wolverine snow tracks within the Malheur's forest areas. Wolverine are known to have a 150 square mile or more winter range, and are also known to utilize roadless and wilderness areas—including the areas surrounding these preferred places. As the EIS notes that wolverine habitat exists 10 miles from the project area, it is probable that wolverines use the Crawford area occasionally. It is also well known that human disturbance related to the proposed activities is likely to alter the movement patterns of wolverine and other

wildlife species. Failing to adequately address the likely impacts to wolverine by the proposed project, given the large home ranges of these animals (approximately a 150 square mile winter range), and the sightings of wolverines in the Malheur, violates both NEPA and NFMA. Nevertheless, the EIS fails to adequately analyze how wolverine will be affected by the proposed project. Because it is probable that the species utilizes the planning area for some life cycle needs, the USFS is required to accurately address how the commercial logging and road building projects will affect those needs and the species itself. The EIS's failure to adequately address the proposed project's likely adverse impacts to wolverine, including the project's likely incremental role in ongoing trends pushing this species towards uplisting under the ESA, violates NEPA and NFMA. 40 C.F.R. § 1502.16 (environmental consequences); 36 C.F.R. § 219.19 (fish and wildlife resources). Given the sensitive nature of this species, it is likely that the proposed project will decrease Wolverine viability through the actual loss of connective travel, nocturnal, and seasonal foraging habitat, and possible loss of individuals. This is inconsistent with the Forest Plan as amended and NFMA because the project would contribute incrementally to Wolverine populations trend towards listing, 36 C.F.R. § 219.19. Wolverine are already listed as "Sensitive" in Oregon by the Oregon Department of Fish and Wildlife, which must be disclosed and addressed within the EIS, as well as any consultation with ODF&W regarding wolverine. The proposed logging is in contravention to the necessary restoration efforts that are sorely needed to begin the recovery of this species and its required habitat.	**4-41**
Northern Goshawk We have several concerns regarding Northern Goshawk. It is known that Goshawks have historically utilized the forests of the proposed project and surrounding areas for nesting, fledgling, and foraging. It is also known that Goshawks, similarly to many predatory species, rotate their nesting and foraging territories over time, so as to not deplete their prey species populations and thus maintain their viability over the long-term. As such, to ascertain potential Goshawk use, agency surveys must be conducted seasonally each year to determine the rotational patterns of Goshawks for the Crawford and adjacent area forests. Goshawks also have an extensive foraging territory. It is likely that nesting pairs may utilize portions of the Crawford area as well as adjacent older green forest areas. The DEIS fails to address impacts to this species such as how logging removal of remaining canopy cover, and further fragmentation of the area's forests, will affect adult and juvenile Goshawks, or other direct, indirect, or cumulative effects to the species. Several scientific studies exist regarding significantly detrimental logging impacts to Goshawks due to logging within or near Goshawk PFA's, as well as from fragmentation of natural forest habitat. (Reynolds et al, 1982, 1989, 1991; Moore and Henry, 1983; Fleming, 1987; Hall, 1984; Saunders, 1982; Crocker Bedford et al, 1988, 1990, 1991; Patla, 1991; Hayward and Escano, 1989; Kennedy, 1988; Shuster, 1980; Speiser and Bosakoski, 1987; Woodbridge et al, 1988; Bendire, 1892, Bull, 1988; Hargis et al, 1991; Bryan and Forsman, 1987; Andeson and Shommer; among others). Additionally, some of these studies were conducted for the agency. However the DEIS violates the NEPA by failing to disclose or assess the information, and existence of these pertinent studies, and the agency fails to uphold its responsibility to address these issues thoroughly as	

required by both the NEPA and the NFMA. The DEIS fails to address the cumulative impacts of the proposed project along with past, present, and reasonably foreseeable future actions, in violation of NEPA, 40 C.F.R. § 1508.7. These failings must be corrected in a new SEIS.	**4-42**
Neotropical Migrant and Native Birds Neotropical migrant and native forest-dependent birds (as well as numerous other forest species) are in serious decades-long population declines due to the adverse cumulative impacts from over a century of commercial logging in Oregon (see "Avian Population Trends" by Brian Sharp). The EIS for this proposed project fails to fully and adequately disclose the current population status and trends of native forest dependent Neotropical migrant and native avian species within the project analysis area and adjacent forest. Compliance with both the NFMA and the MBTA requires that all alternatives presented within the EIS must be capable of protecting forest habitat for these many native forest species, and of reversing any current downward population trends. Such a course of proactive protective action is also required by the ESA and the NEPA, Presidential and USFS directives, and the Migratory Bird treaty Act, as well as credible conservation science and ethical integrity. However, in violation of these legal and ethical requirements, the EIS presents action alternatives which would imperil neotropical and native avian species populations utilizing the project area, resulting in both individual mortality to these species as well as irreparable harm to already impaired habitat. The proposed timber sale would significantly impact migratory birds in violation of the Migratory Bird Treaty Act, 16 U.S.C. §§ 703—712 (1994). It is well known amongst the conservation-science community that many migratory birds which are currently experiencing severe population decline trends are "strongly associated" with forested habitat, and this has also been noted in other timber sale environmental documents. The proposed commercial logging would likely directly kill nesting and fledgling migratory birds. The proposed logging would further seriously reduce existing forest-dependent migratory bird habitat, which has already been significantly diminished due to the cumulative impacts of past management in the area. The proposed logging "units" would also irreparably fragment migratory bird habitat. Areas that were not logged would also be negatively impacted by generalist bird species favored by the environmental conditions created in highly fragmented logged-over forests. The impact these abundant and highly competitive bird species would have on sensitive bird species dependent on natural forest ecology and less fragmented forests should have been sufficiently disclosed and evaluated in the EIS. The adverse impacts that the proposed logging would have on migratory birds are supported by multiple scientific studies. Forest fragmentation, including loss of viable nesting habitat within eastern Oregon's national forests, is considered to be a primary cause behind declines observed in many forest songbird species. Further loss or fragmentation of habitat could lead to a collapse of regional populations of some forest birds (Robinson *et al*. 1995). As landscapes become increasingly fragmented, regional declines of migrant populations may result (*Id)*. In the Pacific Northwest, researchers have found that old-growth forests and natural forest processes (including natural fire-recovery) are integral to the survival of migratory birds. The past and continuing logging-oriented management of the forests of Oregon and Washington, which provide nesting and	

fledgling habitat for numerous migratory birds, has resulted in severe ongoing population declines in forest canopy-dependent migratory and native birds. (*Reference: "Avian Population Trends in the Pacific Northwest" by Brian Sharp - noted in the EIS).* Among the many avian species experiencing population declines due to Forest Service logging projects are: band-tailed pigeon, rufous hummingbird, olive-sided flycatcher, winter wren, song sparrow, golden-crowned kinglet, pine siskin, solitary vireo, willow flycatcher, tree swallow, red-eyed vireo, yellow warbler, yellow-breasted chat, and others as well. This information was not adequately addressed in the EIS despite the obvious direct adverse impacts to many migratory and native bird species from the removal of forest canopy cover and forest structural continuity which would occur with the implementation of this project. Failure to disclose and comprehensively analyze this pertinent, essential, scientific information violates provisions of the NEPA. Implementation of this project would violate both NFMA and the Migratory Bird Treaty Act. As such the commercial logging portion of this project must either be withdrawn from the proposed alternatives, or a new SEIS must be prepared which addresses these issues.

In August 1999, the FWS outlined what it perceived to be the agency's legal obligation in terms of migratory birds and timber harvest. FWS stated that agencies should take "an extremely cautious position with respect to the intentional take of migratory birds by federal agencies." *Letter from Acting Director, United States Fish and Wildlife Service, to Regional Directors, Regions 1–7 and Assistant Director, Refuges and Wildlife (August 17, 1999), 3.* FWS also cautioned that "the Service should not assert in any communication or correspondence that federal agencies are not covered by the prohibitions of the MBTA [Migratory Bird Treaty Act]." *Id*.

In July 2000, the Eighth Circuit Court of Appeals held that federal agencies are required to obtain a take permit from FWS prior to implementing any project that will result in take of migratory birds. *Humane Soc'y of the United States v. Glickman*, 217 F.3d 882 (8th Cir. 2000). Due to this litigation, the FWS is operating under the assumption that the Migratory Bird Treaty Act applies to the Forest Service and its activities. 16 U.S.C. § 703 et seq. The Act states that "it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill . . . any migratory bird." 16 U.S.C. § 703.

In January 2001, President Clinton signed Executive Order 13,186 that outlined the federal government's responsibility to comply with the Migratory Bird Treaty Act. Exec. Order No. 13,186, 66 Fed. Reg. 3,853 (2001). President Bush has not rescinded this Order. Recent legal analysis confirms that the Forest Service must actively prevent the take of migratory birds, or obtain a permit for incidental take of individual species. *Helen M. Kim, Chopping Down the Birds: Logging and the Migratory Bird Treaty Act, 31 ENVTL. L. 125 (2001).*

The Forest Service has failed to aptly honor these legal and scientific obligations. Until the agency can demonstrate that it has complied with the requirements of the Migratory Bird Treaty Act, the timber sale(s) alternatives associated with this proposed project must be withdrawn and/or a new SEIS must be prepared.

The lack of adequate scientific assessment of this study fails to meet NEPA's requirement for high quality scientific analysis that would satisfy the "hard look" standard. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 353 (1989); *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208 (9th Cir. 1998)

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cert. denied, Ochoco Lumber Co. v. Blue Mountains Biodiversity Project, 119 S.Ct. 2337 (1999).

American (Pine) Marten

There is not sufficient analysis in the EIS of the effects of the proposed project on American marten in the planning area. The forests of the Crawford area have historically provided marten habitat. It is likely that these areas may still provide marten habitat-both for denning and foraging, as well as dispersal and travel corridors. The agency has an obligation under NEPA to assess the direct, indirect, and cumulative impacts to all species that will be affected by the proposed action. 40 C.F.R. §§ 1502.16. The Forest Service also has an obligation to obtain missing information or state why it could not be obtained if that information is necessary to make an informed decision. *Id*. § 1502.22. Finally, the agency has a duty to prepare a new SEIS when there are unknown risks to the environment—and its current EIS is deficient in addressing these issues. *Id*. § 1508.27.

In this case, the Forest Service failed to accurately and adequately assess how the proposed timber sale will impact marten. The Malheur NF clearly is not meeting the requirements of NEPA and NFMA as they apply to pine marten, and must conduct new analysis to rectify this, including site-specific project area surveys.

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Conclusion

Many other issues remain with the renewed proposed Crawford EIS project. As part of these comments we are including by reference LOWD-BMBP's appeal of the original Crawford project, along with some of its exhibits. Many issues remain similar, and the appeal can help identify continuing issues, and along with the suggested changes noted in detail above, assist the agency in modifying this proposed project for the better. Our organizations reiterate our offer to work with the USFS to redesign this project to better uphold conservation goals and federal environmental policy laws. Hopefully the FS will recognize this opportunity to begin a new, ecologically responsible direction, and together we can cooperatively create a project that can help restore the Crawford, as well as the Dads Creek areas. We look forward to hearing from you on this project.

For the Natural Heritage of Us All,
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4-1
Purpose and Need – Timber Products

One of the purposes of this project approved by the Line Officer is to "capture the economic value of trees to provide wood products and jobs" (DEIS, Chapter 1, pg 7). This is consistent with Forest Plan direction. The Malheur Forest Plan includes direction to utilize wood material in a cost-effective manner, consistent with the various resource objectives and environment (Forest Plan goals 24, 26, IV-2).

4-2
Recommended Alternative- Changes to Address Wildlife, Roads, Soils

All public comments were considered in the analysis process. These include:

- Comments received during initial scoping efforts. These comments were used to develop significant key issues in November, 2001 Environmental Assessment (EA).
- Public comments received during 30 day comment periods (November, 2001 EA)
- Appeal points on the November, 2001 Crawford EA and April 26, 2002 Decision Notice.
- Comments received on the October 9, 2003 Notice of Intent to Prepare and EIS.

To address public comments adjustments were made from the 2001 EA to the 2006 DEIS. These include:

-The project area size was decreased. The project area in the 2001 EA included portions of several subwatersheds (Bridge Creek, Clear Creek, Phipps Meadow, Mill Creek, Crawford Creek, and Idaho/Summit Creek) encompassing 33,123 acres. The 2006 DEIS project area only includes a portion of the Mill Creek Subwatershed (approximately 14,950 acres).

-Commercial harvest acres decreased in Alternatives 2 and 3. Alternative 4 was added, which does not include commercial timber harvest. Partial Removal and Regeneration Salvaged treatment methods are not proposed in the 2006 DEIS. The following table displays the adjustments made from the 2001 EA to the 2006 DEIS.

		Commercial Harvest Acres
2001 EA	Alternative 2 (Proposed Action)	Partial Removal –HPR – 1,090 acres Regeneration Salvage- HRS – 67 acres Commercial Thinning – 2,230 acres Shelterwood Harvest- 167 acres
	Alternative 3	Partial Removal –HPR – 727 acres Regeneration Salvage- HRS – 57acres Commercial Thinning – 2,038 acres Shelterwood Harvest- 141 acres
2006 DEIS	Alternative 2 (Proposed Action)	Partial Removal – 0 acres Regeneration Salvage – 0 acres Commercial Thinning – 2,073 acres Shelterwood Harvest- 119 acres
	Alternative 3	Partial Removal – 0 acres Regeneration Salvage – 0 acres Commercial Thinning- 1,506 acres Shelterwood Harvest- 0 acres
	Alternative 4	Partial Removal – 0 acres Regeneration Salvage – 0 acres Commercial Thinning- 0 acres Shelterwood Harvest- 0 acres

-New road construction was proposed in the 2001 EA (Alternatives 2 and 3). New road construction is not proposed in the 2006 DEIS (Alternatives 2, 3, and 4), however varying amounts of temporary road construction is proposed in the 2006 DEIS. All temporary roads are located outside of RHCAs would be decommissioned after use. The objectives of decommissioning are to eliminate future used of the road and to restore the hydrological function.

- The original Crawford EA proposed skyline logging on steeper slope areas in Alternatives 2 and 3. In the 2006 DEIS only ground based harvest is proposed. Slopes proposed for ground based harvest are generally less than 35% with some small segments greater than 35% (DEIS, Chapter 3, pg 141).

		New System Road Construction	Temporary Roads
2001 EA	Alternative 2	10.0 miles	4.7 miles
	Alternative 3	7.9 miles	4.1 miles
2006 DEIS	Alternative 2	0 miles	8.6 miles
	Alternative 3	0 miles	1.5 miles
	Alternative 4	0 miles	0 miles

- Alternative 4 was added to the DEIS in response to key issue #1 – Public concern that proposed ground disturbance activities associated with road construction and commercial timber harvest could degrade water quality and soil productivity. There are no commercial harvest, temporary road construction, road maintenance, or reconstruction activities proposed in this alternative (DEIS, Chapter 2, pg 48).

4-3
Harvest Prescriptions- Trees with Old-growth Characteristics, Variable Thinning

Chapter 2 of the DEIS, Management Requirements, Constraints, and Design Measures, (pgs 50-51) describes the variable density, including unthinned patches, that would be retained in both ponderosa pine forested sites and dry mixed conifer forested sites. Additional guidance in the draft Silvicultural Prescription and Marking Guides includes; when thinning in mature clumps, remove the smaller and unhealthier trees and any trees that could be a fuel ladder into the mature trees. Retain all isolated individual mature trees, removing the smaller trees around the clumps of mature trees to reduce competition. This removal should be for a distance equivalent to the height of the mature trees. Also, clumps marked to a density ranging from 25 square feet per acre to 75 square feet per acre and ¼ to 1 acre in size are desired for stand structure diversity. Generally, leave the higher basal areas in areas that are more fertile and in better health and the lower basal areas in areas that are less fertile and are in poorer health. Unthinned clumps and openings with few or no trees are permissible up to ¼ acre in size.

Prescriptions were designed to fit the local, site specific, biophysical environment and have the objective to enhance growth of young stands into old-forest structural stages, and to enhance the sustainability of the forest. Discussion about the site specific biophysical environment is in the Forest Vegetation section, Chapter 3 (pgs 71-107).

4-4
New Roads – Temporary Roads

We appreciate your concerns regarding road building. A concern was identified during scoping regarding proposed ground disturbing activities associated with road construction and commercial timber harvest and the potential effect on water quality and soil productivity. This concern was elevated to a significant issue (key issue) and used as the basis for alternative development. To address this issue a range of alternatives was developed and analyzed in Chapter 3. To summarize, no new system roads are proposed in Alternatives 2, 3, or 4. Alternatives 2 and 3 propose temporary road construction (8.6 miles and 1.5 miles respectively) to support timber harvest. All temporary roads proposed for construction are located outside of

RHCAs and would be decommissioned after use. The objectives of decommissioning are to eliminate future use of the road and restoration of the hydrological function. This would include subsoiling, installation of drainage, and seeding as necessary. Alternative 4 does not propose commercial harvest or temporary road construction.

4-5
Soils- Soil Quality

The DEIS discloses LRMP standards would be met for all units under all alternatives (Table S – 3 in Chapter 3, Soil section). None of the units fail to meet the standards.

4-6
Big Game Cover – Satisfactory Cover, Forest Plan Standards

Big game cover analysis is discussed in the DEIS in Chapter 3, pgs 239-241, 244-246, and 248-249. A nonsignificant Forest Plan amendment was proposed (Alternative 2 – Proposed Action) in the DEIS to commercially thin 70 acres of satisfactory cover. Units classified as satisfactory cover in the DEIS were field reviewed during the summer of 2007. Portions of units 94 and 95 (43 acres) were determined to have less than 50% canopy cover, therefore do not meet the definition of satisfactory cover in the Forest Plan. The Proposed Action Alternative was modified to reflect this updated field information. A nonsignificant Forest Plan amendment to commercially thin 27 acres of satisfactory cover is proposed in the FEIS. A concern was identified during scoping regarding proposed treatments in satisfactory cover stands. This concern was elevated to a significant issue (key issue) and used as the basis for alternative development. To address this issue two new alternatives were developed (Alternatives 3 and 4). No harvest in satisfactory cover is proposed in either of these alternatives (See DEIS, Table WL – 12, pg 244, and Table WL – 13, pg 245).

All action alternatives would reduce marginal cover to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Marginal cover and total cover will be maintained above Forest Plan Standards in all alternatives. Throughout the project area the negative effects of removing understory trees would be reduced by the design requirement to retain unthinned patches of dense trees as wildlife security cover. Unthinned patches would comprise 5 to 15% of each unit and range from 2 to 5 acres in size depending on the density of understory trees.

4-7
303d Streams

The EIS discloses the Middle Fork John Day River, Crawford Creek, and Mill Creek are on the Oregon 303(d) list for high summer temperatures, and that for all alternatives, none of the proposed activities, singly or cumulatively, would cause measurable increases in stream temperature (Chapter 3, Aquatics & Water Quality, Affected Environment and Environmental Effects - Aquatic Habitat and Water Quality, Water Temperature/Stream Shading section). The EIS discloses that, to comply with the Clean Water Act, the Crawford Project needs to meet two responsibilities, neither of which is to reduce temperature. (Chapter 3, Aquatics & Water Quality, Regulatory Framework, Forest Plan Forest-Wide Standards, Clean Water Act section)

4-8
Listed Species and Management Indicator Species (MIS)

Species identified in the comment are addressed in Chapter 3, pgs 215-262 (MIS), 262-265 (Featured Species), and 265-268 (TES). Assessment of the impacts of each alternative is addressed in those sections.

4-9
Burning – Avian Species Nesting

The effects of the proposed activities in the DEIS on avian species, including ground nesters, is addressed in Chapter 3, pgs 268-282, with specific assessment of prescribed fire effects on pgs 276-277. Recent research on the effects of prescribed fire on nesting birds is considered and assessed and used in the rationale for effects determinations. Proposed treatments will convert, maintain, or develop future single stratum old forest structure (OFSS), which would benefit species using these habitats including white-headed woodpeckers, flammulated owls and chipping sparrows. (See DEIS Table WL – 22, pg 275.) Proposed thinning would benefit OFSS species. Thinning from below designed to emulate understory fire in reducing fuels in an old-growth forest in Oregon, did not alter use of the site by pileated woodpeckers or Vaux's swifts, another bird that uses the tree canopy in old-growth forests (Bull and others 1995). Vegetation management cannot completely avoid unintentional take of birds, no matter what mitigations are imposed on the activities. Mitigation, such as retention of snags and down logs, retention of live trees, and avoidance of riparian areas, grass-lands and juniper woodlands proposed in this project will minimize take of migratory birds.

Although proposed thinning would be intended to benefit OFSS-dependent species in the mid- to long-term, some habitats may actually be used soon after treatment. In the short-term, canopy cover would be reduced and herbaceous vegetation and shrub growth would be stimulated. Populations of OFSS-dependent species would be expected to increase. Birds that nest on the ground, on shrubs, or within lower tree canopies would be vulnerable to loss of nest productivity from prescribed burning if the activities occur during the nesting season. Although breeding adults could be killed during burning operations, most adult birds regularly escape the direct effects of the burn by simply leaving. However, disturbance from burning activities could lead to nest abandonment and subsequent loss of nestlings.

Nests, eggs and nestlings could be directly destroyed. Turner (2001) found a 20% loss of human-installed ground nests during low-intensity spring prescribed fires, results of local burns are expected to be less because human-installed nests were distributed at greater densities than natural nests would be. Spring prescribed fire may cause some mortality of young in early nests; however, it would not necessarily have a devastating effect on bird populations (R. Sallabanks, personal communication 2003). However, it would not necessarily have a devastating effect on bird populations (R. Sallabanks, personal communication 2003). If a nest burns, in most cases, breeding opportunities would still be available. Neotropical migratory birds appear to be fairly resilient to spring prescribed burning, with re-nesting in remaining habitat common among birds that suffer early-season nest failure (R. Sallabanks, personal communication 2003). Shrub nesters could be effected from smoke and heat and could be detrimental to local populations

Although spring wildfires occurred infrequently, spring burning is being considered for several reasons. In some areas, unnaturally high fuel loads preclude initial fall burns; high intensity fires could result in the undesirable loss of large trees and snags, canopy cover and other key habitat components. In the spring, moisture levels are typically higher; therefore, reducing fire intensity and providing easier, safer and less costly and potentially damaging control options. Under existing conditions, spring burning can be implemented in a way that mimics historic conditions. Low intensity fires create a mosaic of burned areas with non-burn areas that may function as refugia for breeding birds. If burning is conducted early enough in the spring, the degree of impact is minimized for migratory birds that have not initiated nesting activities.

Once spring burning reduces fuel loads, fall burns can then be safely implemented during future entries to better mimic what is believed to be the natural fire history of the area. Fall burning would have little direct effect on bird mortality, because even young birds would be developed enough to fly and escape a fire. Reductions in understory vegetation are likely to adversely affect species that prefer dense canopies such as the red-breasted nuthatch, American robin, and spotted towhee, referred to as non-target species. The Northern Rocky Mountains Bird Conservation Plan (Altman 2000) considers the alteration/loss of habitat for non-target species to be of low concern because:

- Non-target species are opportunistically present in dry forest sites, and generally not of conservation concern in this habitat because of their primary association with other forest types,
- The long-term benefit of habitat enhancement for target dry forest species outweighs the impacts of habitat loss for non-target species, and
- Restoration of dry forest habitats is among the highest priorities for bird conservation in western North America.

Treatments proposed represent a positive attempt to manage stands for dry forest restoration. Prescribed burning and timber harvest would be expected to improve habitats for those species of landbirds, including neotropical migratory species, which are at highest risk.

4-10
Protecting Wildlife Habitat

The comment lacks specific detail, however effects of prescribed fire actions on most of the habitat features listed are addressed in various sections of the DEIS, Chapter 3, pgs 212-283.

4-11
Soil Disturbance – Invasive Plants

Several design measures were included to reduce the potential for introduction, establishment, and spread of invasive plants (DEIS, Chapter 2, pg 60, Table 2.11). The effects of proposed activities on the invasive weed spread and establishment are disclosed in the DEIS in Chapter 3, pgs 296-304.

4-12
Road Decommissioning – OHVs and Snowmobiles

Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. Over 90% of these roads are already closed. Proposed decommissioning activities would include culvert removal, ripping/subsoiling and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use. Conifers would be seeded in decommissioned road segments where conditions will support establishment and growth. Decommissioned roads will be removed from the Forest Road Transportation System (DEIS, Chapter 2, pg 45).

4-13
Livestock Grazing

Changes in livestock grazing are not within the scope of the EIS. Several design measures regarding range management were included in the analysis (DEIS, Chapter 2, Table 2.13, pg 61). A rest period of one full growing season in accordance with the Forest's Post Fire Interim Grazing Guidelines is anticipated after prescribed burning. Cumulative effects of grazing were analyzed and can be found throughout Chapter 3.

4-14
Collaboration – Public Trust

We agree that the Crawford project was started prior to the "era of collaboration." However, through the life of the Crawford project analysis, substantial public involvement did occur. Public comments were considered, and did influence the analysis. See Notice of Intent to Prepare and EIS (October 9, 2003); DEIS, Chapter 1 (Introduction, pg 3), (Public Involvement, pg 22); and Comment Response 4-2.

4-15
ESA and Sensitive Species

Commenter provides a list of species to be assessed, concurrent with what is found in Chapter 3 of the DEIS (pgs 212-283). Specifically, Threatened, Endangered, and Sensitive (TES) Wildlife species are addressed in the DEIS, Chapter 3, pgs 265-268. See the Crawford Wildlife Biological Evaluation located in the project file for additional detail.

4-16
Species of Concern

Commenter provides a long list of species to be assessed, concurrent with what is found in the DEIS on pgs 212-283. See specifically, Landbirds/Neotropical Migratory Birds (pgs 268-281), Old-Growth Dependent Species (pgs 215-235), Primary Cavity Excavator Species (pgs 249-261), and Featured Species (pgs 262-265).

4-17
NEPA – Significant Issues, Laws, Forest Plan Amendments

Significant issues, otherwise known as key issues that rose from public comments, other agencies, organizations and businesses, and Forest Service resource specialists are listed in the DEIS, Chapter 1, pgs 24-25. Two significant issues were identified and used to develop alternatives. In addition, several analysis issues are also listed in Chapter 1, and tracked in the FEIS in relevant resource areas in Chapter 3 and in the Comparison of Alternatives section at the end of Chapter 2.

The effects of proposed actions on sensitive, threatened and endangered species are disclosed in the DEIS, Chapter 3.

-Wildlife Species, pgs 265-268
-Aquatic Species, pgs 183-209
-Sensitive Plants, pgs 283-287

Consistency determinations with Direction and Regulations can be found at the end of each resource section in the DEIS, Chapter 3.

- Forest Vegetation (pg 107) - Forest Plan, National Forest Management Act, Regional Forester's Eastside Forest Plan Amendment 2
- Fire and Fuels (pg 133-134) – Forest Plan, Clean Air Act
- Soils (pg 145) – Forest Plan
- Aquatic and Water Quality (pgs 209-211) – Forest Plan (Including PACFISH), Clean Water Act, Endangered Species Act, Magnuson-Stevens Act, Recreational Fisheries
- Terrestrial Wildlife (pgs 282-283) – Forest Plan (Dedicated Old-growth, Big Game Cover, Snags and Down Wood), Regional Forester's Eastside Forest Plan Amendment 2 (Wildlife Standard – HRV, LOS, Northern Goshawk), Migratory Bird Treaty Act, Endangered Species Act
- Sensitive Plants (pg 296) – Forest Plan and Other Direction
- Invasive Plants (pg 304) – Forest Plan Standards and Pacific Northwest Invasive Plants Program FEIS
- Rangeland Resources (pg 317) – Forest Plan
- Heritage Resources (pg 349) – Forest Plan and Federal Laws

Selecting Alternatives 2, 3, or 4 would include a site-specific, non-significant amendment (to adjust Management Area designations) to Proposed Forest Plan to adjust three DOGs and create three new ROGs. Another nonsignificant amendment would be needed to select Alternative 2 to allow commercial thinning in 27 acres identified as satisfactory big game cover. Amendments are addressed in the following sections of the DEIS. The satisfactory cover amendment would not be required to implement Alternatives 3 and 4.

-Satisfactory Cover- Chapter 1 – Forest Composition and Density Reduction Need, pg 7
- Proposed Activities, pg 15

Chapter 2 – Alternative 2, Commercial Harvest, pg 40
- Alternative 3, Purpose and Design, pg 46
- Alternative 4, No commercial harvest proposed, pg 48
- Forest Plan Amendments, pgs 49-50

Chapter 3 – Alternatives 2, 3, 4, Big Game Habitat, Effects, pgs 244-248
- Consistency with Direction and Regulations, pgs 282-283

-Old-growth-Chapter-Old-growth Boundary Adjustment Need, pg 10-Proposed Activities, pg 16
- Adjustments of Dedicated Old-growth and Additions to Replacement, pg 19

Chapter 2- Alternative 2, Old-growth Adjustments, pg 46
- Alternative 3, Old-growth Adjustments, pg 48
- Alternative 4, Old-growth Adjustments, pg 48
- Forest Plan Amendments, pgs 49-50

Chapter 3 – Alts 2, 3, and 4, Dedicated Old-growth, Effects, pgs 226-230
- Consistency with Direction and Regulations, pgs 282-283

4-18
Purpose and Need

To clarify, one of the purposes of this project is to "capture the economic value of trees to provide wood products and jobs." The Line Officer made the decision to include this objective as part of the purpose and need (DEIS, Chapter 1, pg 7). The Malheur Forest Plan includes direction to utilize wood material in a cost-effective manner, consistent with the various resource objectives and environment (Forest Plan goals 24, 26, IV-2), therefore including this statement as part of the purpose and need is consistent with the Forest Plan.

The DEIS includes two alternatives with no commercial timber harvest (Alternative 1 – No Action and Alternative 4). Alternative 4 was added to the 2006 DEIS to address public comments.

4-19
Goals-Forest Health

The Forest Vegetation section, Chapter 3 of the DEIS (pgs 72-92) discusses past management activities and the existing conditions of forested stands. The effects of mechanical and/or burning treatments and improvement of stand health are also discussed in the Forest Vegetation section, Chapter 3 of the DEIS (pgs 92-106).

4-20
Old-Growth Forests and Healthy Watersheds

The DEIS assesses the existing condition of old-growth, (LOS) and old-growth dependent species on pgs 215-223. The DEIS states that single-stratum LOS conditions are generally lacking in the Project Area, as a result of past timber harvest, fire suppression, and other disturbances. Old forest multi-strata (OFMS) is currently within or above HRV in the hot-dry, cool-moist, cool-dry, and cold-dry biophysical environments. The warm-dry biophysical environment is the only type of OFMS below HRV. One of the purposes of the project is to accelerate development of future LOS single-stratum wildlife habitats (see DEIS, pg 7). See DEIS, Chapter 3, pgs 224-235 for effects of proposed actions on old-growth dependent management indicator species (including American marten, pileated woodpecker, and white headed woodpecker). See response 4-22.

The DEIS and FEIS disclose effects to threatened, endangered, and sensitive (TES) wildlife species. See DEIS, Chapter 3, pgs 265-268. In this section the effects to bald eagle, gray wolf, Canada lynx, and wolverine are addressed. The Crawford Project Biological Evaluation for TES wildlife species is located in the project files.

Direct, indirect, and cumulative effects on watershed and fisheries are disclosed in the Aquatics and Water Quality Section of the DEIS and FEIS. See DEIS, Chapter 3, pgs 145-211. The effects to TES fish species are fully analyzed in the DEIS and FEIS, Biological Evaluation (BE) and Biological Assessment (BA) as per the standards developed by Region 6, USDA, U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NOAA). The Crawford project BE for TES aquatic species is located in the project files. The fisheries BA was prepared pursuant to the Endangered Species Act of 1973, as amended, to evaluate and describe the effects of activities on Columbia River steelhead, Columbia river basin bull trout, and Spring Chinook Salmon Effective Fish Habitat.

4-21
Species Surveys and Habitat

Each resource section in Chapter 3 includes an analysis methods section describing the scales of analysis, data used, surveys, and analysis tool. The Terrestrial Wildlife section (DEIS, pgs 213-215) states that “presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, and status/trend and habitat trend documentation from the

Interior Columbia Basin." Effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. This strategy is based upon science that demonstrates connections between species populations and viability and the quantity and condition of habitat at appropriate scales of analysis (Baydack et al. 1999). There is a high confidence level that species discussed in this document are currently present in the area.

The Aquatics & Water Quality Section (DEIS, pgs 145-211) state that "stream surveys have been conducted on all three streams …. Stream survey information was analyzed to compare existing habitat conditions to Forest Plan RMOs / DFCs for aquatic habitat…. However, since these creeks exhibit characteristics of Rosgen F channel types, they may not be as stable as the fish habitat surveys indicate….. Similarly, they observed little to no change in stream channel morphology and no substantial change in erosion or deposition in the surveyed reaches." Effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. This strategy is based upon science that demonstrates connections between species populations and viability and the quantity and condition of habitat at appropriate scales of analysis (Baydack et al. 1999). There is a high confidence level that species discussed in this document are currently present in the area.

The Sensitive Plant Section (DEIS, pgs 283-296) states that "a large proportion of potential habitats were surveyed …. completed during periods when individual plants could be identified, during the 1998, 2000, 2002, and 2005 field seasons. No sensitive species were found in the project area, although more habitats exist than was surveyed, mainly for *Achnatherum*, *Botrychium*, and *Carex* species. …. The potential for occurrence of any given plant species is based on combinations of habitat, elevation, aspect, and micro sites known to occur within or adjacent to the analysis area. The following table presents the Regional Forester's listing of plants designated as sensitive (USDA, July 2004) that are considered as potentially having habitat on the Blue Mountain Ranger District."

4-22
Old-Growth Habitat

The DEIS assesses the effect of actions proposed on old growth/LOS habitat on pgs 215-235. All action alternatives would adjust the DOG boundaries to incorporate suitable late and old structure habitat and to reflect logical vegetation or topographical boundaries in the Forest Geographic Information System (GIS) database. All action alternatives would designate new ROG areas and Pileated Woodpecker Feeding Areas. Changes would make the DOG habitats in the project area consistent with the standards for MA–13 Old-Growth habitats as identified in the Forest Plan, as well as recommendations and direction provided in the FEIS for the Forest Plan. . Acreage changes are summarized in FEIS Table WL – 4. See Appendix B (Maps) showing existing DOG/ROG locations and proposed locations.

The Forest Plan would be nonsignificantly amended to adjust DOGs and to add ROG areas, converting acres from Management Areas 1 (General Forest), MA–14 (Visual Corridors) and MA–3 (Riparian) to MA–13 (Old-Growth). Standards and guidelines in MA–14 and MA–3 would still apply. PWFA acres would retain their original MA classification, except where they overlap with the ROGs. Under all action alternatives, there would be a net increase of 57 acres of DOG habitat. The adjustments of boundaries and acreage for these DOGs would meet or exceed Forest Plan Standards for MA–13. The acres moved into MA–13 would be protected and maintained as suitable habitat for American marten or pileated woodpecker (or both). Not all of the acres added as DOG are currently providing old forest structure. The acres added were the best adjacent habitat available.

There would also be a net increase of 497 acres of ROG habitats due to the delineation of three new ROGs. These ROGs would meet Forest Plan standard Forest Plan Standards for size and proximity to their associated DOG units. ROGs and PWFAs areas were located in the best habitat available within ¼ mile of existing DOGs. Generally ROGs are half the size of DOGs however the ROG 134 was delineated over a larger area since the only available adjacent habitat is within the hot-dry biophysical environment. This biophysical environment is not the most suitable to sustain pileated woodpeckers and American marten.

4-23
Significant Impacts, Environmental Laws

Consistency determinations with applicable environmental laws are included at the end of each resource section in Chapter 3. Determinations address consistency with the Clean Water Act, Endangered Species Act, and National Forest Management Act. Consistency with applicable Forest Plan Standards is also addressed at the end of each resource section. In the FEIS a section called "Other Disclosures" has been added. This section discloses consistency with applicable laws.

Selecting Alternatives 2, 3, or 4 would include a site-specific, non-significant amendment (to adjust Management Area designations) to Proposed Forest Plan to adjust three Dedicated Old-Growth areas and create three new Replacement Old-Growth areas. Another non-significant amendment would be needed to select Alternative 2 to allow commercial thinning in 27 acres identified as satisfactory big game cover. See FEIS Table 2.3, List of Proposed Forest Plan Amendments.

4-24
Purpose and Need, Environmental Laws

A full description of the purpose and need for the Crawford Project is available in the DEIS in Chapter 1, pgs 6-12. The purpose and need statements were approved by the line officer and were derived from the differences between current conditions and desired conditions. Desired conditions are based on Forest Plan direction and Forest Plan management objectives. Consistency determinations with applicable environmental laws are included in Chapter 3. The cumulative effects of past logging, road building, and grazing are also included in Chapter 3 of the DEIS. Appendix D lists the past, ongoing, and foreseeable future actions considered in the cumulative effects analysis. See response 4-23.

4-25
Fire Risk Fuels

The DEIS discloses that there would be a short term increase in surface fuel loading due to mechanical treatment (pg 123). The DEIS discusses the relationship between surface fuels and fire hazard on pgs 111-112. Treatment of activity generated slash would occur under all action alternatives (Chapter 1, pgs 16, 18; Chapter 2, pgs 43-44, 47-49, and Chapter 3, pgs 123-125, 129, and 132). The effects of fuels reduction (including a short term increase after mechanical treatment) are discussed in Chapter 3 of the DEIS (pgs 118-133).

Modifying Wildfire Behavior-The Effectiveness of Fuel Treatments-The Status of Our Knowledge by Carey and Schumann (2003) of the organization The Forest Trust, is a review that lists literature which explored the reduction in fire behavior accomplished by prescribed burning alone, mechanical thinning, combined thinning and burning, and commercial timber harvest alone. The study reviewed several papers that supported the fuel reduction effectiveness of thinning, to remove trees from below and reduce crown density, reduce fuel ladders, and raise crown base height. Many of the papers reviewed as negative toward thinning were on studies that left thinning slash in place. There were also supporting papers that described wildfires that dropped from the crowns to the ground and causing less mortality in thinned stands than in unthinned areas. Carey and Schumann found few studies relating fire reduction strictly to commercial timber harvest. Most concerned the effects of treating vs. not treating created logging slash, with lower fire severity when slash is treated. Also, see response to comment 3-14.

4-26
Roads and Skid Trails

The proposed implementation schedule for all alternative actions was discussed in Chapter 1 pg 49. Roads utilized by the purchaser requiring closure would be implemented on the above mentioned timeline. Temporary roads created by purchaser would be closed when their activities were completed. Existing skid trails will be utilized whenever possible and rehabilitated after use. Design measures to reduce or alleviate soil compaction are listed in FEIS Chapter 2, Tables 2.7 and 2.8, and Chapter 3, Table S – 3.

4-27
Cumulative Effects

Cumulative effects of each alternative studied in detail are included throughout Chapter 3 of the DEIS and FEIS. See previous responses.

4-28
Forest Health- Ecological Function

Under the proposed action, approximately 21% of the Crawford Project Area is proposed for commercial and precommercial treatment, allowing areas to undergo cyclic fluctuations and impacts. Other alternatives treat less area. Cover is discussed in the DEIS in Chapter 3 (pgs 239-240 and 244-248). Alternative 3 and 4 as described in Chapter 2 (pg 46) do not harvest satisfactory cover.

4-29
Recommended Alternative

Your suggested alternative of thinning trees less than 12 inches dbh and seasonal appropriate burning is addressed in Alternative 4. There is no commercial harvest or temporary road construction proposed in this alternative. Approximately 795 acres of small diameter tree thinning (generally less than 9 inches in diameter) and 5,300 acres of prescribed burning are proposed. A complete description of proposed burning activities and objectives are listed in the DEIS, Chapter 3, pg 43-45. Specific design measures to be used as part of Alternative 4 are listed in Chapter 2, Tables 2.1 through 2.23.

4-30
Supplemental EIS

The specific objectives or reasons "why" the proposal was developed are listed in the purpose and need section of the DEIS (DEIS, Chapter 1, pg 6-12. The Malheur National Forest has completed several projects with similar objectives over the last 10-15 year. We would be glad to visit some of these projects with you.

4-31
Cover, Non-Significant Forest Plan Amendment, Big Game Habitat

The DEIS assesses the effect of actions proposed on big game habitat, specifically cover, on pgs 239-242 and 244-249. The DEIS identifies the current condition of cover relative to Forest Plan Standards. Current conditions are below Forest Plan Standards for satisfactory cover. Marginal cover and total cover, however, exceed Forest Plan Standards. Alternative 2 would require a Forest Plan amendment as a result of the reduction of satisfactory cover by approximately 27 acres. Alternatives 1, 3, & 4 would not result in changes to satisfactory cover. See response 4-6.

4-32
Cumulative Impacts

Effects on commercial thinning on satisfactory big game cover (Issue #1); and concerns over the effects of roads, commercial harvest, and burning on soil, water quality, and listed aquatic species habitat (Issue #2) were identified as a significant (key issues) in the analysis. A range of alternatives was developed to address these issues. Alternative 3 excludes harvest in those areas identified as satisfactory cover and minimizes temporary roads construction to less than 0.1 miles (500 feet) for each road. Alternative 4 does not propose commercial harvest or temporary road construction (DEIS, Chapter 2, pgs 46 and 48). See response 4-24.

4-33
Research, New Science

References are cited throughout the DEIS and are summarized in the references section of the DEIS. The references list in the DEIS has been updated in the FEIS.

4-34
Impacts to Wildlife Species

The DEIS assesses effects of each alternative, including Alternative 2 which would require the non-significant Forest Plan amendment for reductions in satisfactory cover, on pgs 262-265.

4-35
Cumulative Impacts, Cover Amendment

The DEIS assesses cumulative effects of all alternatives on big game cover on Chapter 3, pgs 248-249.

4-36
Road Impacts, Skid Trails

The Mill Creek Subwatershed was analyzed for road impacts to soils, terrestrial wildlife, aquatic and water quality, and invasive/noxious weeds. Minor changes in road miles and the effects of road activities were made throughout the FEIS. This includes disclosing the effects of minor segments of road activities (maintenance, reconstruction, closures, and decommissioning) that extend into adjacent subwatersheds (see FEIS Appendix C- Road Summary).

4-37
Peak Flows

The EIS discloses that the Crawford Project would not be expected to produce significant effects on peak flow (Chapter 3, Aquatics & Water Quality, Affected Environment and Environmental Effects – Aquatic Habitat and Water Quality, Aquatic Habitat & Water Quality – Cumulative Effects, Cumulative Effects – Equivalent Roaded Area section).

4-38
Lynx

The DEIS assessment of effects upon Canada lynx is found on pgs 267. The Crawford Project Biological Evaluation for TES wildlife species is located in the project files. According to the *Canada Lynx Conservation Assessment and Strategy*, August 2000, Lynx have been documented in the Blue Mountains and Wallowa Mountains. About half of the verified records are from the northeastern corner of Oregon. This area may be important in providing connectivity between Idaho and the Cascade Mountains Geographic area, although the Snake River and Hells Canyon likely would impede lynx movements.

Since lynx habitat is so limited in the project area, both now and historically, there would be no direct, indirect or cumulative effects expected from any of the alternatives. There is potential that the project area provides connectivity between the two lynx analysis units (LAUs). Use would be incidental and not prolonged due to the lack of prey species. Vegetation treatments are planned to allow connectivity of dispersal habitat and would not impede movement by lynx and other carnivores. Connectivity corridors would be maintained which could provide travel and foraging corridors. Since 1993, the Forest Plan as amended has directed the Malheur National Forest to protect connectivity habitat between LOS stands. In the short-term, the action alternatives would not contribute to cumulative losses of mature and old-growth habitat because stands would not be treated except to enhance old-growth attributes. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of OFSS and maintaining connectivity habitat between LOS stands. Clumpy patches ranging in size from 5-15 acres would be maintained which could provide hiding cover. The Lynx Conservation Agreement (CA) between the U.S. Fish and Wildlife Service was revised and amended in 2005 and 2006; the FWS Recovery Outline was issued in September 2006. The 2006 amendment to the CA identified the Malheur N.F. as not occupied based on the results of the surveys conducted in 1999, 2000 and 2001 as part of the National Lynx Survey. The project area was not surveyed due to the fact that the habitat was not considered suitable. The revision to the CA concluded that the Lynx Conservation Assessment and Strategy (LCAS) (under which Lynx Analysis Units (LAU) were delineated) did not apply to habitat that was unoccupied by lynx. However, the CA amendment also states that the LCAS may provide useful information for FS managers to consider when making decisions regarding unoccupied, mapped lynx habitat.

The Forest is included in “Peripheral Habitat” in the FWS Recovery Outline (pg 4): “In ‘peripheral areas’ the majority of historical lynx records is sporadic and generally corresponds to period following cyclic lynx populations high in Canada. There is no evidence of long-term presence or reproduction that might indicate colonization or sustained use of these areas by lynx. However, some of these peripheral areas may provide habitat enabling the successful dispersal of lynx between populations or subpopulations…"

Research indicates that lynx need approximately 10 to 15 square miles of high quality habitat to support a functional home range (Ruggiero et al. 1994). Forest managers have conducted several mapping analyses of lynx habitat on the Malheur National Forest; none of these analyses classified the Crawford Project Area as a LAU. The number of acres is considered insufficient for lynx and what does exist is noncontiguous; therefore, this area is not considered suitable habitat for lynx to occupy. The nearest area that approximates lynx source habitat is located in the Strawberry Mountains, about 25 miles to the east.

A ***no effect*** determination was stated for all action and No Action Alternatives.

4-39
Wolf

The DEIS assessment of effects on gray wolves is found on pg 267. The Crawford Project Biological Evaluation for TES wildlife species is located in the project files. Wolves are limited by prey availability and are threatened by negative interactions with humans. Generally, land management activities are compatible with wolf protection and recovery, especially actions that maintain ungulate populations. Despite good populations of ungulates on the Malheur National Forest, no wolf populations currently exist and no denning habitat has been located. However, in the past 6 years large canid tracks have been seen and scat collected for analysis on the Malheur NF. It is postulated that while no denning habitat or packs of wolves have been located to present, individual wolves may be traveling through the Blue Mountains. Effective March 28, 2008, the Northern Rocky Mountain population of the Gray Wolf was removed from the federal list of Endangered and Threatened Species under the Endangered Species Act (ESA). In the Crawford Project, Gray Wolf was addressed as a sensitive species. Therefore, a ***no impact*** determination was stated in the BE (Biological Evaluation).

The United States Fish and Wildlife Service (the Service) proposed to establish a distinct population segment (DPS) of the gray wolf (*Canis* lupus) in the Northern Rocky Mountains NRM) of the United States. The proposed NRM DPS of the gray wolf encompasses the eastern one-third of Washington and Oregon a small part of north-central Utah, and all of Montana, Idaho and Wyoming. The Service is also proposing to remove the gray wolf in the NRM DPS from the list of Endangered and Threatened wildlife under the Act. (Federal Register Notice (Volume 72, No. 26 2/8/07.)

4-40
Wolverine

Assessment of effects upon wolverine (*Gulo gulo*) is assessed on pg 267-268. The Crawford Project Biological Evaluation for TES wildlife species is located in the project files. Periodically throughout the 1990s, wolverine surveys were conducted across the District including the Summit Creek/Idaho Creek area just east of the project area. No wolverine tracks or individuals were found. A wolverine was confirmed from bones and fur found in the Strawberry Mountain Wilderness in 1992. Unconfirmed sightings of wolverine were reported near Dixie Mountain and to the northeast near Big Boulder Creek. Additional sightings of animals and tracks have occurred on the District, but none have been confirmed. In 1994, bait and camera stations were set up in the vicinity of Tipton Summit, since two sightings had occurred there just across the Long Creek Ranger District border. No wolverines or sign were found.

The Crawford Vegetation Management project is projected to have both positive and negative effects to wolverine and its prey. Positive effects include reducing canopy cover and increasing forage for deer and elk as well as ground cover for smaller wolverine prey species. Connectivity corridors would be maintained which could provide travel and foraging corridors. Since 1993, the Forest Plan as amended has directed the Malheur National Forest to protect connectivity habitat between LOS stands. In the short-term, the action alternatives would not contribute to cumulative losses of mature and old-growth habitat because stands would not be treated except to enhance old-growth attributes. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of OFSS and maintaining connectivity habitat between LOS stands. Clumpy patches ranging in size from 5 to 15 acres would be maintained which could provide hiding cover. Negative effects could include the reduction of hiding cover from timber harvest, but can increase forage for deer and elk.

4-41
Goshawk

Assessment of effects on the northern goshawk in the DEIS is assessed on pgs 262-264. Under Alternative 2 (the preferred alternative), approximately 451 acres, (10%) of mature and old growth habitat would be treated. Alternatives 3 and 4 would treat approximately 247 acres (5%) and 173 acres (4%), respectively. Following treatment, stands are less likely to support nesting goshawks. Several studies (Marshal 1992) have suggested that selection harvest of trees can reduce nesting; however, goshawk management recommendations by Reynolds et al. (1992) do not exclude timber harvest. Prescribed burning could also reduce cover, but generally burning kills smaller trees and would have minimal effect on canopy cover. As with timber harvest, seasonal restrictions would be applied to burning activities if nesting goshawks are identified.

4-42
Neotropical Migrant and Native Birds

Assessment of the effects of the proposed activities on Neotropical Migrant birds is discussed on pgs 268-282 of the DEIS. OFMS conversion, OFSS maintenance and OFSS development would benefit species using these habitats including white-headed woodpeckers, flammulated owls and chipping sparrows. (See Table WL – 23, pg 276.) Proposed thinning would be intended to benefit OFSS.

4-43
American Marten

The effects of actions proposed on American (pine) marten are documented in the DEIS on pgs 217, 220, and 224-235. See responses 4-20 and 4-22.

4-44
Original Crawford Appeal

We reviewed the LOWD-BMBP appeal on the original Crawford EA. The issues in the appeal were considered in the Crawford DEIS.

We look forward to working with you on future projects. Thank you for your comments on the Crawford Project DEIS.

Comment # 5 – Ryan Torland, Oregon Department of Fish and Wildlife	Response

Oregon
Theodore R. Kulongoski, Governor

Department of Fish
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Bake

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Ryan Falk, Environmental Coordinator
Prairie City Ranger District
PO Box 337
Prairie City, OR 97869

Dear Mr. Falk:

5-1

I am writing in response to the Crawford Timber Sale DEIS. This project proposes to treat forest lands in the upper Middle Fork of the John Day River watershed to reduce fuels using commercial harvest, precommerical thinning, and prescribed burning. In addition, replacement old growth areas will be designated and a roads management plan implemented.

5-2

The Crawford Timber Sale project area is summer range for deer and elk. It's important the big game habitat of this area is maintained because it provides secure cover for calving and fawning as well as high quality forage throughout the summer. Loss of these types of habitats may force deer and elk to adjacent developed agriculture increasing damage conflicts.

5-3

While I support the purposes of this project, I'm concerned that, if implemented too aggressively, deer and elk will be forced onto adjacent landowners. To avoid this I recommend that alternatives 2, 3, and 4 be modified to leave dense cover in lodge pole and fir thickets on the north and east aspect slopes. I also suggest that patches and corridors of uncut and/or unburned cover be left within treatment units to reduce openness, obstruct line of sight, provide multiple cover sizes and types, and provide security to animals. This would break up the landscape leaving a mosaic pattern.

I prefer alternative 3 because areas classified as satisfactory big-game cover are not harvested. I also strongly support the destruction or decommissioning of roads used for treatment purposes proposed in this alternative. This will help maintain security for wildlife and reduce disturbance after treatment.

If you have any question or would like to discuss my comments please contact me at (541) 523-5832.

Sincerely,

Ryan Torland
Acting Baker District
Wildlife Biologist

5-1
Big Game Habitat- Loss of Habitat

Big game habitat analysis documented in the DEIS on pgs 236-249 relative to the potential effects to big game habitat from the four alternatives. Comment is general, with the expression of a desire for absence of adverse affects to summer range, calving and fawning habitat, and forage habitat. The elk population trend information for the Sumpter and Desolation Management units has been updated in the FEIS. Updated Table WL – 10 indicates that elk population levels have remained relatively stable over the last 12-13 years in both the Sumpter and Desolation Management units in spite of past forest management activities

5-2
Alternative Recommendation- Retaining Dense Cover and Fir Thickets

Big game cover habitat documented on pgs 239-241, 244-246, and 248-249 is relative to the potential effects to big game cover habitat. This concern is partially addressed by retaining unthinned patches within thinning units of dense trees as wildlife security cover. Unthinned patches would comprise 5 to 15% of each unit and range from 2 to 5 acres in size depending on the density of understory trees. See Chapter 2, Table 2.4. To provide additional security to big game, the Mill Creek subwatershed road density will be maintained at 1.8 miles per square mile which is below the Forest Plan Standard, and total cover will be maintained well above Forest Plan standards in all action alternatives.

5-3
Satisfactory Big Game Cover

Your support for Alternative 3, as satisfactory cover would not be entered with that alternative is noted. Your support for decommissioning roads is also noted.

Comment # 6 – Christine B. Reichgott, United States Environmental Protection Agency	Re-sponse
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY **REGION 10** 1200 Sixth Avenue Seattle, WA 98101 January 8, 2007 Reply To Attn Of: ETPA-088 Ref: 03-070-AFS Mr. Ryan Falk, Environmental Coordinator Prairie City Ranger District P.O. Box 337 Prairie City, OR 97869 Dear Mr. Falk: The U.S. Environmental Protection Agency (EPA) has reviewed the draft Environmental Impact Statement (DEIS) for the **Crawford Project Timber Harvest, Fuel Treatments, and Road Closure Activities** on the Malheur National Forest in Oregon. We are submitting comments pursuant to our responsibility under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. The Malheur National Forests (the Forest) is proposing to treat the Crawford Project area to 1) Promote a change in species composition and structure; 2) Decommission and close roads to reduce the risk of sedimentation reaching streams while meeting public and administrative access needs; 3) Adjust old growth boundaries to meet Malheur Forest Plan standards; 4) Capture the economic value of trees to provide wood products and jobs; 5) Develop future and late old structural single stratum wildlife habitats; 6) Reduce fire fuels; and 7) Implement the Highway 26 and Highway 7 Viewshed Corridor Plans. The proposed action would treat approximately 5,300 acres within the 14,950 acre project area. The DEIS considers a no-action alternative and four action alternatives: 1. Alternative 1 – No Action. This alternative represents the existing condition. Under this alternative, current resource management activities would continue, but the proposed project would not take place. 2. Alternative 2 – Proposed Action. This alternative is identified as the preferred alternative. Under this alternative the Forest would conduct commercial thinning on 2,073 acres, precommercial thinning on 935 acres, and shelterwood harvest on 119 acres. The alternative would also include construction of 8.6 miles of temporary roads, reconstruction of 10.9 miles of road, maintenance of 35.2 miles, and opening of 1.7 miles of road. Other activities include the closure or decommissioning of 18.7 miles of road, prescribed burning on 5,300 acres, and an adjustment (increase) to three Dedicated Old Growth areas. 3. Alternative 3 – This alternative minimizes temporary road construction to less than 0.1 miles for each road, and drops approximately one third of the harvest areas in Alternative 2. The Forest would conduct commercial thinning on 1,506 acres, precommercial thinning on 666 acres, and no shelterwood harvest. The alternative would include	

construction of 1.5 miles of temporary road, reconstruction of 10.9 miles of road, maintenance of 31.9 miles of road, and opening of 1.7 miles of road. Other activities include the closure or decommissioning of 18.7 miles of road, prescribed burning on 5,300 acres, and an adjustment (increase) to three Dedicated Old Growth areas.

4. Alternative 4 – This alternative does not include any commercial timber harvest, temporary road construction, maintenance, or reconstruction. A total of 795 acres would be precommercially thinned. Other activities include the closure or decommissioning of 18.7 miles of road, prescribed burning on 5,300 acres, and an adjustment (increase) to three Dedicated Old Growth areas.

6-1

Our review focused on Alternative 2, the preferred alternative. Based on the information provided, we are rating the DEIS as EC-1 (Environmental Concerns – Adequate). An explanation of this rating is enclosed. The Environmental Concerns rating is associated primarily with concerns that roads (particularly those in Riparian Habitat Conservation Areas) may contribute sediment loading to streams, apparent discrepancies within the document related to the number and location of road miles, sedimentation rates, and concerns with the undocumented cost and timing of restoration measures. We have discussed our comments in detail in the enclosed attachment.

Thank you for the opportunity to review and comment on this draft EIS. If you have questions or would like to discuss these comments, please contact Teresa Kubo of my staff at 503/326-2859.

Sincerely,

Christine B. Reichgott

Christine B. Reichgott, Manager
NEPA Review Unit

Enclosure

Crawford Project Timber Harvest, Fuel Treatments,
Road Closure Activities Draft Environmental Impact Statement
EPA Region 10 Detailed Comments

Roads 6-2

The purpose and need sections of the EIS state that the area has a fairly high road density due to past logging activities and there is a need to reduce sediments to streams from the existing road system. The EIS also states that the Mill Creek subwatershed was rated as high risk for roa(density, overall watershed risk and overall aquatics risk (pages 3-155 and 3-157). The proposed action (Alternative 2) will reconstruct 10.9 miles of road, reopen 2.1 miles of road and construct 8.6 miles of temporary road within the project area. The addition of 13.0 miles of permanent road miles and 8.6 miles of temporary roads does not appear to meet the stated purpose and need of the proposed project or address the high road density, watershed and aquatics risks. While much of the reconstructed and temporary roads will be located outside the Riparian Habitat Conservation Areas (RHCA), 11.0 miles of roads including FS 2620 will remain in the RHCA and would contribute to the sediment load in the project area. The EIS needs to discuss how the stated purpose and need for reducing road densities and sediment loads to streams will be met with the proposed addition of 21.6 miles of permanent and temporary roads when only 17.8 mile of roads (most of which are currently closed) will be decommissioned.

The information presented in the body of the EIS is restricted to the Mill Creek subwatershed. The EIS states that minor additional activities will occur outside the Mill Creek subwatershed (page 2-45). Appendix C – Road Summary, provides the information for all road activities within the project area. Summarized below are the differences between what is reported in the body of the EIS and that which is presented in Appendix C. 6-3

[All values in miles]	**Body of EIS**	**Appendix C – Road Summary**	**Difference**
Gated or Signed Closures	0.7	0.9	+0.2
Bermed or Signed Closures	0.2	0.2	0.0
Decommissioning	17.8	18.9	+1.1
Opening of Closed Roads	1.7	2.1	+0.4
Road Reconstruction	10.9	10.9	0.0
Road Maintenance Alt. 2	35.2	35.2	0.0

While there would be additional environmental benefits from having additional roads closed and decommissioned outside the Mill Creek subwatershed, there are concerns that Appendix C indicates that there will be an additional 0.4 miles of roads reopened in the Dry Fork

subwatershed that could result in long term environmental impacts. The EIS needs to discuss why these additional roads will be reopened, where the additional 0.4 miles of road are located in the Dry Fork subwatershed (e.g., within a RHCA) and the environmental impacts associated with the reopening of these roads.	**6-4**
The Road Density Summary presented in Table 2.24 of the EIS appears to be in conflict with information presented in other parts of the document. [Note: The reference to Table 2.23 on page 2-46 of the document should reference Table 2.24.] For example, Table 2.24 states that the information presented is for the Mill Creek subwatershed only, however, the increase in 'Open' roads (from 50.7 miles to 51.1 miles) appears to correspond with the values in Appendix C for the Dry Fork subwatershed. In addition, Table 2.24 indicates that miles of road 'Closed to Motorized Vehicles' would be reduced from 62.8 miles to 44.6 miles (16.9% reduction in closed roads) under the proposed action. This suggests that an additional 18.2 miles would be made accessible to motorized vehicles. The EIS does not discuss where these additional miles of roads would be located within the project area and the environmental impacts associated with these roads. The EIS needs to address the discrepancies between the information presented in the text of the document and the information presented in Table 2.24.	**6-5**
The EIS states that 1.7 miles of road in the Mill Creek subwatershed were closed in the 1990s to reduce wildlife disturbances (page 1-16). One of the closed roads is located in a meadow area and the public has consistently driven around the established closure causing rutting and meadow damage. The second road is located in an upland area and has forced alternate use of a nearby road located in a riparian area. Use of the riparian alternate is causing resource damage and sediments concerns. The proposed alternative would reopen both of the closed roads. While the EIS is clear that these roads created environmental impacts, it does not discuss in detail the environmental impacts associated with these roads when they were open. In addition, the EIS does not compare the impacts between having the roads open versus keeping them closed. The EIS needs to provide a comparison of environmental impacts these roads had when they were open and when they were closed. The EIS should discuss the manner in which the roads were closed and why the closure was ineffective in keeping the public from gaining access to the area. Finally, the Forest Service should utilize information about the ineffective road closures to propose actions that would prevent the public from accessing these environmentally sensitive areas in the future.	**6-6**
Sedimentation Rates Throughout the document, it is repeatedly noted that aquatic resources in the Mill Creek Subwatershed are at risk, and that the road system has had a major impact (page 3-154). The document concludes, however, on page 3-153, that because the Mill Creek Subwatershed is not as steep or as wet as other subwatersheds, roads are "probably" not a major sediment source. Given the listing of Mill Creek and Crawford Creek on the Oregon 303(d) list for water quality-limited water bodies for high summer temperatures, and the importance of these waters as fish habitat, this question should be given full treatment. Use of GeoWEPP or another similar modeling package would help to verify that sedimentation rates would not affect water quality.	**6-7**

costs associated with restoration and mitigation to be $0. This raises the question of when and how the proposed restoration and mitigation measures will be accomplished. If the proposed restoration measures are not to be included in the contract work under this project, please discuss how these measures will be funded.	**6-8**

6-1
Review Rating

Thank you for reviewing and commenting on the Crawford DEIS

6-2
Road Density – Stated Purpose and Need

The proposed action would reconstruct 10.9 miles of road. These are existing roads that are already part of the transportation system. Reconstruction would consist of constructing new drainage dips, new waterbars, and new ditches, which address the stated purpose and need of reducing the risk of sediment reaching streams and road related impacts to aquatic species (DEIS, Chapter 2, pg 42). Existing bank vegetation will be protected during road maintenance/ reconstruction activities in RHCAs. Road reconstruction would not extend outside of existing road prisms in RHCAs. Therefore, road maintenance/reconstruction would not result in a decrease in current bank stability levels (DEIS, Chapter 3, pg 167). Haul routes would occur in RHCAs. There would be about 5.6 miles of haul route along RHCAs roads. Road maintenance and reconstruction activities would occur on 4.0 and 0.7 miles of road in RHCAs, respectively. Road maintenance/ reconstruction would occur in existing roads prisms, not in streams (DEIS, Chapter 3, pg 170). Use of haul routes in RHCAs would result in the creation and transport of a negligible amount of fine sediment to stream channels, due to the loosening of sediment particles and destruction of ground cover by maintenance/reconstruction and by traffic. However, maintenance/reconstruction of road segments prior to haul and dust abatement during haul activities would keep the amount of fine sediment resulting to a minimum (DEIS, Chapter 3, pg 171).

Approximately 2.1 miles that are currently closed to motorized vehicles would be re-opened. This includes 1.7 and 0.4 miles in the Mill Creek and Dry Fork Subwatershed, respectively (See FEIS, Appendix B, ATM Plan West Map). This consists of two road segments that were closed in the early 1990s to reduce wildlife disturbance. Monitoring has identified some problems associated with the closures. In both cases, damage to nearby environmentally sensitive areas can be reduced by reopening the road segments, which are not in environmentally sensitive areas. For the 7000255 segment a nearby unauthorized road is located in a meadow area and the public has been consistently driving around the attempted blockage causing rutting and meadow damage. The proposal is to decommission the unauthorized road and reopen the 7000255 segment, which would remove the incentive to drive around the blockage. For the 2600237 / 2600235 segment, closure forced use of a 2600237 road segment located in a riparian area. Use of the riparian road is causing resource damage and sediment concerns. The proposal is to decommission the riparian 2600237 segment and re-opening the stable upland 2600237 / 2600235 segment for public access.

The proposed action does not propose adding 13.0 permanent road miles. No new permanent roads are proposed for construction. Approximately 8.6 miles of temporary road is proposed. Temporary roads would be constructed in several short segments ranging from a few hundred feet to approximately a mile in length (DEIS, Chapter 2, pg 41). Temporary roads are needed to support timber harvest. All temporary roads would be decommissioned after use. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. This would include subsoiling and seeding as necessary (DEIS, Chapter 2, pg 42). Temporary roads will not be located in RHCAs (DEIS, Chapter 3, pg 170).

Approximately 18.0 miles (17.8 Mill Creek Subwatershed and 0.2 Dry Fork Subwatershed) of road is proposed for decommissioning. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. Approximately 17.7 miles of these roads are already closed (17.5 Mill Creek Subwatershed and 0.2 Dry Fork Subwatershed). The remaining road roads (0.3 miles in the Mill Creek Subwatershed) are currently open. The decommissioned roads would be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, drainage provided on the road surface, and a culvert would be removed from a decommissioned road. Conifers would be planted on decommissioned road segments located in RHCAs where conditions will support establishment and growth. These roads would be removed from the Forest Transportation system (DEIS, Chapter 2, pg 45). About 5.8 miles of road would be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek (DEIS, Chapter 3, pg 172). There is a short-term risk of generating sediment during and shortly after decommissioning activities which could reach streams, and could affect fish and fish habitat in those streams. This risk is primarily associated with removing the culvert, and with the scarification, or subsoiling which may be needed on some road segments to discourage vehicle use and improve infiltration. Design criteria include culvert removal guidelines, as well as standard contract clauses, which incorporate BMPs. The proposed design criteria and application of BMPs would reduce the probability and magnitude of this short-term risk. The longer-term effects of road decommis-sioning are beneficial effects for water quality and fish habitat. The improved infiltration and ground cover conditions of the decommissioned roads will help restore natural watershed function, including reduced sediment yield from the road prism (DEIS Chapter 3, pg 173).

6-3

Discrepancies – Road Miles in Body of EIS and Appendix C

The proposed action would close 1.5 miles of road with gated signed closures. These mileages include 0.7 miles within the Mill Creek Subwatershed; additional activities occur outside this subwatershed (DEIS, Chapter 2, pg 45). The Appendix C- Road Summary table shows specific roads and miles that would be closed by subwatershed. The table shows 0.7 miles of road to be closed with gated signed closures in the Mill Creek Subwatershed and 0.8 to be closed with gated signed closures in the Idaho/Summit Creek Subwatershed. Some of the roads proposed for closure in the Mill Creek Subwatershed extend for short distances into the adjacent subwatershed (Idaho Creek/Summit Creek). Side roads from the proposed closure roads also extend into the adjacent subwatershed. The table in Appendix C also shows the minor segments of road in the adjacent subwatershed. In the FEIS, Chapters 1 and 2 have been updated to show miles of proposed road maintenance, reconstruction, closure, and decommissioning by subwatershed.

Approximately 17.8 miles of road is proposed for decommissioning. This only includes the activity within the Mill Creek subwatershed. Minor segments (approximately 0.2 miles) of roads proposed for decommissioning extend into the adjacent Dry Fork Subwatershed.

6-4

Roads Reopened in Dry Fork Subwatershed

The DEIS (pg 45) states that 1.7 miles of closed road would be reopened. It also states that these mileages include only the activity within the Mill Creek Subwatershed and minor additional activities occur outside the subwatershed. Portions of the 2600235 Road (0.4 miles) extend into the Dry Fork Subwatershed (DEIS, Appendix C, pg 400). This small segment of drivable road is located in the uplands. Public use is currently restricted by a pole barricade. Reopening the road to the public would have no measurable effect on water quality or wildlife species.

6-5

Roads- Table Discrepancies

Minor corrections to Table 2.24 (which is 2.26 in the FEIS) and Appendix C have been made in the FEIS. When evaluating the numbers in the table, please take into consideration that the majority of the roads proposed for decommissioning are already closed. Decommissioning will return these roads to a more hydrologically stable condition.

6-6

Road Effects

The EIS discloses the environmental impact of the two roads, when they were open, was an increase in wildlife disturbance (Chapter 1, Proposed Action, Proposed Activities, Road Activities section). The EIS strongly implies that if only one road was opened, rutting and meadow damage would decrease, and if the other one were opened, resource damage and sediment concerns would decrease in the riparian area. The reason the closures were ineffective is due to the ground being fairly level, making it is easy to drive a four-wheel drive, high clearance vehicle around any type of closure. The closed roads proposed for reopening are not in environmentally sensitive areas (like RHCAs). The descriptions of these proposals were clarified in the FEIS.

6-7

Roads Sediment Modeling

The EIS discloses that factors that contribute to the high temperatures in Crawford and Mill Creeks include high width-to-depth ratio, the intermittent to very low perennial flow, the stringer meadow vegetation, past riparian logging, and the 2620 road (Chapter 3, Aquatics & Water Quality, Affected Environment and Environmental Effects - Aquatic Habitat and Water Quality, Water Temperature/Stream Shading section). Therefore, sediment is not a significant factor in the 303(d) listings. Neither Crawford Creek nor Mill Creek will ever be able to support significant fish populations, even under completely natural conditions, because at most only a few thousand feet of either stream is perennial. As a result these two streams are not essential fish habitat. GeoWEPP or any other model is based on many assumptions and simplifications. Thus, models are not as reliable as on-the-ground inspections for road surface conditions and connections between roads and streams. It was such on-the-ground inspection by the project soils specialist that lead to the determination that hydrological connection is not high. These facts were clarified in the FEIS.

6-8

Completion of Restoration Measures

Restoration work may be complete with funding and labor from a variety of sources including: funding appropriated from Congress, partnership/grant funding, Title II funding, and volunteer labor. Some of the work may be completed with money generated from the sale of timber (KV and BD funding) or may be completed as part of the timber sale contract.

APPENDIX F – BEST MANAGEMENT PRACTICES (BMPS)

BMPs are the primary mechanism for achievement of water quality standards. This appendix describes key BMPs that have been selected in addition to those listed in Chapter 2 (in the description of the alternatives and in the Management Requirements, Constraints, and Design Measures Tables 2 – 6 and 2 – 7) and in PACFISH Standards and Guidelines (as described in Chapter 3, Aquatics & Water Quality, Regulatory Framework section) for implementation with any of the action alternatives.

Best Management Practices include but are not limited to structural and non-structural controls, operations, and maintenance procedures. BMPs would be applied before, during, or after pollution producing activities to reduce or eliminate the introduction of pollutants into receiving water-bodies.

BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility. Blue Mountain Ranger District monitors some applications of BMPs to evaluate implementation and effectiveness and to determine if changes are needed.

The Memorandum of Understanding, between the USDA Forest Service and the Oregon Department of Environmental Quality, To Meet State and Federal Water Quality Rules and Regulations, specifically identifies the implementation of site specific BMPs as one of the Forest Service responsibilities to satisfy State and Federal point and non-point source pollution control requirements on National Forest Service lands.

Below are applicable BMPs, listed in the General Water Quality Best Management Practices (USDA Forest Service Pacific Northwest Region, 1988) document that will be used with the Crawford Project, along with information as to who will be responsible for implementing them, when they will be done, and a determination of ability to implement, and effectiveness:

T – 1 – Timber Sale Planning Process

Estimates have been made on the potential changes to water quality and instream beneficial uses, and are disclosed in the EIS.
Responsibility: Project Soil Scientist and Fisheries Biologists
Timing: Prior to activity
Ability to Implement: High
Effectiveness: High

T – 4 – Use of Sale Area Maps for Designating Water Quality Protection Needs

The Sale Area Map will include locations of streams to be protected and the required harvest method.
Responsibility: Presale Technician
Timing: Prior to activity
Ability to Implement: High
Effectiveness: High

T – 7 – Streamside Management Unit Designations

The IDT designated PACFISH RHCAs as streamside management units. RHCAs will prevent potential adverse effects of nearby logging and prescribed burning.
Responsibility: Presale Technician
Timing: Prior to activity
Ability to Implement: High
Effectiveness: High

T – 10 – Log Landing Location

Harvest plans will include proposed landing locations. Landing locations and size will be approved in advance by Forest Service personnel.
Responsibility: Presale Technician and Sale Administrator
Timing: Prior to and during activity
Ability to Implement: High
Effectiveness: High

T – 11 – Tractor Skid Trail Location and Design

Harvest plans will include proposed yarding patterns. Skid trails will be approved in advance by Forest Service personnel.
Responsibility: Presale Technician and Sale Administrator
Timing: Prior to and during activity
Ability to Implement: High
Effectiveness: High

T – 13 – Erosion Prevention Measures during Timber Sale Operations

Erosion control work will be kept current.
Responsibility: Sale Administrator
Timing: During activity
Ability to Implement: High
Effectiveness: High

T – 18 – Erosion Control Structure Maintenance

The Purchaser will provide maintenance of soil erosion control structures as required in the timber sale contract.
Responsibility: Sale Administrator
Timing: During activity
Ability to Implement: Moderate
Effectiveness: High

T – 19 – Acceptance of Timber Sale Erosion Control Measures before Sale Closure

The effectiveness of erosion control measures will be evaluated periodically during the life of the timber sale contract.
Responsibility: Sale Administrator and Hydrologist
Timing: During activity
Ability to Implement: High
Effectiveness: High

R – 1 – General Guidelines for the Location and Design of Roads

Temporary road construction and system road reconstruction design creates minimal resource damage.
Responsibility: Engineering Technician
Timing: Prior to activity
Ability to Implement: High
Effectiveness: High

R – 2 – Erosion Control Plan

Limit erosion and sedimentation through effective planning and contract administration.
Responsibility: Engineering Technician and Sale Administrator
Timing: Prior to and during activity
Ability to Implement: High
Effectiveness: Moderate

R – 3 – Timing of Construction Activities

Road reconstruction and temporary road construction will occur during minimal runoff periods to minimize erosion.
Responsibility: Sale Administrator, Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: Moderate

R – 6 & R – 7 – Dispersion of Subsurface and Surface Drainage Associated with Roads

Ditch relief and cross drainage design will assure intercepted ground water and surface water is moved from road prism before it develops enough energy to undermine cut slopes or erode fill slopes.
Responsibility: Sale Administrator, Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: Moderate

R – 12 – Control of Construction in Streamside Management Units

No road construction is planned within RHCAs.
Responsibility: Sale Administrator, Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: High

R – 18 – Maintenance of Roads

Ditches and culverts will be kept open and ruts repaired
Responsibility: Sale Administrator, Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: High

R – 19 – Road Surface Treatment to Prevent Loss of Material

Watering and grading will be kept on schedule to assure surface material is not lost.

Responsibility: Sale Administrator, Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: High

R – 21 – Snow Removal Controls to Avoid Resource Damage

Snow removal will assure water can drain from road prism before it develops enough energy to erode road surface or fill slopes.
Responsibility: Sale Administrator, Engineering Technician, Silvicultural Technician
Timing: During activity
Ability to Implement: High
Effectiveness: High

R – 22 – Restoration of Borrow Pits and Quarries

Borrow pits will be stabilized such that banks are stable and access road provides necessary drainage.
Responsibility: Engineering Technician
Timing: During activity
Ability to Implement: High
Effectiveness: High

R – 23 – Obliteration of Temporary Roads

Temporary roads will be decommissioned as described in Chapter 2, Alternative 2, Commercial Harvest section. Future use of the road would be eliminated, and hydrological function would be restored using subsoiling and seeding as necessary.
Responsibility: Sale Administrator, Engineering Technician
Timing: At the end of activity
Ability to Implement: High
Effectiveness: High

F – 3 – Protection of Water Quality during Prescribed Fire Operations

The prescribed fire will follow the burn plan. Adjustments will be made during firing operations if objectives are not being met.
Responsibility: Fire Management Officer, District Ranger
Timing: Prior to and during activity
Ability to Implement: High
Effectiveness: High

W – 5 – Cumulative Watershed Effects

The IDT analyzed and disclosed in the EIS the effects of the proposed management activities, when added to the existing conditions to ensure cumulative effects do not exceed thresholds of concern or result in adverse (degraded) water quality or channel/fish habitat conditions.
Responsibility: Project Soil Scientist and Fish Biologists
Timing: Prior to activity
Ability to Implement: High
Effectiveness: High

APPENDIX G – SUMMARY OF GLOBAL CLIMATE CHANGE PREVENTION ACT OF 1990. *7 U.S.C. §§ 6701-6710, November 28, 1990.*

Overview

This Act authorizes and directs the Secretary of Agriculture to take steps towards researching climate change, including establishing: a Global Climate Change Program; a technical advisory committee; an Office of International Forestry; urban forestry demonstration projects; biomass energy demonstration projects. The Secretary is also directed to study the effects of global climate change on agriculture and forestry, and the interaction between forest greenhouse gas emissions and climate change.

Global Climate Change Program

The Act directs the Secretary of Agriculture (Secretary) to establish a Global Climate Change Program in order to have within the Department of Agriculture a focal point for coordinating all issues of climate change. The Secretary must designate a director, who shall: coordinate policy analysis, long range planning research, and response strategies relating to climate change issues; provide liaison with other federal agencies, through the Office of Science and Technology Policy, regarding issues of climate change; perform other enumerated duties. § 6701.

Agriculture and Forestry

The Act directs the Secretary to study: the effects of global climate change on agriculture and forestry; the emissions of methane, nitrous oxide, and hydrocarbons from tropical and temperate forests, and the manner in which they may affect, and will be affected by, global climate change. The Secretary must submit to Congress reports of the agriculture and forestry studies by November 1993 and November 1996, respectively. § 6702.

Technical Advisory Committee

The Secretary must establish a technical advisory committee to provide advice to the Secretary concerning the major study areas required under this chapter. § 6703.

Office of International Forestry

The Secretary, acting through the Chief of the Forest Service, must establish an Office of International Forestry within the Forest Service. The Chief is to appoint a Deputy Chief for International Forestry responsible for the international forestry activities of the Forest Service. § 6704.

Institutes of Tropical Forestry

The Secretary is authorized and directed to establish an Institute of Tropical Forestry in Puerto Rico and an Institute of Pacific Islands Forestry. The Institutes will conduct research on forest management and natural resources that must include: managing and developing tropical forests;

the relationship between climate change and tropical forests; threatened and endangered species recreation and tourism; developing tropical forest resources on a sustainable yield basis; techniques to monitor health and productivity of tropical forests; tropical forest regeneration and restoration; effects of tropical deforestation on biodiversity, global climate, wildlife, soils and water. § 6706.

Urban Forestry Demonstration Projects

The Secretary is authorized to undertake, through the Forest Service's Northeastern Area State and Private Forestry Program, a study and pilot implementation project to demonstrate the benefits of retaining and integrating forests in urban development. § 6707.

Biomass Energy Demonstration Projects

The Secretary may carry out projects that demonstrate the potential of short-rotation silvicultural methods to produce wood for electricity production and industrial energy needs. § 6708.

Interagency Cooperation to Maximize Biomass Growth

The Secretary may enter into an agreement with the Secretary of Defense to: conduct a study of reforestation and improved management of Department of Defense military installations and lands; develop a program to manage such forests and lands so as to maximize their potential for biomass growth and sequestering carbon dioxide. § 6709.

Appropriations Authorized

There are authorized to be appropriated sums necessary to carry out the Act for fiscal years 1991 through 1996. § 6710.